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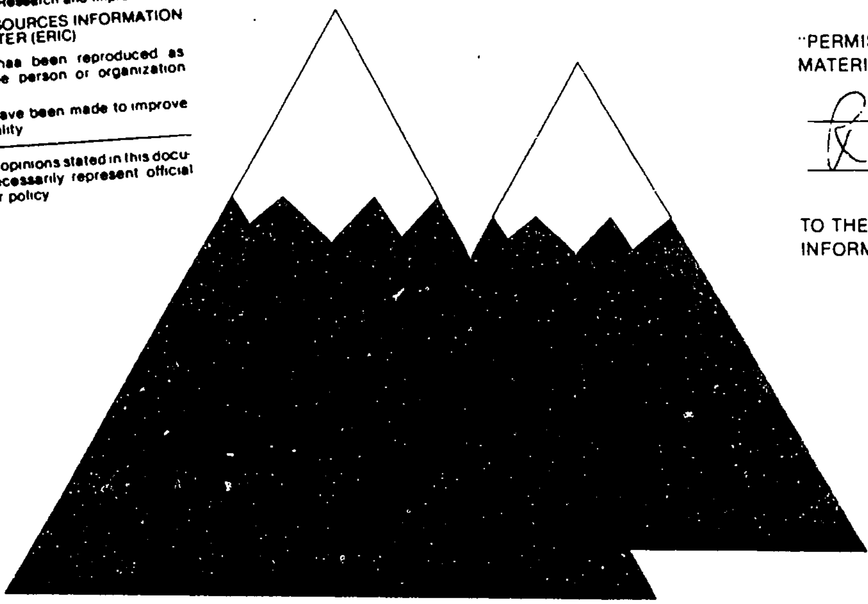
ABSTRACT

The theme of this conference reflects the continuing need to conduct and report research that addresses significant problems and issues in Agricultural Education. Selected research papers are as follows: "Opportunities and Obstacles for Distance Education in Agricultural Education (AE)" (Murphy, Terry); "Faculty Needs Associated with Agricultural Distance Education" (Murphy, Terry); "Learning Styles of Agricultural Distance Learners" (Miller); "Effectiveness of Distance Learning Courses" (Swan); "A National Validation Study of Research Priorities for Adult Education" (Harbstreit et al.); "Goals Met by Adult Organizations in AE, Nationally" (Dormody et al.); "Analysis of the Inservice Needs of Beginning Teachers of Agriculture" (Garton, Chung); "Conducting AE Research Using Electronic Surveys" (Kawasaki et al.); "Using Assessment Information in Educational Decision Making" (Kershaw, McCaslin); "Perceptions of Secondary School Principals toward AE" (Jewell); "Arkansas Agriculture Teachers' Opinions Concerning Science Credit for Agriculture" (Johnson); "Factor Analysis of Attitudes of Illinois Guidance Counselors toward Agriculture Programs" (Dyer, Osborne); "Toward a Model for Increasing Cognitive Level Reached by Students in College Classrooms" (Whittington); "Decision Cases versus Traditional Lecture in a University Agriculture Course" (Allen et al.); "Interaction in the Distance Education Setting" (King, Doerfert); "Computer Use, Experience, Knowledge, and Attitudes of Extension Personnel" (Park, Gamon); "Distance Education Needs of Cooperative Extension Agents" (Jackson et al.); "Effects of Teaching Approach on Problem Solving Ability of AE Students with Varying Learning Styles" (Dyer, Osborne); "Learning Style" (Torres, Cano); "Factors Influencing Enrollment in AE Programs as Expressed by Iowa Secondary AE Students" (Reis, Kahler); "Evaluating the Physical Accessibility of Indiana High School AE Facilities" (Ploss, Frick); "Present and Future Emphasis of Secondary School Agricultural Mechanics Programs in the United States" (Laird, Kahler); "Mathematical Problem-Solving Proficiency of AE Teachers in Alabama" (Hunnicutt, Newman); "Attitudes of University of Illinois College of Agriculture Freshmen toward Agriculture" (Dyer et al.); "Comparison of the Career Choice and Job Satisfaction of Scholarship Recipients with Non-Scholars in a College of Agriculture" (Fraze, Ritz); "Food and Agriculture Awareness of Land Grant University Education Faculty" (Elliot, Frick) "Defining Internationalization for Extension" (Ludwig, Barrick); "Agent Turnover in Ohio State University Extension" (Rousan, Henderson); "Safety Attitudes of Agricultural Mechanics Students and Their Relationships to Selected Variables" (Lawver, Fraze); "Career Decision-Making Processes of Minority Youth in One Rural Mississippi Delta Community" (Wardlow et al.); "Barriers to Professional Careers as Perceived by Minority Professionals in Agriculture" (Wardlow et al.); "Mentoring Activities of Women Graduates in Agricultural Education at the Pennsylvania State University" (Baker, Baggett); and "College Faculty Motives and Barriers for Participating in International Activities" (Kelsey, Dormody). (YLB)

PEAK PERFORMANCE . . .

Reaching for Excellence in Agricultural Education Research



Proceedings of the 22nd Annual

National Agricultural Education Research Meeting

December 1, 1995 Denver, Colorado

Volume XXII

National Agricultural Education Research Meeting
December 1, 1995 Denver, Colorado

The National Agricultural Education Research Meeting (NAERM) provides a national forum for presenting and discussing research related to Agricultural Education. Responding to a Call for Papers, authors prepare paper proposals for peer review. There were 112 proposals submitted for the 1995 NAERM. Each paper proposal was submitted to a "blind review" by a three-member panel. Peer review panels were comprised of individuals nominated by members of the American Association for Agricultural Education (AAAE). Paper proposals were submitted to review panels comprised of members who were not from the same institution as the authors.

Peer reviewers were asked to rate each paper proposal using a five-point scale ranging from 1= Low to 5= High on the following criteria: (a) Introduction/Theoretical Framework, (b) Purpose/Objectives, (c) Methods/Procedures, (d) Results/Findings, (e) Conclusions/ Recommendations/Implications, and (f) Other.

In addition to the specified criteria, peer reviewers were asked to indicate an overall recommendation for the paper proposal in one of three categories: Accept, Neutral, or Reject. Peer reviewers were asked to return rating forms for each proposal to the NAERM Co-Chairs by July 1, 1995. After compiling responses from peer reviewers, 48 paper proposals were selected for presentation at the 1995 NAERM in Denver, Colorado. In addition, one alternate paper was selected for inclusion in the Proceedings. This process resulted in an acceptance rate of 43% for papers presented at NAERM and 44% for papers published in the Proceedings.

Papers selected for the 1995 NAERM received "Accept" recommendations from at least two peer reviewers and mean ratings above 22 (on a 6 - 30 scale) on selected criteria. Therefore, the papers presented at the 1995 NAERM were judged to be the best research in the field of Agricultural Education.

We are proud to serve as Co-Chairs of the 1995 NAERM. We hope you will benefit from the results of this effort.

Respectfully submitted,

Robert J. Birkenholz
1995 NAERM Co-Chair
University of Missouri

Leon G. Schumacher
1995 NAERM Co-Chair
University of Missouri

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Preface

The theme for the 22nd Annual National Agricultural Education Research Meeting was *"PEAK PERFORMANCE . . . REACHING FOR EXCELLENCE IN AGRICULTURAL EDUCATION RESEARCH."* This theme is reflective of the Rocky Mountains on the western horizon of Denver, Colorado, the host site for the 1995 NAERM. In addition, the theme reflects the continuing need to conduct and report research that addresses significant problems and issues in Agricultural Education.

The proceedings of the 1995 NAERM were compiled and distributed to communicate research results in a timely and efficient manner. These reports are a valuable resource to guide efforts to improve Agricultural Education programs in the future. Since the first NAERM was held in 1974, there have been steady improvements in the NAERM program, presentations, and proceedings. The 1995 NAERM will hopefully pave the way for continued improvements in the future.

Therefore, it is with great pride and humility that we honor the excellent program established by the previous NAERM chairpersons as follows:

1.	1974	New Orleans, LA	Hollie Thomas, Florida State University
2.	1975	Anaheim, CA	Hollie Thomas, Florida State University
3.	1976	Houston, TX	Glen Shinn, Mississippi State University
4.	1977	Atlantic City, NJ	William Richardson, Purdue University
5.	1978	Dallas, TX	Bennie Byler, Mississippi State University
6.	1979	Anaheim, CA	Ronald Brown, Mississippi State University
7.	1980	New Orleans, LA	L.H. Newcomb, The Ohio State University
8.	1981	Atlanta, GA	Maynard Iverson, North Carolina State University
9.	1982	St. Louis, MO	Dale Oliver, Virginia Tech State University
10.	1983	Anaheim, CA	Paul R. Vaughn, New Mexico State University
11.	1984	New Orleans, LA	Jimmy Cheek, University of Florida
12.	1985	Atlanta, GA	Bob Stewart, University of Missouri
13.	1986	Dallas, TX	Alan A. Kahler, Iowa State University
14.	1987	Las Vegas, NV	Alfred J. Mannebach, University of Connecticut
15.	1988	St. Louis, MO	Edgar P. Yoder, The Pennsylvania State University
16.	1989	Orlando, FL	Michael F. Burnett, Louisiana State University
17.	1990	Cincinnati, OH	Robert A. Martin, Iowa State University
18.	1991	Los Angeles, CA	Larry R. Arrington, University of Florida
19.	1992	St. Louis, MO	John P. Mundt, University of Idaho
20.	1993	Nashville, TN	Dennis C. Scanlon, The Pennsylvania State University Thomas H. Bruening, The Pennsylvania State University
21.	1994	Dallas, TX	David E. Lawver, Texas Tech University Robert Terry, Jr., Texas A&M University

Acknowledgements

The National Agricultural Education Research Meeting (NAERM) is a cooperative effort of literally hundreds of individuals which culminates in the presentation of research papers and published proceedings. Planning for NAERM begins two years in advance with the selection of the program chairs. Following the selection of the NAERM chair(s), a Call for Papers is distributed and paper proposals are written and reviewed. Accepted papers are then developed and submitted to discussants for their comments. Final papers and discussant comments are then compiled into published proceedings for distribution at the NAERM Conference. The 1995 NAERM Co-Chairs gratefully acknowledge the professional contributions of the following persons who have contributed to the National Agricultural Education Research Meeting.

1995 NAERM Paper Proposal Reviewers

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Blannie Bowen	Pennsylvania State University
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James Flowers North Carolina State	Gary Leske University of Minnesota	Gary Wingenbach West Virginia University
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University of Missouri

Program Facilitators

Don Johnson
University of Arkansas

George Wardlow
University of Arkansas

1995 NAERM Papers Presented

OPPORTUNITIES AND OBSTACLES FOR DISTANCE EDUCATION IN AGRICULTURAL EDUCATION

Tim H. Murphy Robert Terry, Jr.

Introduction and Theoretical Framework

We live in a time of change. Gelatt (1993) said "Change itself has changed: It has become so rapid, so complex, so turbulent, and so unpredictable that is now called 'white water change'" (p. 10). The currents of change move so swiftly that they destroy what was considered the norm in the past, and by doing so, create new opportunities. Education, and more specifically, agricultural education, is not immune to the effects of change.

The development and use of communications technologies and instructional systems currently taking place are certain to bring about change in education. Wilkenson and Sherman (1991) stated technology to deliver and receive educational programs through technologies associated with distance education has become more accessible and acceptable. Moore and Thompson (1990) pointed out many states are in the process of installing telecommunications technology to allow all levels of education to utilize distance education. Looking to the future, Pessanelli (1993) speculated that technologies will allow learning to take place virtually everywhere. Recently, President Bill Clinton and Vice-President Al Gore (1993) expressed the commitment of his administration to have every school in the nation connected to the "information superhighway."

A vast number of technologies have a place in distance education strategies. While video-based technology is currently the primary method of instructional delivery, a variety of others are used as well (Wilkenson & Sherman, 1991). Many desktop computer-based delivery systems show great promise. Documents, pictures, videos, sounds, and multimedia presentations can be accessed through computer networks such as the World Wide Web (Hill, 1993). Salvador (1994) described how "pen computing," where an electronic pen is used with a LCD screen pad, is being used in a middle school to connect students to an instructor and to one another. The Virtual Online University, as reported by Marklien (1995), will connect faculty from universities around the world to more than 3500 students.

Despite these developments, challenges persist. Faculty and administrators consider these changes in educational delivery systems to be threatening (Beaudoin, 1990). Such concerns focus on poor attitudes toward distance education, suspicion of the nontraditional, and required changes in instructional methods (Dillon, 1989). Miller and King (1994) were able to identify 16 obstacles that exist in delivering distance education to secondary agricultural education programs.

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However, Moore (1993) encouraged educators to look beyond these challenges and consider the vast opportunities distance education technologies and methodologies facilitate.

The opportunities for agricultural educators are numerous. Agricultural educators will be able to deliver programs to broader audiences, including learners of all ages and from diverse backgrounds. It will be possible to design and research distance education methodologies and assist colleagues in other areas of agriculture to enhance their teaching capabilities. Promise exists for partnerships and collaborative efforts with agricultural extension services and agribusinesses as never before. However, for these opportunities to develop from promise to reality, we need to explore this evolving methodology of distance education, determine specific benefits it offers to our profession and obstacles it presents, and clarify a vision for the future.

Purpose and Objectives

The purpose of this study was to develop a consensus to provide focus and direction for future research activities concerning the adoption of electronic communication, information, and imaging technologies for instructional use in agricultural education settings. The specific objectives were:

1. Identify the positive effects the adoption of electronic technologies designed to facilitate communication, information gathering/retrieval, and imaging will have upon the instructional process.

2. Identify the major obstacles that must be overcome in the adoption of these technologies.

3. Identify the technologies that hold the most promise for instruction at the secondary level.

4. Identify the technologies that hold the most promise for instruction at the post secondary level.

Methods and Procedures

The conceptual model for this study was taken from Buriak and Shinn (1989) who used a Delphi approach involving expert opinion leaders to identify a research agenda for agricultural education. The Delphi method was selected for its ability to identify, and even create consensus among expert opinion leaders (Sackman, 1974). While decisions should be based upon a developed knowledge base, if one is unavailable, the opinions of experts are an acceptable alternative (Helmer, 1966). Buriak and Shinn (1989) suggested a Delphi model in which the study progresses in separate phases, "each phase moving closer to satisfying the objectives" (p.14). The phases of this research project are described below.

Phase I: Identification of the Panel

The Delphi method is heavily reliant upon the proper selection of an expert panel (Dalkey, 1969; Sackman, 1974). In order to identify an appropriate panel of experts, 37 names were purposely selected by an advisory committee from appropriate sampling frames. These frames included the 1993 Directory of Teacher Educators in Agriculture and the 1993 Ag Teachers Directory. Experts were selected on the basis of recognized involvement with programs utilizing these technologies. A request was sent to each of these people on March 31, 1994. They were asked to identify expert opinion leaders to serve on a Delphi panel to examine how the new electronic communication, information, and imaging technologies will be used to improve instruction in the years ahead. They were also informed that panel members would be asked to identify the decisive obstacles that must be overcome in the process of adopting these technologies and the consequential instructional benefits derived following their adoption.

These 37 individuals nominated 61 members to serve on the Delphi panel. Only two panel members were duplicated during the identification process, indicating that there is not a consensus among opinion leaders as to expertise in this field. All 61 identified panelists were therefore invited to participate and informed of the commitment required to complete the study.

Of the 61 panelists invited to participate and mailed the 1st round instrument, 50 accepted and returned the instrument. Of these 50, 35 were university faculty members and 15 represented industry, state teacher supervisors, and secondary teachers of agriculture and technology courses. University faculty were primarily from departments of agricultural education, although agricultural extension, communications, and technology departments were represented as well. Forty-two of these 50 panelists completed the second round, and 38 completed the third. According to studies completed by the Rand Corporation, questions of process reliability when using the Delphi method are satisfactorily answered by a panel size larger than 13 (Dalkey, 1969).

Phase Two: Collection of Opinion

In the first round, panelists were asked to offer their response to four open-ended questions. These questions reflected the specific objectives of the study, and remained unchanged throughout the study.

Phase Three: Determining the Value of Opinion

In the second round, panelists were asked to review their own and the other panel members' responses and assign a value rating based upon the level of agreement with the item. A seven-point Likert scale was employed with items ranging from a 1 for "Strongly Disagree" to a 7 for "Strongly Agree." Space was provided at the end of each section for panelists to suggest new ideas. Panelists were also encouraged to further refine existing statements by adding comments and suggestions.

Phase Four: Working Toward Consensus

Based upon the suggestions and comments from the second round, new items and parenthetical clarifications to several existing items were added in the creation of the third round instrument. Frequency distributions were used to refine further Round II

responses. Only those statements on which 66% of the panel members selected "Somewhat Agree" (rating of 5), "Agree" (rating of 6) or "Strongly Agree" (rating of 7) were retained for the third round. In the third round, panelists were asked to re-evaluate items. Each panelist again indicated his/her level of agreement with the items, using summary data from Round II responses as a guide to a new rating.

Phase Five: Analyzing the Data

Only descriptive statistics were used due to the sample selection process. Means and frequency distributions and percentages were calculated for each statement on the third round instrument. The fact that only small changes in the frequencies of retained items were found between the second and third rounds indicated that a consensus had been reached and the Delphi process could conclude.

Findings

Improving Instruction

Panelists suggested 21 ways in which these technologies will improve instruction (see Table 1). Their responses tended to cluster around four areas: 1) an increase in the availability of educational opportunities for students, 2) improved informational resources for faculty and students, 3) more effective instructional materials, 4) more convenient delivery methods for instructors.

Obstacles

Panelists achieved consensus on 13 obstacles to be overcome in the process of adopting these technologies (see Table 2). These obstacles tended to cluster around five areas: 1) lack of time, 2) lack of a formalized reward system for faculty, 3) lack of technical support, 4) cost of the equipment, and 5) lack of properly designed facilities.

Promising Technologies

There was little difference between the technologies identified by the panelists as being most promising for the secondary and post-secondary levels. They achieved consensus on 13 statements for secondary programs (see Table 3), and 19 for post-secondary (see Table 4). In general, the panelists identified technologies that tended to cluster around four areas: 1) Distributed information systems, 2) Computer based information systems, 3) Computer assisted telecommunications systems, 4) Graphical image production and display systems.

Panelists agreed that there would be great variation in the adoption of these technologies by the state, as well as by individual institutions. They reserved only one technology for the secondary level, interactive video, while identifing several technologies solely for the post-secondary level. These included: 1) Electronic advising will become an important and accepted avenue for students; 2) On-line database searches; 3) satellite delivery of audio visual materials, and 4) multimedia authoring systems were all described as promising technologies for the postsecondary level.

Areas of Disagreement

Some items eliminated in the second and third rounds were also notable (see Table 5). Panelists did not achieve consensus on many items, most of which clustered around three areas, namely, teaching methodology or pedagogy, the technology adoption process, and educational institution administration.

Conclusions and Recommendations

Conclusions

1. Electronic communication, information, and imaging technologies will improve how we teach in agricultural education settings. They will allow us to reach more students, more effectively, with better information.
2. Faculty and administrators considered the time required to become proficient in the use of these technologies to be an obstacle to their use. Other obstacles included a lack of commitment for the use of these technologies to improve instruction and a lack of faculty support to the adoption of these technologies. A lack of funding and the cost associated with these technologies were also cited as obstacles.
3. This research supports Dillon's (1989) finding that a lack of incentives is a primary reason why faculty do not support or adopt distance education technologies and methodologies.
4. While no one technology was identified as being most promising for either secondary or post-secondary agricultural education, the computer-based telecommunications technology of all types is a clearly dominate group. Post secondary agricultural education will focus upon networked applications such as e-mail and the World Wide Web. Secondary agricultural education programs will focus upon "stand alone" applications such as CD-ROM and other interactive software programs.

Recommendations

1. This study indicates that agricultural educators are knowledgeable and hold strong opinions about distance education and its related technologies. Therefore, agricultural educators should be included in the planning, development, and implementation of distance education programs.
2. Due to the variety of technologies suggested, a priority assignment should be completed regarding the selection and use of distance education technologies at individual institutions.
3. Because of the frequency with which personnel outside the profession of agricultural education were suggested as resource persons, partnerships should be developed within and between institutions to plan for the use of these technologies.
4. Adjustments of faculty assignments and modification of faculty reward systems should take place to encourage the adoption of these technologies and methodologies.
5. Research should be conducted to identify specific rewards and incentives to motivate faculty to commit to and support the adoption of these technologies.

Table 1
Improving Instruction Through Technology

Statement	Percent "Agree" or "Strongly Agree"
They will provide teachers with additional teaching aids to reach and meet the needs of the diverse learning styles of students.	100.0
Teachers will have greater access to information resources.	100.0
Students will be able to take courses at many institutions.	91.9
A wider range of visual materials will be utilized.	89.2
Student's access to instruction will be enhanced.	86.5
Experts of all kinds will be more available for both students and teachers.	86.5
Textbooks will be available on CD ROM.	86.5
Teachers will communicate with their colleagues more.	83.8
Experts of all kinds will be more available, and more utilized, by both students and teachers.	83.8
They will reinforce learning by providing students with relevant, timely, experiences.	78.6
Instruction will become more individualized.	77.6
Teachers will collaborate over distance on curriculum and research.	75.8
They will increase the opportunities for business/education partnerships.	75.7
Feedback to learners will be quicker and more specific.	73.0
Experts of all kinds will be more utilized, by both students and teachers.	73.0
Direct communications with content experts will be utilized instructionally.	73.0
Multimedia will be more effective in the instruction of abstract concepts.	73.0
Travel time for both student and instructors will be reduced.	70.3
Students will be able to choose courses based upon quality, regardless of the relative geographical location of student and instructor.	70.3
Realistic simulations and or virtual experiences will be utilized instructionally.	70.3
Course materials will be more easily updated.	67.6

Table 2
Obstacles to Overcome in the Process of Adopting Distance Education Technologies

Statement	Percent "Agree" or "Strongly Agree"
Educator apathy, most teachers are not using the technologies available now.	89.2
A lack of commitment by educators to spend the time to master the use of these technologies.	86.5
The level of preparation necessary for the instructor to utilize the technologies consistently.	83.8
The lack of administratively provided time, like professional development leave, to learn to use the technologies.	81.1
The lack of a reward system that encourages staff members to utilize the technologies.	78.4
The resistance to change by educators	78.4
The lack of administratively provided time, not leave, just time during the day to attend workshops.	73.0
The lack of support services to maintain hardware.	73.0
The awareness level of administrators and legislators.	73.0
The lack of coordination of effort in securing these technologies.	73.0
The lack of access to state of the art hardware.	73.0
The lack of availability of facilities designed to utilize the new technologies.	70.3
The cost of the hardware.	67.6

Table 3
Promising Technologies for Secondary Programs in Agricultural Education

Statement	Percent "Agree" or "Strongly Agree"
Interactive computer software programs.	94.6
Presentation software.	94.6
Interactive multimedia CD ROM based computer programs.	86.5
Electronic mail used to communicate among teachers.	86.5
Computers in all classrooms.	86.5
LCD Panels and projectors to display information.	83.8
Computer graphics programs for landscaping and design, CAD.	81.1
Video tapes.	81.1
Interactive Video.	78.4
Electronic mail used for students to communicate with other students.	78.4
Multimedia delivered over a network, like MOSAIC.	78.4
Computer assisted telecommunications and data transmission using the Internet.	75.7
Two way interactive television.	75.7

Table 4
Promising Technologies for Post-Secondary Programs in Agriculture.

Statement	Percent "Agree" or "Strongly Agree"
On-Line database searches using Gopher, Veronica, After Dark, Lexus/Nexus.	97.3
Presentation software.	97.3
LCD Panels and projectors to display information.	94.6
Multimedia delivered over a network, like MOSAIC.	94.6
Computer assisted telecommunications and data transmission using the Internet.	92.1
Interactive computer software programs.	91.9
Electronic mail used to communicate among Professors.	91.9
Interactive multimedia CD ROM based computer programs.	91.6
Electronic mail used for students to communicate with other students within and between campuses.	89.2
Distance Learning at this level will vary greatly by State.	89.2
Distance Learning at this level will vary greatly by Individual Institution.	89.2
Two way interactive television.	81.1
Some advising will be done electronically.	78.4
Satellite delivery of audio visual materials.	75.7
Computers in all classrooms.	75.7
Video tapes.	75.7
Computer graphics programs for landscaping and design, CAD.	71.1
Multimedia authoring systems.	71.1
Electronic advising will become an important and accepted avenue for students.	67.6

Table 5
Sample of Statements Not Retained

Statement	Percent "Agree" or "Strongly Agree"
Benefits not retained:	
The presentation of information will be greatly improved.	65.8
Traditional educational "service areas" or "boundaries" will overlap, and competition between educational institutions will increase.	64.9*
The utilization of information will become more important than its memorization.	64.9*
Students will collaborate with others at distant sites in real time.	62.2*
The presentation of information will be greatly improved.	62.2*
They will increase the equity of course offerings among educational institutions	60.6
Student interest will be increased.	60.5
Instruction will become highly specialized.	57.8*
They will increase the number of students served by an instructor.	55.3
It will fundamentally change the teacher/student roles in education, enabling student centered education with the teacher assuming the role of coach.	50.0
The authenticity of instruction will be increased.	42.1
Education will become more economical.	26.4
Lesson preparation time will be reduced.	5.3
Obstacles not retained:	
The educator's fear of the technologies.	63.2
The high cost of network connections.	62.2*
Lack of vision by administrators.	60.4
The resistance to change by administrators.	57.9
The increased cost to students for the ability to utilize these technologies.	55.3
The paradigm of the instructor as the expert, using teacher directed learning.	52.6
Competition among universities for the same learners.	42.2
The lack of student training in the use of the technologies.	34.2
Student fear of the technologies.	5.2
The lack of student interest.	5.2

* Items removed in Round III. All other were removed in Round II.

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OPPORTUNITIES AND OBSTACLES FOR DISTANCE EDUCATION IN AGRICULTURAL EDUCATION: A CRITIQUE

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This study employed the use of the Delphi method to develop a consensus to provide focus and direction for future research activities concerning the adoption of educational technologies in agricultural education settings. The Delphi approach used was modeled after the work of Buriak and Shinn in 1989. The study provides the authors with a research agenda over a period of time.

With the increasing emphasis on the use of electronic instructional technology and distance education, this study is very timely and important. The authors provided a sound theoretical framework for the conduct of the study. The purpose and objectives were clearly defined, and the methods including the Delphi process were explicitly described.

The researchers found that ways in which technologies will improve instruction center around an increase in educational opportunities for students, improved informational resources, more effective instructional materials, and more convenient delivery methods. It was interesting to note that obstacles to overcome in the process of adopting technologies centered around a lack of faculty time, technical support, and properly designed facilities. These factors have certainly been prevalent in my department and college. With regard to promising technologies, I can understand why electronic advising would be a technology reserved for the postsecondary level. I do not understand why on-line database searches and satellite delivery of audio visual materials wouldn't also be promising uses at the secondary level.

The conclusions of this paper are appropriate and consistent with the data presented. A recommendation suggested that a priority assignment be completed regarding the selection and use of distance education technologies at individual institutions. I would like further explanation of this recommendation. Does it mean university, postsecondary, or secondary institutions?

This research was a well conducted study. The authors are to be commended for conducting research that is timely and important, and for reporting it in an excellent fashion.

FACULTY NEEDS ASSOCIATED WITH AGRICULTURAL DISTANCE EDUCATION

Tim H. Murphy Robert Terry, Jr.

Introduction and Theoretical Framework

With rapid advancements in telecommunications technology in recent years, a great deal of interest has developed about distance education and its uses by colleges of agriculture. However, the research that has been conducted concerning distance education for agriculture programs has been limited. During the five year period between 1989 to 1993, only seven studies dealing with the topic of distance education were reported at the National Agricultural Education Research Meeting (Arrington, 1990; Martin, 1991; Mundt, 1992; Scanlon & Bruening, 1993; Lawver & Terry, 1994).

Keegan (1986) classified theories of distance education into three groups. The third was a group of theories concerning interaction and communications. Gamble and Gamble (1989) proposed a model for any type of communication. This model contained four primary parts. As illustrated in Figure 1, the first component is the sender, or source of information. The sender can be a person, group of people, or an entire institution. The second component is the message -- the information to be communicated. The third part is the channel, or method by which the message is communicated. Finally, the fourth part is the receiver -- the person, persons, or institution to which the message is targeted. These same four components are important in evaluating the potential success of distance education efforts for agricultural educational programs. Overall, distance education research has focused primarily on the two former factors with more limited evaluation of the latter two.

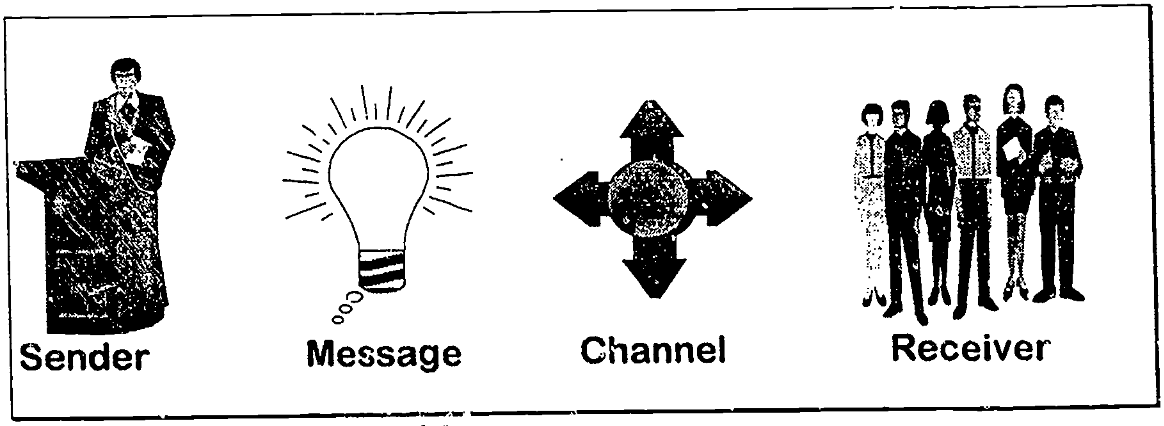

Figure 1. Communications model

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New developments in communications technologies have brought research regarding the methods of delivery, or the channel, used in distance education. Much attention has been directed to the technology itself. The concept of the "information super-highway" has been the subject of countless articles in the popular press. Currently, there is a barrage of television commercials being aired by telecommunications giants such as AT&T, MCI, and IBM promoting the benefits of these new technologies to help people work, learn, and recreate more effectively. Jackson (1994) stated that the increase of available telecommunications technology has provided educators of agricultural subject matter unique opportunities.

A great deal of concern has also been directed toward learners, or the receivers of distance education programs. Dillon and Walsh (1992) pointed out "the dominate theme of distance education research has been linear; research has focused primarily upon learning outcomes, learning characteristics, and learner attitudes" (pg. 5). However, other factors must be considered as well. That is, there are other aspects of this communications process that must be considered.

The sender of the information is another critical factor in the communications model and must be investigated to ensure success of distance education programs. Newcomb (1990) pointed out that technology for distance education is ready; however, such programs in agriculture will not succeed until educators are as ready as the technology. McNeil (1990) stated that while the implementation of new technologies is growing, the rate of adoption is quite slow. A reason commonly given for this disappointing rate of adoption is negative attitudes and resistance of college faculty (Gunawardena, 1990). However, as Dillon and Walsh (1992) contend, faculty, the persons responsible for program design and delivery, have been largely neglected by distance education research. It is important to identify obstacles and challenges facing faculty in colleges of agriculture related to their work with electronic teaching technologies to ensure the success of distance education efforts.

Purpose and Objectives

The purpose of this study was to provide baseline data and focus for the improvement of instruction in a college of agriculture through the utilization of electronic technologies used in teaching. The objectives, stated as questions, were:

1. What are selected personal and professional characteristics of the teaching faculty of a college of agriculture at a land grant university?

2. What is the perceived level of competence that members of the teaching faculty of a college of agriculture have in the use of electronic technologies used in teaching often associated with distance education?

3. How important do teaching faculty members perceive that these technologies are or will be in teaching and learning?

4. What is the perceived availability of equipment, facilities, and training for faculty to use these technologies?

Methods and Procedures

Population

The population for this study was all teaching faculty in the college of agriculture of a land grant university. A census of the population was surveyed. Department heads were asked to provide a complete listing of faculty members in their department who held teaching appointments. With all departments reporting, there was determined to be a total of 314 faculty members with teaching appointments.

Instrumentation

The instrument used to collect data was a three-part questionnaire designed by the researchers. Part I consisted of forty statements with a seven-point Likert-type response scale. The response choices were: 1 = "Strongly Disagree," 2 = "Disagree," 3 = "Somewhat Disagree," 4 = "Neither Agree nor Disagree," 5 = "Somewhat Agree," 6 = "Agree," 7 = "Strongly Agree." A seven point scale was chosen so categories could be included that would more accurately identify respondents who did not hold strong opinions. The researchers considered the possibility that many of the faculty would not hold strong opinions on some statements due to a lack of information about, and or exposure to, these relatively new technologies.

Items in Part I were designed to measure the following:

- level of competence of faculty members in the utilization of technologies associated with distance education.
- perceived value these technologies have or will have to the teaching of agriculture.
- perceived availability of equipment, facilities, and training related to the use of these technologies.

Part II of the questionnaire was designed to identify the selected personal and professional characteristics of the respondents. The demographic variables included in the survey were gender, age, the number of undergraduate and graduate courses the faculty member taught per year, and the total annual enrollment in those courses.

Part III provided an opportunity for the respondents to add their comments concerning improvement of their use of distance education technologies. This part of the questionnaire consisted of a single open-ended question.

Content validity of the instrument was established by a panel of five experts made up of faculty members from the Department of Agricultural Education and the Department of Educational Human Resource Development. A pilot test of the instrument was completed by selected faculty members from the two departments. Minor changes in

the instrument were made based upon evaluation of the pilot test and suggestions of the panel of experts.

Collection of Data

All teaching faculty in the college were sent a copy of the questionnaire along with a cover letter describing the project via campus mail. Of the 314 survey instruments sent out, 234 were returned within two weeks, for an effective response rate of 74%. A reminder was sent to non-respondents via campus mail and a third call was made via e-mail four weeks after the initial mail out. Those faculty without valid e-mail addresses were contacted via telephone. In each case, additional instruments were supplied upon request. In all, 256 survey instruments were returned for a final effective response rate of 81.5%. Survey and follow-up procedures were in accordance with those outlined by Dillman (1978).

Analysis of Data

Data were analyzed using SPSS® software on an IBM 3090 mainframe. Descriptive statistics were calculated for each variable. An attempt to control non-respondent error was made by comparing the data from early and late respondents as suggested by Miller and Smith (1983). No significant differences were found between the groups. Reliability was established by calculating Cronbach's Alpha. The alpha for items related to perceived level of competence was .61; for items related to perceived level of importance was .65; and for items related to perceived availability was .68.

Frequencies and percentages were used to summarize agreement or disagreement with statements related to competence, importance, and availability. Only those respondents who indicated "agree" and "strongly agree" or those indicating "disagree" or "strongly disagree" are reported in the findings. Thus, those respondents who indicated "somewhat agree," "neither agree nor disagree" or "somewhat disagree" were considered not to have a strong opinion about a given statement.

Results

Personal and Professional Characteristics of Teaching Faculty

The population of this study was all teaching faculty in the college of agriculture at a land grant university. More than 92% were male and fewer than 23% were younger than 40 years old.

Almost 64% of the faculty reported that they taught one or two undergraduate classes per year with 15.6% reporting they taught no undergraduate courses. Twenty-five percent did not teach any graduate classes while 55.5% taught one graduate class per year. The average number of students taught annually was 117 with a range from 6 to 1,000.

Competence

Nine items on the questionnaire were used to measure the perceived level of competence that members of the teaching faculty of the college of agriculture had in the use of electronic teaching technologies often associated with distance education.

Almost three-fourths of the teachers believed fax machines were not difficult to use. More than 50% of the faculty indicated they agreed or strongly agreed that facsimile machines are easier to use than mailing a letter while less than 10% disagreed or strongly disagreed. Only 4.3% marked at least "agree" when asked if they sent their most important correspondence by e-mail. Nearly 60% marked disagree or strongly disagree. More than one-fourth agreed they could teach others how to use the campus e-mail system, while 39% disagreed or strongly disagreed with that statement.

The faculty were generally negative concerning their competence in producing instructional materials and using appropriate teaching methodologies for distance education. Nearly half of the respondents indicated they were not involved in creating multimedia instructional materials for their courses. Slightly more than 52% indicated they could not teach others how to use presentation graphics software, and 71.1% stated they did not produce their own color overhead transparencies. When asked if they were familiar with teaching methodologies used in teaching courses over distance, 44.6% disagreed or strongly disagreed and 12.4% agreed or strongly agreed. Less than 20% indicated they could confidently deliver their course over distance, while 34.6% indicated they could not. These data are illustrated in Figure 2.

Importance

Fifteen items were used to measure the importance teaching faculty believed technologies associated with distance education have or will have to teaching agriculture. Faculty members recognized the importance of e-mail with the vast majority (80.7%) agreeing they would put their e-mail address on their business cards. They were also positive concerning the value of electronic bulletin boards. Nearly 36% marked agree or strongly agree for the statement, "participation in electronic bulletin board services offers great benefits."

As illustrated on Figure 3, opinions were mixed concerning the effect of electronic communications technologies. Nearly 57% agreed these technologies would drastically alter how we teach in the next five years with only 6.3% in disagreement. However, 39% disagreed that these technologies would change what we teach in the same time period. Some 26% agreed with that statement.

Nearly one-third of the respondents agreed that course materials could be improved by incorporating sound with visual aids. In response to a statement about the value of animated graphics increasing student interest and retention, 43.7% agreed and 4.8% disagreed. More than one-third agreed that the use of full-motion video increases student interest and 58.6% agreed electronic information technologies will provide students with instantly available supplemental course materials. Fewer than 30% of the respondents had a strong opinion about students expecting more graphical learning experiences today. Slightly more than 25% agreed with that statement and only 1.2% disagreed.

More than 40% believed electronic information technologies were valuable in graduate and undergraduate courses. Thirty-seven percent agreed or strongly agreed that learning requires face-to-face interaction between teacher and student while more than 15% disagreed or strongly disagreed. More than 30% agreed there are not too many "bells and whistles" used in teaching today.

Availability

Ten items were used to measure the perceived availability of equipment, facilities, and training for faculty to use technologies associated with distance education. Faculty opinions were negative on all but one of the items.

Concerning the availability of equipment, 79.9% of the teachers indicated they are connected to electronic mail in their office and nearly the same percentage indicated they were not connected at home. More than 45% disagreed or strongly disagreed that the equipment needed to produce and display multimedia course materials is readily available. Although there was a published memo, distributed university-wide describing the procedure to secure electronic presentation equipment, nearly half of the faculty members were not aware of this procedure. More than 57% disagreed that their classrooms were designed to support the use of such teaching aids.

Teaching faculty members were asked about the availability of training and assistance in the use of instructional technologies. More than one-third disagreed that there is ample opportunity to secure faculty development training to use multimedia equipment. Nearly 70% had no strong opinion about the availability or faculty training workshops on distance education. Of those with a strong opinion, 22.1% disagreed with the statement and 8.8% agreed. Nearly the same results were obtained concerning the availability of technical assistance in using distance learning technologies. Thirty-nine percent were not aware of a central location for assistance in using multimedia equipment. When asked if time spent developing multimedia materials was valued by their department, 41.4% disagreed and 6.4% agreed (see Figure 4).

Conclusions and Recommendations

Conclusions

1. A teaching faculty member in the college of agriculture is male and over forty years of age.
2. Each faculty member teaches one to two undergraduate classes and one graduate class per year with an average annual enrollment of 117 students.
3. Teaching faculty in the college of agriculture lack competence in the use of electronic technology used in distance education.
4. Faculty lack confidence in their ability to use appropriate teaching methodologies to deliver their courses over distance.
5. Faculty consider the use of electronic technologies to enhance their teaching to be useful and important.

6. Faculty believe development and use of electronic teaching technologies will change how they teach, but will not change what they teach.
7. The faculty agree electronic teaching technologies contribute to teaching graduate and undergraduate courses; however, there is a need for face-to-face interaction between teacher and student.
8. The teaching faculty in the college of agriculture consider their access to be limited to equipment and facilities needed to develop and use electronic teaching technologies.
9. The teaching faculty in the college of agriculture consider their access to be limited to training and assistance needed to develop and use electronic teaching technologies.
10. Faculty do not believe time and effort expended to develop multimedia course materials is appropriately valued in their departments.

Recommendations

1. Programs to help teachers to become proficient in the use of electronic teaching technologies should be developed. These programs should focus upon equipment readily available to the teaching faculty.
2. Efforts should be increased to make teaching faculty aware of training workshops, equipment, and technical assistance available to help them develop and use electronic teaching technologies.
3. Classrooms should be modified and additional electronic teaching equipment should be purchased to enhance the teaching of graduate and undergraduate courses.
4. The faculty reward system needs to formally include rewards and incentives for the special efforts necessary for successful distance education programs. Modifications in the tenure and promotion process should be developed to cultivate improvement of instruction through the adoption of these technologies.
5. Further clarification of the obstacles to the adoption of these technologies is required as well as identification of appropriate rewards and incentives.
6. A study similar to this should be conducted using extension specialists and agents involved in presenting educational programs.
7. Research should be conducted to determine subject matter that can best utilize these technologies and methodologies.
8. Further evaluation should be conducted concerning the impact that these technologies have upon various teaching and learning styles and how these technologies affect learning.

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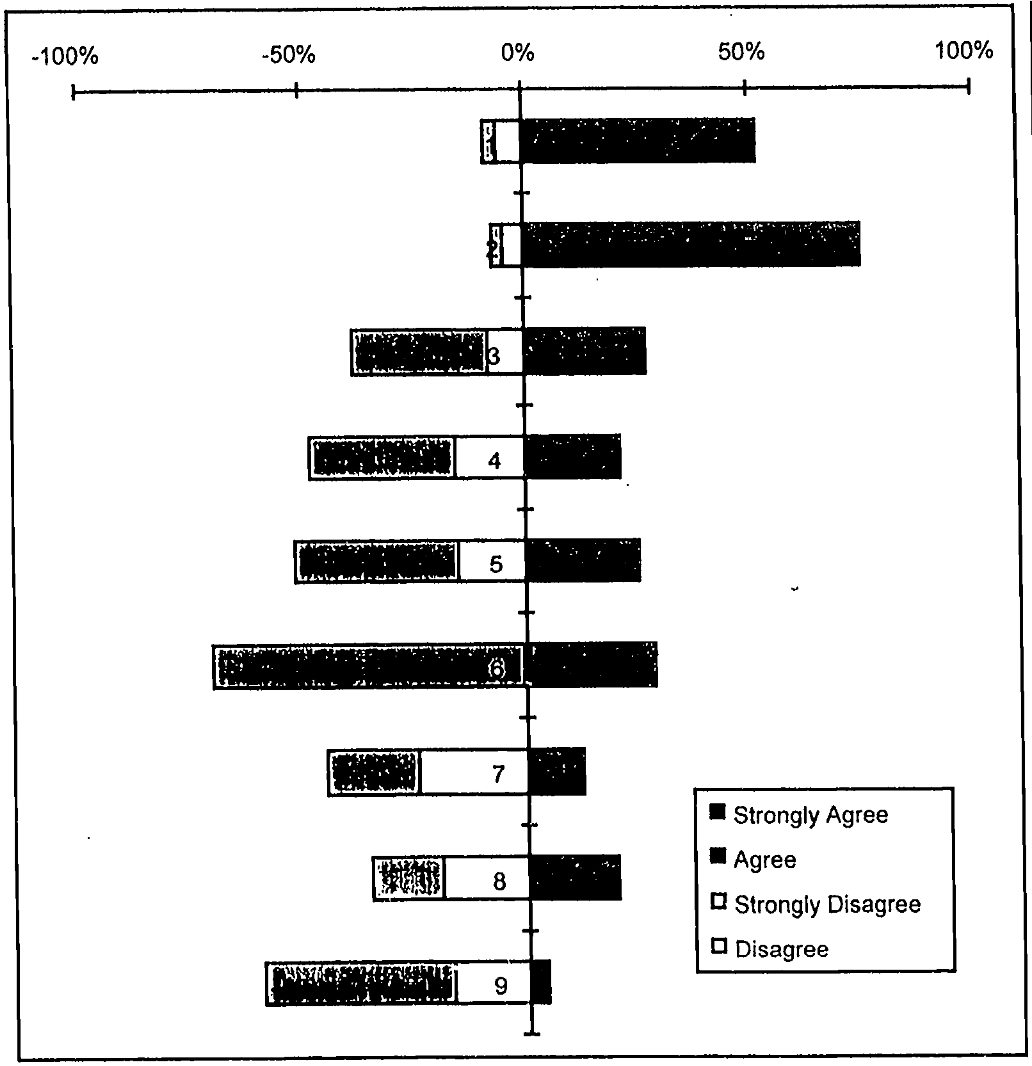


1. Using a fax machine is easier than mailing a letter.

2. Fax machines are not difficult to use.

3. I can teach others how to use the campus e-mail system.

4. I am involved in the creation of multimedia instructional materials for my course.

5. I can teach others how to use "presentation" software packages.

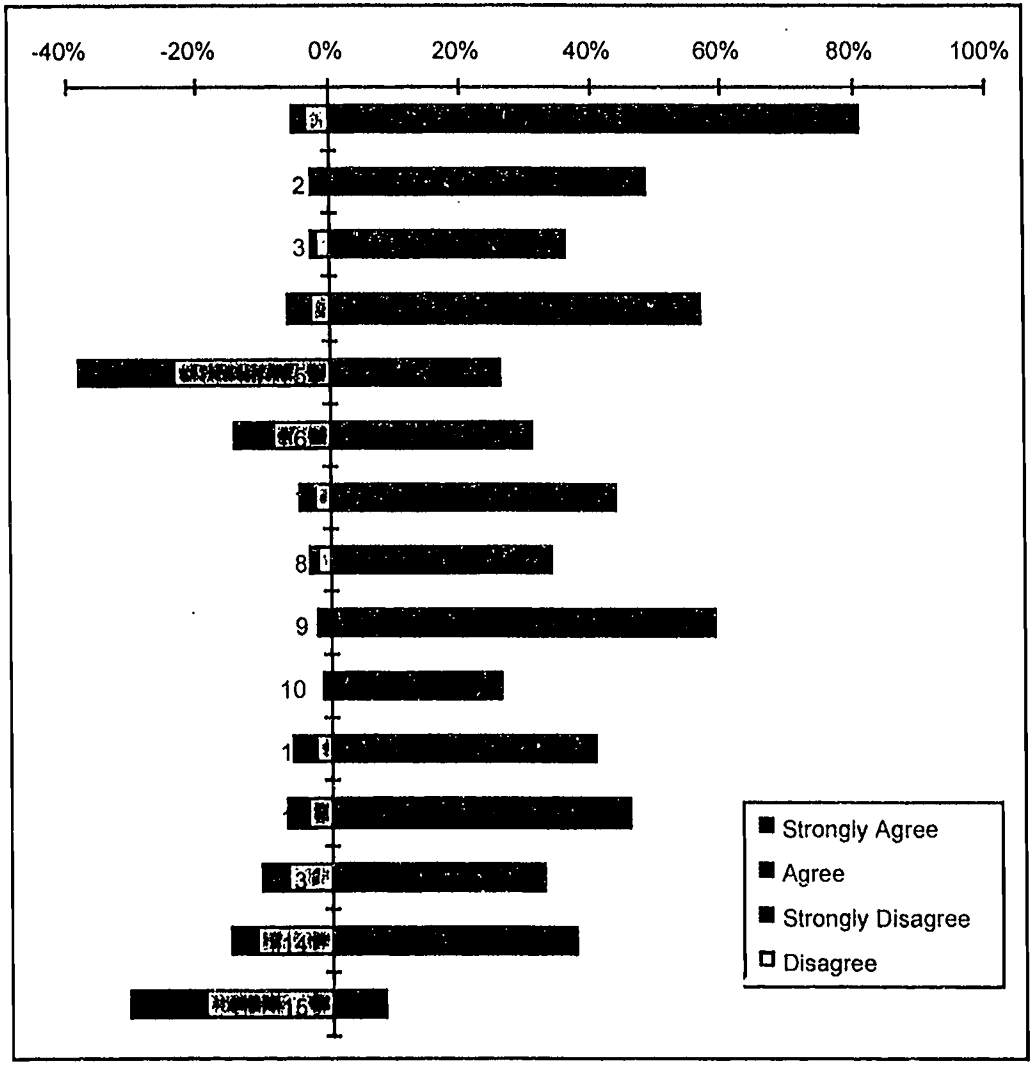
6. I produce my own color overhead transparencies.

7. I am familiar with the methodological considerations of teaching courses over distance.

8. I could confidently deliver my course over distance, utilizing the TTVN or some other bi-directional television network..

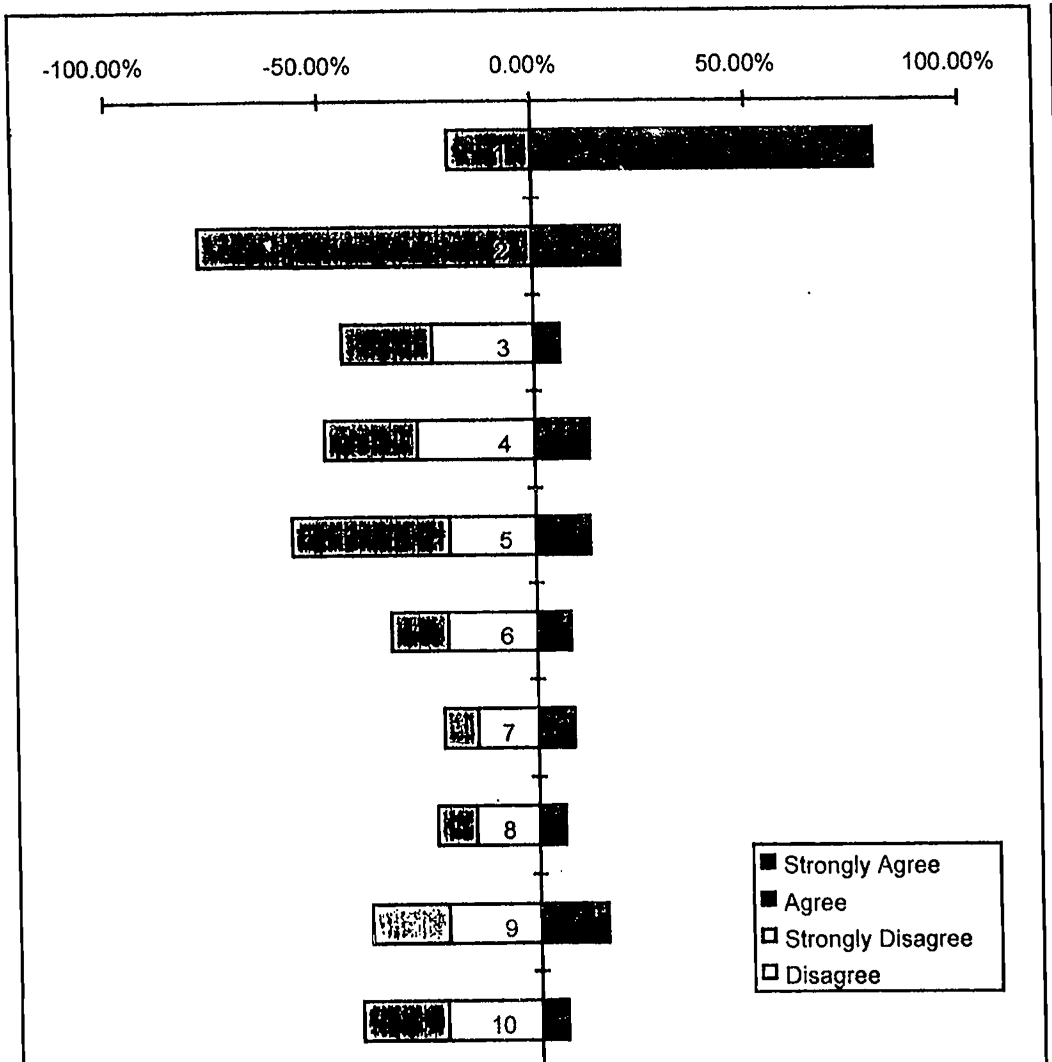
9. I send my most important

Figure 2. Perceived level of competence



1. I would put my e-mail address on my business cards
2. Electronic database management systems, like Gopher searches, the World Wide Web, and Mosaic are convenient ways to access information.
3. Participation in electronic bulletin board services offers great benefits.
4. Electronic communications, information, and imaging technologies will drastically alter *HOW* we teach in the next five years.
5. Electronic communications, information, and imaging technologies will drastically alter *WHAT* we teach in the next five years.
6. I think most course materials would be improved by incorporating sound with the visual aids.
7. Animated graphics increase student interest and retention.
8. The use of full-motion video increases student interest.
9. Electronic information technologies will provide students with instantly available supplemental course materials.
10. Students today expect a more graphical learning experience.
11. Electronic information technologies are important in graduate courses.
12. Electronic information technologies are important in undergraduate courses.
13. It is important that I incorporate appropriate electronic information technologies in the courses I teach.
14. Learning requires a face to face meeting between teacher and student.
15. There are too many "bells and whistles" being used in teaching today.

Figure 3. Perceived level of importance



1. I am connected to e-mail at the office.
2. I am connected to e-mail at home.
3. The equipment needed to produce and display multimedia course materials is readily available.
4. I am aware of the necessary procedure to secure electronic presentation equipment for classroom use at this university.
5. I have access to a classroom that is designed to support the use of multimedia teaching aids.
6. There is ample opportunity to secure faculty development training on using multimedia equipment.
7. There are enough faculty development workshops on distance learning methodology.
8. Technical assistance in utilizing distance learning technologies is readily available.
9. I am aware of a central location to which I can turn for assistance in using multimedia equipment.

Figure 4. Perceived level of availability

FACULTY NEEDS ASSOCIATED WITH AGRICULTURAL DISTANCE EDUCATION: A CRITIQUE

Vernon D. Luft
University of Nevada, Reno

This study sought to provide baseline data and focus for the improvement of instruction in a college of agriculture through utilization of electronic technologies used in teaching. The theoretical framework provided was sound, the purpose and objectives clearly stated, the methodology systematically conducted, and the results, conclusions and recommendations carefully presented.

The population for the study was all teaching faculty in a college of agriculture of a land grant university. Like many studies, data concerning selected personal and professional characteristics were collected. I recognize it is sometimes valuable to report biographical data to know more about the respondents, but the data could also be used to make comparisons. Why was this information collected when it was simply reported and the variables were not used in making comparisons?

The narrative portion of the results section of this paper reports the exact percentages of individuals who strongly agreed, agreed, or who disagreed, or strongly disagreed. My concern is with the presentation of the data in the form of bar graphs in the figures. While it provides variety in reporting procedures, I would have found it more convenient to see the percentages provided in table form and included in the text of the paper. Statement nine in Figure 2 was incomplete, and a statement ten in Figure 4 is apparently missing.

Teaching loads of university faculties are under scrutiny across this country. We need to be careful about how we report the work load of faculty. A conclusion of this study indicated that each faculty member teaches one to two undergraduate classes and one graduate class per year with an average annual enrollment of 117 students. Someone who does not understand the functions of university faculty could certainly interpret this as being a very light load when in fact those individuals likely had research and service duties as well. Therefore, I would suggest that if this study is reported in other sources, you clarify the statement by indicating these faculty have other duties in addition to this teaching load.

This was an interesting study, and the authors are to be commended for their fine work. I believe they accomplished their purpose of acquiring baseline data, and encourage them to continue pursuing their interests in researching faculty's involvement in distance education.

LEARNING STYLES OF AGRICULTURAL DISTANCE LEARNERS

Greg Miller *

Introduction/Theoretical Framework

Cognitive theory concentrates on the conceptualization of students' learning processes. It focuses on the way information is received, organized, and retained by the brain (Thompson, Simonson, & Hargrave, 1991). Knowledge of students' learning styles can aid educators in understanding these mental processes. Learning styles are important in that teaching methods that are effective with some students may be ineffective with others who prefer a different style (Riddle, 1992).

Learning, or cognitive, style is not defined in the same terms nor assessed in the same manner by all educational researchers and practitioners. DeBello (1990) defined learning style as "the characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 203). Much of the learning style research (Cano, Garton, & Raven, 1992a, 1992b; Cano & Metzger, 1995; Garton, 1993; Torres, 1993) done by members of the agricultural education profession involved assessment of the field-dependence/ independence psychological dimension. This dimension relates to global vs. analytical perceiving and the ability to perceive items without being influenced by the surrounding field (Chinien & Boutin, 1993).

Although a plethora of research exists on learning styles, with several published works related to agriculture, no published research was found that investigated the learning styles of agricultural distance learners. Distance education programs in agriculture are becoming more common, yet little is known about the characteristics of students who enroll in these programs. Research (Miller, 1995; Miller & Honeyman, 1993) involving students enrolled in an agricultural distance learning program at a midwestern land-grant university suggests that distance learners prefer being able to control the pace of their learning, prefer independent study, have less need for structured learning experiences, and have less need for interaction with the instructor and with other students. Such preferences are consistent with those of field-independent learners and are well suited to the nature of distance learning programs (Thompson & Knox, 1987).

Are field-independent learners better suited to agricultural distance education programs? Researchers have concluded that field-dependent learners were more likely to drop out of distance education programs (Clark & Verduin, 1989). Learning styles research in agricultural distance education is needed to promote our understanding of distance teaching and learning.

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Purpose/Objectives

The purpose of this descriptive study was to determine whether field-independent students are better suited to agricultural distance education programs than are their field-dependent counterparts. The research objectives were as follows:

1. Determine if students enrolled in agricultural courses delivered through distance education technologies were characterized more by the cognitive style of field-independence than normative groups.
2. Compare attitudes of field-dependent and field-independent learners toward distance education delivery tools (i.e., videotape, interactive communications network [ICN]).
3. Describe relationships between cognitive style and selected student characteristics.

Methods and/or Procedures

The population for this descriptive correlational study consisted of students enrolled in an off-campus professional agriculture degree program at Iowa State University. The sample (n=115) included all students who enrolled in one or more of the five agricultural courses delivered through distance education technologies during Spring Semester, 1995. Courses were offered in agronomy (2), agricultural systems technology, animal science, and animal ecology.

The Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971) was used to determine the preferred cognitive style of the distant learners. The GEFT is a standardized instrument with a reliability estimate of .82. Also, concurrent validity with the Embedded Figures test was .82 for males and .63 for females. To compare attitudes of field-dependent and field-independent learners toward videotape and ICN-delivered instruction, a median split was used (Spanier & Tate, 1988; Thompson & Knox, 1987). Students who scored below the group median of 13.5 on the GEFT were labeled field-dependent, and those with scores greater than the median were labeled field-independent.

The scale for assessing attitudes toward distance delivery media consisted of 11 Likert-type items with response categories ranging from strongly disagree (1) to strongly agree (5). The instrument was previously developed and validated by Miller and Honeyman (1993). The Cronbach's alpha reliability coefficient for the attitudinal instrument was .86.

Attitudinal and demographic data were collected by mailed questionnaire. One complete follow-up of nonrespondents was conducted. The GEFT was administered by proctors during a regularly scheduled examination. A letter was sent to all students included in the sample (n=115) approximately one week before the GEFT administration to explain the purpose of the study and to encourage their participation. Seventy-two students completed both the GEFT and the questionnaire for a useable response rate of 63%.

All data were analyzed with the SPSS/PC+ personal computer program. Appropriate statistics for description (frequencies, percentages, means, and standard deviations, Pearson correlations, point biserial correlation, and Cramer's V statistic) were

used. The magnitude of all relationships was interpreted by using Davis' (1971) descriptors.

Results and/or Findings

The mean score on the GEFT was 12.8 for females and males with a standard deviation of 3.2 and 4.1, respectively. GEFT scores from the present study were compared with normative groups to determine whether agricultural distance learners tended toward a field-independent cognitive style. Both male and female students in the present study obtained scores on the GEFT that were higher than the original normative group reported by Witkin et al. (1971) in the GEFT manual. Higher scores on the GEFT are associated with the field-independent cognitive style. Also, mean scores from the present study were compared with those reported by Torres (1993). Torres studied a representative sample of senior college of agriculture students. Females in the present study obtained higher GEFT scores whereas males attained lower scores than those in the Torres study (Table 1).

Table 1
Comparison of the Mean Scores on the GEFT for Male and Female Subjects in the Present Study with Scores of Normative Groups

	Present Study	Witkin et al, 1971	Torres, 1993
Females			
n	12	242	44
Mean	12.8	10.8	11.1
S.D.	3.2	4.2	4.6
Males			
n	60	155	59
Mean	12.8	12.0	13.4
S.D.	4.1	4.1	3.8

Torres (1993) classified students who obtained GEFT scores above the national mean (11.4) as field-independent. Using this classification procedure, Torres labeled 61.2% of the college of agriculture seniors as field-independent. The same procedure, when applied to the current study, classified 65.3% of the students as field-independent.

Attitudes held by field-independent and field-dependent students toward instruction delivered by distance education technologies (i.e., videotape, ICN) were compared. Fifty-nine students provided attitude toward videotaped instruction and cognitive style data. Twenty-nine students were categorized as field-dependent and 30 were labeled field-independent. Overall, both groups held positive attitudes toward videotaped instruction and were particularly positive about its convenience, the

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opportunity for learning, the ability to control the learning pace, and the prospect of enrolling in additional videotaped courses (Table 2).

Table 2
Analysis of Mean Attitude Scores by Cognitive Style

	Videotape (n=59)		ICN (n=8)	
Item	$\bar{X}fd$	$\bar{X}fi$	$\bar{X}fd$	$\bar{X}fi$
1. I enjoyed learning from the videotaped/ ICN lessons.	4.31	4.37	4.00	4.25
2. Videotape/ICN should be utilized more often to deliver agriculture-related instruction.	4.34	4.10	4.75	4.50
3. I feel more isolated as a student when I take courses by videotape/ICN.	3.00*	2.83*	3.50*	3.50*
4. I would recommend videotape/ICN courses to my friends.	4.31	4.37	4.75	4.00
5. Learning through videotape/ICN instruction is convenient.	4.72	4.67	5.00	4.25
6. Videotape/ICN allows me to control the pace of my learning.	4.59	4.50	3.75	2.75
7. I prefer videotape/ICN to traditional classroom instruction.	3.34	3.30	3.50	2.00
8. Learning through videotape/ICN is boring.	3.86*	3.67*	4.50*	4.25*
9. I would enroll in another videotape/ ICN course.	4.59	4.60	5.00	4.75
10. Videotape/ICN provides me with learning opportunities that I otherwise would not have.	4.72	4.63	4.75	4.25
11. I would not take videotape/ ICN courses if I had some other means of acquiring course credit.	3.41*	3.50*	3.50*	3.75*
Videotape total	4.11	4.05		
ICN total			4.27	3.84

* Indicates negatively worded items that were reverse coded.
Note: *fd*=field-dependent; *fi*=field-independent
Note: Based on Scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree.

Eight students provided attitude toward ICN and cognitive style data with an equal number (4) of students in each cognitive style group. ICN-delivered instruction provides a television-based delivery media via fiber optic cable with live two-way interactive audio and video. Field-dependent students held more positive attitudes toward ICN-delivered instruction than did their field-independent counterparts. Field-dependent students provided greater mean scores on attitude items related to convenience, ability to control the pace of learning, preference for ICN, and whether or not they would recommend ICN courses to a friend (Table 2).

Negligible associations were found between cognitive style and age, gender, and attitude toward videotaped delivery. Low positive associations existed between cognitive style and occupation and motivation to enroll. And, a substantial negative association existed between cognitive style and attitude toward ICN delivery. Field-independent learners were more likely to have occupations related to agricultural education, whereas field-dependent learners were more apt to have occupations in agribusiness. Field-dependent learners were more likely to be motivated to enroll in a distance course to pursue a degree, whereas field-independent learners were more likely to cite personal or career development as motivating factors. Regarding delivery tools, field-independent learners were more likely to hold negative attitudes toward ICN (Table 3).

Table 3
Relationships Between Cognitive Style and Selected Student Variables

Variable	Association
Age	.05[a]
Gender	.01[b]
Occupation	.19[c]
Motivation to enroll	.25[c]
Attitude toward videotape delivery	-.08[a]
Attitude toward ICN delivery	-.53[a]

Note: [a]=Pearson; [b]=point biserial; [c]=Cramer's V

Conclusions/Recommendations/Implications

As a group, the agricultural distance learners studied were relatively more field-independent than the original GEFT norm group (Witkin et al., 1971) and a College of Agriculture norm group (Torres, 1993). This finding may suggest that field-dependent learners are less inclined to enroll in agricultural distance education programs and is consistent with previous distance education research (Thompson & Knox, 1987). The proportion of field-dependent learners enrolled in agricultural distance education programs should be routinely monitored. These data should be shared with faculty and administrators to promote awareness of the characteristics of learners enrolled in their programs. Although the distribution of cognitive styles was not drastically skewed in the current study, efforts to encourage diversity of cognitive style in distance programs may

be warranted.

Although the orientation of this group, particularly the female students, to a more field-independent cognitive style was noted, field-dependent learners were equally satisfied with videotaped delivery of instruction when compared with their field-independent counterparts. Perhaps the range of student services provided through the off-campus agriculture degree program has helped to create a climate that satisfies many preferences attributed to the field-dependent learner. Furthermore, field-dependent learners had more positive attitudes toward ICN-delivered instruction than field-independent learners. This result may be due to the social orientation of the field-dependent learner. Billings (1993) suggested that sociological aspects of learning style have the greatest effect on distance education course completion. ICN provides more opportunity for interaction with the instructor and with other students. In this case, the social orientation of the field-dependent learner may have been stronger than the typical distant learner's need for convenience and choice about when and where instruction takes place.

Theoretically, instruction that is in harmony with an individual's learning style will improve the student's performance, shorten study time, and improve the student's attitude toward learning (Chinien & Boutin, 1993). Van Vuren (1994) concluded that more positive attitudes and improved academic achievement are promoted when instructional methods account for learning style preferences. Van Vuren, however, did not focus on the field-dependence/independence psychological dimension commonly studied in agricultural education. Furthermore, Claxton and Murrell (1987) report that the small amount of research involving this dimension is contradictory. Further research in agricultural distance learning should seek to isolate cognitive styles, design style specific instruction, and test the effect on achievement and satisfaction. Meanwhile, students should be allowed to choose distance learning options that provide various degrees of structure, interaction, and control of the learning environment. No one delivery tool or method will satisfy all learners. Instead, one tool or method used exclusively will discriminate against groups of learners.

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LEARNING STYLES OF AGRICULTURAL DISTANCE LEARNERS: A CRITIQUE

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This is another interesting study contributing to the learning style knowledge base for agricultural educators and our clientele. The research sought to determine whether field-independent students are better suited to agricultural distance education programs than their field-dependent counter parts.

The paper is well written. The introduction clearly provides a theoretical framework for the conduct of this study. However, I felt it would be helpful to the reader to have a description of a field-independent learner as compared to one that is field-dependent. The purpose and objectives were clearly defined. The methodology appears to be sound. It was reported that the concurrent validity with the Embedded Figures test was .82 for males and .63 for females. I found this interesting. Is there an explanation for the validity difference between genders, and what are the research implications?

The results of this study are clearly reported. The author does a fine job of comparing the results with those of other studies. One must take a cautious look at the ICN data reported in Table 2 with the small $n=4$ in each of the two cognitive style groups. I found it interesting that the data indicated that field-independent learners were more likely to hold negative attitudes toward ICN, yet field-independent learners were more likely to have occupations related to agricultural education. What does that imply regarding agricultural educators' attitudes toward ICN?

The author presented a fine discussion of the conclusions, recommendations, and implications often citing findings of other studies. He suggested that students should be allowed to choose distance learning options that provide various degrees of structure, interaction, and control of the learning environment. In many cases, choices are not available, and students have to take whatever is available. I am curious if these suggested choices are available to the students enrolling in distance education in your state.

The author is to be commended for conducting a study worthwhile to the agricultural education profession.

EFFECTIVENESS OF DISTANCE LEARNING COURSES - STUDENTS' PERCEPTIONS

Dr. Michael K. Swan

INTRODUCTION/THEORETICAL FRAMEWORK

Equity and access in education are major issues in rural and urban schools. Electronic technologies that facilitate distance learning with interactive video network (IVN) offer promise in these two areas. As Tift (1989) stated: "Technology-based education is maintaining the viability of small, rural schools through equitable access to a quality education by all students." Some of the underlying factors as noted by Barker (1990) include teacher availability, low student enrollments, and geographic location.

The literature favors the effectiveness of this technology as an instructional delivery method. "Well-designed distance education programs are equally effective in terms of learner outcomes with resident instruction, in general, and produce superior learning outcomes in specific applications" (Kelly, 1993, p. 76). An analysis of published reports found extensive evidence that courses delivered by a teacher at a distance were equally effective as those with the teacher in the classroom. One limitation, however, is the effectiveness of distance education for some students who need direct interaction with a classroom instructor and with other students (Schmidt and Faulkner, 1989). Students who select courses taught through the IVN systems are more likely to be self motivated and higher achievers. These students are the ones who typically have positive educational outcomes (Schrum, 1991). Thus, while there is some controversy, experts in distance education believe it can be as effective an educational mode as traditional methods. This study will identify perceptions of students in IVN courses with respect to the educational quality of the courses offered and their satisfaction with the educational experiences in the distance learning programs.

The Greater Southeast ITV Consortium has studios in ten rural secondary schools and two vocational centers in the Southeast corner of North Dakota. This consortium is struggling to provide educational equity and access to students within the consortium enrollment area. Because of their small 9-12 enrollment, (Fairmont has 53 students, Hankinson has 126, Lidgerwood has 87, Milnor has 68, North Sargent at Gwiner has 70, Oakes has 199, Richland at Colfax has 85, Sargent Central at Forman has 138, Verona has 20, and Wyndmere has 93 students), these schools find it difficult to offer selected limited enrollment, advanced placement and enrichment courses. Financial constraints make it impractical to offer courses at each location.

The interactive video network (IVN) system provides a way for the school districts to combine resources and pool students who are interested in classes that normally could not be offered. Examples are Spanish, College Algebra, AP English, and Calculus.

The system is two-way interactive network. Students and teachers at all locations can see, hear, and talk to each other over the system. There are two video cameras in each classroom; one camera is on the teacher's work station and the other camera is focused on the students. Each classroom has at least four television monitors in the room for the students and two monitors located on the ceiling over the students' desks for the teacher. One of the student monitors shows the teacher and/or visual aids and the other monitor shows the students at individual sites. Every classroom has the same equipment and every school can be an originating site. Additionally, each site has facsimile machines, telephones, and computer terminals.

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PURPOSE/OBJECTIVES

The problem addressed in this study is the lack of knowledge and understanding about IVN in public schools and its impact on students' learning and their attitudes toward learning. The specific research question was to: determine student perceptions about IVN courses. Subquestions were: (1) gender differences in student perceptions, (2) number of students taking classes by period and by grade level, (3) differences in students' perception at the remote sites and the home sites and, (4) reasons why students took IVN classes.

METHODS/PROCEDURES

Data were collected using a structured questionnaire developed by researcher. The research method used was descriptive in nature. While quantitative instruments provided some measurements of satisfaction and fulfillment of expectations, qualitative data collected added in-depth insights.

The survey population was identified as all students enrolled in IVN courses within the consortium in the 1994-95 academic year. The population was homogeneous by age and academic grade levels, 9-12 grades. All of the students were enrolled in IVN courses, which may not be representative of the typical high school student. Content validity was established by having the pilot questionnaire reviewed and completed by a panel of experts that included experts in evaluation and measurement, technology diffusion, classroom teaching, administration, and curriculum. The pilot study was administered to three groups: 1) faculty and students of sending and receiving sites from a secondary school consortium, eight schools, who were not involved in the study, 2) the advisory committee for distance education technology in the region and 3) university faculty involved with distance education at North Dakota State University. The data from the pilot test of the questionnaire were analyzed for reliability. Cronbach's alpha and factor analysis using the Statistical Package for Social Sciences (SPSS) were used to establish reliability, $r= .82$. Modifications were made to enhance validity and reliability.

The questionnaire was developed for quantitative measures of students' perceptions of the experiences, with a series of 27 statements using a four point Likert scale included: strongly agree (a value of 1), agree (2), disagree (3), and strongly disagree (4). Qualitative measures, used three open-ended questions, of students' feelings of the IVN courses in which they were currently enrolled.

Data were collected from the students enrolled in all secondary IVN courses offered by the consortium of all schools located in the Greater Southeast ITV Consortium. Students taking more than one IVN course were asked to fill out only one questionnaire. Three-hundred eleven students enrolled in IVN classes completed the structured questionnaire; 18 questionnaires were unusable leaving 293 usable instruments. The questionnaire was administered during class time using the interactive video network. Seventy percent of the surveys were completed by females, 73.6% of the students were at remote sites, and 42.3% were enrolled in Spanish.

RESULTS / FINDINGS

When we looked at grade level of students taking IVN courses we found that as students progressed in grade level, more students were taking IVN courses. We found that grade 9 had 46 students enrolled, grade 10 had 70, grade 11 had 85, and grade 12 had 92 students enrolled in IVN courses. We also found that we had 87 male students and 206 female students enrolled. When we looked at where students were located we found 77 students enrolled at the home sites and 216 enrolled in remote sites. What was interesting was that we had 124 students of the 293 students in the study enrolled in Spanish and 169 in all other classes. By class period we found consistent numbers in all periods. During

class period 1 we had 59 students, period 2 = 44, period 3 = 32, period 4 = 44, period 5 = 39, period 6 = 44, and period 7 = 31 students enrolled.

Table 1 identifies perceptions of students toward the IVN courses in which they were enrolled at both home and remote sites. Students identified that they would take another IVN course and their parents liked the idea of IVN courses being offered to students. They disagreed with the statements that materials were late, they would earn higher grades, and that more students cheat in IVN courses.

Table 1 Rank order of perceptions of all students towards IVN courses.

Statement	Mean	SD
I would take another IVN class if it were one I wanted.	1.00	0.68
My parents think that IVN classes are a good idea.	1.00	0.73
IVN is a good method to offer some courses.	1.70	0.77
I could see the TV monitors from where I sat.	1.96	0.91
I was able to see all the materials the teacher presented.	2.00	0.66
I was able to talk to the teacher as often as I needed to.	2.04	0.78
The chairs and/or tables in the IVN room were comfortable.	2.12	0.98
I got to know the students from the others schools.	2.29	0.77
I could hear the other students in the other sites.	2.34	1.08
I like my IVN class better than my other classes.	2.40	0.78
Student discipline is better in the IVN classes.	2.40	0.89
My work was graded and returned as fast as in my other classes.	2.50	1.02
I would be interested in taking college courses offered on IVN.	2.50	1.21
Most of the talking/questions were done by students in the host site.	2.60	0.83
The materials for the class were often late in arriving.	2.80	0.86
I earn higher grades in my IVN class than my other classes.	2.80	0.99
More students cheat in IVN classes than other classes.	2.80	1.13

Table 2 identifies perceptions of remote site students toward the IVN courses in which they were enrolled. Students agreed with the statements that they could hear the teacher well, that the teachers paid attention to all students, that they could ask questions at any time, and that the teachers knew the students as well as those in the home site.

Table 2 Rank order of perceptions of Remote Site students towards IVN courses.

Statement	Mean	SD
I could hear the teacher well.	1.95	0.67
The teacher paid attention to both home and remote sites.	2.00	0.97
The teacher taught from our site as much as necessary.	2.00	0.79
I felt my IVN teacher knows me as well as my other teachers.	2.00	1.14
I felt I could ask questions in class when it was necessary.	2.00	1.03
It was easy to ask questions in class.	2.10	1.02
I would like to meet more with students from other schools.	2.19	0.97
I felt the teacher could hear me when I asked questions.	2.30	0.88
I was able to hear questions from other sites.	2.40	0.86
It is easier to cheat at a remote site.	2.70	1.23

When students were asked to identify why they took an IVN course they responded by identifying various reasons. "I thought it would be interesting to take an IVN class" identified by 160 students, "I really wanted the class and it was the only way to get it" by 158 students, "Because it was the best option for that particular hour" by 152 students, "Because my friends were taking the class" by 50 students, and "My counselor/teacher/principal put me in it" by 10 students.

Student were asked to respond to three qualitative questions related to their IVN course experiences. Question one was "What do you feel are the good things about interactive video network and the classes you are taking on it?" Student responses were summarized as follows: I can take the class I want, It offers classes we normally wouldn't have; Meet new people from different towns; You get a chance to learn another language; Have better teachers for the subject; Learn with different people, teachers and subjects; Have more variety of classes; The teacher involves everyone; and The only way to meet college entrance requirements.

Question two was "What do you feel are the weak points about interactive video network and the classes you are taking on it?" Responses summarized were: It is boring to stare at a TV all hour; Getting papers grades/sent away; Younger students; Some remote sites are not getting the same attention; The equipment doesn't always work; Time schedules are different in different schools; Hard to work with groups; You can't have hands-on learning; Hard to hear at times; Remote sites goof around too much; Quickness of grading and returning tests; Cannot eat or drink anything in the room; Your teacher is not always here; Crowded classrooms; Discipline; Can't see everyone at once; and Teacher not available throughout the day for questions.

The final questions was "How would you suggest changing the interactive video network classes and any other suggestions you might have relating to Interactive Video Network classes?" The responses summarized were: Have teacher visit all sites more often; New seating; Put in more microphones; Have more courses offered over IVN; Teachers come to different sites more often; I'd like to see more science courses; Put TV's up higher; Better sound; Require everyone to take at least one course over IVN; and Expand to before and after school hours.

CONCLUSIONS / RECOMMENDATIONS / IMPLICATIONS

Gender differences in student perceptions of satisfaction and value of the IVN courses were not statistically different. The null hypothesis of independence between gender and the survey items can be rejected. There were no noticeable differences in the opinions of the students at the remote sites and the home sites. Individual schools did not differ on the degree of student satisfaction with the IVN courses.

Students were satisfied with the quality of IVN, believed these courses lived up to their expectations, as well as the expectations of their parents, and that the experience will benefit them in the future. Students believe they do as well in IVN classes as in a traditional classroom.

Students use IVN as a regular part of their education and do not want to be singled out as special. Like exceptional students in other classes, they prefer to keep a low profile rather than call attention to attributes that distinguish them from their peers.

Students believe that IVN is an effective way to teach courses in small rural schools where geographic location, adequate funding, and student enrollment are limiting factors. There is face-to-face, fully interactive teaching and learning taking place in a warm and caring environment that is as effective as traditional methods.

Students are excited about the IVN courses and agree that offerings should be expanded to include a greater variety of subjects. Students believe that offering courses before and after school hours would be beneficial and would increase the number of students taking courses over the IVN system.

Students agreed that making the classroom setting more comfortable would facilitate more students enrolling in IVN courses. They would like to see more microphones in each IVN classroom as well as locating the TV's higher so every student could see easier. Students were also very concerned with the lack of discipline in remote site classrooms.

Most students liked being part of this new technology. Students use IVN courses as a regular part of their education and do not think they are special. Students believe that IVN courses are an effective way to learn in small rural schools where geographic location,

adequate funding, and student enrollment are limiting factors. There is face-to-face, fully interactive teaching and learning taking place in a warm and caring environment that is as effective as traditional methods.

A longitudinal research study exploring the effect of high school distance learning on students' performance during and after completing related courses at the college or university level would be valuable. As well as adding to the knowledge base, it would aid in determining the effectiveness of distance education as an instructional mode to provide educational equity to rural schools.

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EFFECTIVENESS OF DISTANCE LEARNING COURSES - STUDENT PERCEPTIONS: A CRITIQUE

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Most often distance education and the research related to it addresses the delivery of courses from a university to sites around a state. An interesting factor of this research is that it studies the perceptions of students taking courses through an interactive video network (IVN) in high school settings. The introduction of the paper clearly describes the IVN arrangement in a consortium of ten rural secondary schools in North Dakota.

The introduction/theoretical framework of the paper provides an excellent foundation for the conduct of the study. All parts of the paper were clearly written in an organized manner. It would have been helpful to know the titles of all the courses in which the students were enrolled.

The results reported that as students progressed in grade level, more students were taking IVN courses. This appears to be a predictable finding when it was reported in the introduction that example classes are college algebra, AP English, and calculus -- classes which upper level students would take. Weak points about IVN reported by students in the qualitative portion of the data indicated that remote sites goof around too much. This leads to the question as to whether there is a teacher present in the classroom at remote sites. It also leads me to think that a study centered around classroom management in remote sites would be interesting.

I have some concerns about the conclusions section of this paper that I would raise. The first conclusion refers to gender differences not being statistically different, and the null hypothesis being rejected. However, the paper did not address comparisons between genders, nor did it contain hypotheses. Another conclusion states, "There is face-to-face, fully interactive teaching and learning taking place in a warm and caring environment that is as effective as traditional methods." After reading the paper several times, I did not find data to support this conclusion in that no comparisons were made between the IVN and traditional methods of delivering classes. Another conclusion was repeated in the paper.

This was an interesting study and very useful in the delivery of electronic distance education in North Dakota. Since it is being reported at the National Agricultural Education Research Meeting, I expected to find some reference to agricultural education's family of disciplines. However, the paper does not mention agricultural education, extension education, vocational education, FFA, 4-H, or agricultural communications. Perhaps an additional section dealing with implications for agricultural education would have been appropriate.

A NATIONAL VALIDATION STUDY OF RESEARCH PRIORITIES FOR ADULT EDUCATION

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Introduction/Theoretical Framework

Agricultural Education programs and departments have faced numerous changes during the past decade. These changes have been accelerated by the changes in the agricultural industry, including a decline in the number of agricultural producers and an increase in the number of persons employed in related agribusinesses. Therefore, the need for educational programs in agriculture has expanded beyond those directed toward increasing agricultural productivity (Harbstreit, Stewart, and Birkenholz, 1989). Recent changes in education have also contributed to the need to direct attention toward issues and problems relating to adult education in agriculture. Emphasis on continuing education and the trend toward life-long learning (Zemsky and Meyerson, 1985) necessitates that adjustments be made in educational programs for adults in agriculture.

Purpose/Objectives

The purpose of this study was to provide national validation for a regional study titled "Validation of Research Priorities for Adult Education in the North Central Region" conducted by the NCR 158 committee on adult education in 1989 (Birkenholz, Harbstreit & Law, 1990). This effort was part of the ongoing program of activities of the Adult Education Committee of the American Association for Agricultural Education. Objectives developed to guide this research effort were as follows:

1. To validate on a national level, the research priorities related to adult education in agriculture in the United States.
2. To prioritize on a national level, the research issues related to adult education in agriculture in the United States.
3. To determine if differences existed on a national level, between the perceptions of state supervisors and teacher educators concerning research priorities related to adult education in agriculture in the United States.

Methods and/or Procedures

The population for this study consisted of all teacher educators and state supervisors of agricultural education included in the 1992-93 directories of agricultural education provided by the American Association of Agricultural Education and the National Association of Supervisors of Agricultural Education. The accessible population was determined to include 428 agricultural educators and 161 state supervisors.

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The data collection instrument used in this study was identical to the instrument used by the NCR158 committee during their regional study completed in 1989. The instrument included seven segments of questions relating to issues or problems in adult education. Respondents were asked to rate the importance of each question using a five-point, Likert-type, response scale which ranged from "1" = "no importance" to "5" = "utmost importance". Also within each of the seven sections of the instrument, respondents were asked to rank each question in relation to other questions in the same section. Demographic data were also requested which included years of experience, age and sex of the respondent. Instrument reliability was estimated by calculating a Cronbach's alpha coefficient for the dependent variables and found to be .88 for this survey.

Cover letters and data collection instruments were mailed to the department chairs of each teacher education department and directors of each state department of education with instructions to distribute the cover letters and coded instruments to their staff. Two weeks following the initial mailing, a reminder letter was sent to those who had not responded. Following an additional two-week period, a second letter and instrument was sent to those persons who had not yet returned completed data collection instruments. A comparison of early and late respondents (Miller and Smith, 1983) was conducted to assess the assumption that those who had provided responses were representative of the population.

The data were coded into a data file on the Kansas State University mainframe computer for data analysis. Statistical analysis included the computation of both descriptive and inferential statistics. Descriptive statistics calculated included means, standard deviations, and frequencies. Inferential statistics were used to determine if significant differences in the responses between state supervisors and teacher educators existed. T-tests were used to determine if there was a significant difference between early and late respondents.

Results and/or Findings

Usable data were collected from 354 (for a 60.1% overall response rate) of a possible 589 respondents. Ninety four instruments were collected from state supervisors and 260 from teacher educators. The average amount of experience reported by each group was 14.7 years for teacher educators and 11.5 years for state supervisors. The average age was reported to be 47 years for teacher educators and 46 years for state supervisors.

The results of the t-test procedure revealed no significant differences in the responses of early and late respondents. Therefore, the data collected from those who responded was assumed to be representative of the population.

The first research objective was to validate research priorities related to adult education in agriculture on a national level. The validity of the identified research issues and problems was assessed by examining mean importance ratings. Each item included in the data collection instrument received a mean importance rating in excess of 3.25 on the five point response scale. Three items received a mean importance rating of 4.0 or greater. Those items were:

1. How effective are adult education programs in agriculture? (X=4.06).
2. What motivates adults to participate or not participate in adult agricultural education programs? (X=4.03).
3. What should be the focus of adult education in agriculture in terms of philosophy, mission, and target audiences? (x=4.01).

Each of these items were judged to be the most important issues and problems which should be addressed in future research efforts. It was also observed that the teacher educators and state supervisors were generally consistent in their ratings of the importance of issues and problems examined as part of this study. The research question which received the highest mean rating by the teacher educator group was "How effective are adult education programs in agriculture? (X=4.04). The highest rated research question for

the state supervisor respondent group was "What motivates adults to participate or not participate in adult education programs? (X=4.20). The teacher educator respondent group produced three item means greater than or equal to 4.00, whereas the state supervisor respondent group produced five item means at or above that level.

Research objective two was undertaken to identify the priority research issues related to adult education in agriculture in the U.S. Unweighted means were used to rank the research questions to control for the difference in the number of respondents in each group. This procedure placed equal emphasis on the responses of teacher educators and state supervisors. Unweighted means were computed by averaging the means for the two respondent group means for each item. The top ten research questions as identified by the unweighed item means were:

1. What motivates adults to participate or not participate in adult agricultural education programs? (X=4.084).

2. How effective are adult education programs in agriculture? (X=4.082).

3. What should be the focus of adult education in agriculture in terms of philosophy, mission, and target audiences? (X=4.037).

4. What competencies are needed by adult educators who work in various formal and nonformal educational environments? (X=3.956).

5. Who should be responsible for conceptualizing, funding, administering, delivering, and evaluating of adult education programs in agriculture? (X=3.934).

6. What should be the technical skills content of adult education programs in agriculture? (X=3.879).

7. What instructional methods improve adult learning? (X=3.873).

8. How does adult education in agriculture influence rural development? (X=3.859).

9. What are the costs and benefits associated with adult education programs in agriculture? (X=3.835).

10. What impact will continued urbanization have on policymakers' decisions to support adult education programs in agriculture? (X=3.830).

The third research objective was undertaken to determine if differences existed between respondent groups regarding the importance of the priority research questions in this study. Three research questions produced means which differed significantly between the respondent groups; however, none were included in the top ten priority research questions. State supervisors rated the questions "Who is providing adult education in agriculture?", "What are the theories that explain how and why adults learn?", and What is the rationale for adult education in agriculture?" significantly higher than did the teacher educator group. The importance of other items ranked among the priority research questions were not found to be significantly different between the respondent groups.

Conclusions

The following conclusions were formulated as a result of this national study initiated by the Adult Education Committee of the American Association for Agricultural Education:

1. Teacher educators and state supervisors perceive the research questions included in this study to be important issues which should be investigated.

2. Both state supervisors and teacher educators reported that determining the effectiveness of adult programs (first for teacher educators and second state supervisors) and assessing what motivates adults to participate in adult education programs (first for state supervisors and second for teacher educators) were the two most important research issues to address.

3. Teacher educators place significantly less importance on three research questions

than state supervisors. These questions were not rated in the top ten research questions by either group.

Recommendations/Implications

The Adult Education Committee of the American Association for Agricultural Education should examine the priority research issues which were identified in this study and develop a plan for coordinating the research efforts in states with strong interests in adult education. The committee should provide the profession with this plan through their annual report to AAAE and challenge teacher educators in their role as faculty advisors to encourage graduate students to conduct research which would address the issues identified as priorities. In addition, teacher educators with interests in adult education should adopt a focus for their own research on issues identified in this study. To assist with the coordination of these efforts, the Adult Education Committee of AAAE should coordinate an annual survey of research being conducted in the area of adult education and include the results as part of the Committee's annual report to AAAE.

AAAE recently adopted "Adult Education In and About Agriculture", an position statement for the profession indicating that: "The American Association for Agricultural Education supports adult education programs <u>in</u> and <u>about</u> agriculture and encourages expansion of programs to prepare adult educators to conduct such programs." It is time for the profession to seriously consider the redefinition of adult education in agriculture and identify new clientele groups, new approaches, and new models and strategies to serve the growing need for adult education in agriculture. This study should provide the framework for beginning this task.

Table 1

Teacher Educator and State Supervisor Importance Ratings of Research Questions Related to Adult Education in Agriculture

Research Questions	Teacher Educators X (N= 260)	SD	State Supervisors X (N= 94)	SD
A. The cultural, societal, educational, and occupational trends affecting adult agricultural education programs				
Who is providing adult education in agriculture?	3.24	1.05	3.52	1.01
Who needs adult education in agriculture?	3.74	1.07	3.85	1.02
What are the attitudes of decision makers toward adult education in agriculture?	3.71	1.08	3.90	1.05
Who do adults turn to when they need to solve agricultural problems?	3.76	1.14	3.85	0.96
What societal and cultural trends are affecting adult agricultural education?	3.68	1.12	3.50	1.01
What is the public perception of agriculture?	3.67	1.25	3.72	1.22
B. Assessment of delivery methods and instructional technologies for adults				
How can instructional technologies be utilized to deliver adult education?	3.81	1.04	3.82	0.99
What instructional delivery systems are appropriate for urban audiences?	3.53	1.01	3.59	1.01
How should the present delivery system be modified for rural audiences?	3.63	1.06	3.72	0.94
What instructional methods improve adult learning?	3.90	1.15	3.85	1.03
C. Evaluating adult education in agriculture				
What are the costs and benefits associated with adult education programs in agriculture?	3.83	1.08	3.83	1.01
How effective are the instructional materials used in adult education?	3.45	0.97	3.52	0.97
How does adult education in agriculture influence rural development?	3.85	1.06	3.87	1.02
How effective are adult education programs in agriculture?	4.05	1.07	4.11	1.14

Research Questions	Teacher Educators X (N= 260)	SD	State Supervisors X (N= 94)	SD
D. The content and organization of adult education in agriculture				
What should constitute the leadership development programs for adults in agriculture?	3.65	1.14	3.81	1.13
What should adults in agriculture know about other countries and their agricultural systems?	3.52	1.03	3.41	1.09
What should constitute the adult education programs offered to commercial agriculture?	3.63	1.03	3.47	0.94
What should constitute the adult education program related to noncommercial agriculture?	3.46	0.93	3.37	0.84
What should be the technical skills content of adult education programs in agriculture?	3.72	1.08	4.04	1.06
E. The Policies and Administration of Adult Education Programs in Agriculture				
What should be the focus of adult education in agriculture in terms of philosophy, mission, and target audience?	3.96	1.14	4.11	1.02
Who should be responsible for conceptualizing, funding, administering, delivering, and evaluating adult education programs in agriculture?	3.84	1.08	4.03	1.13
What impact will continued urbanization have on policymakers' decisions to support adult education programs in agriculture?	3.90	1.09	3.77	1.07
F. The preparation and continuing education of adult educators				
What are the most effective and efficient models of preparation of adult educators in agriculture?	3.70	1.15	3.95	1.11
What competencies are needed by adult educators who work in various formal & nonformal educational environments?	3.85	1.18	4.05	1.07
How can you identify and augment the intrinsic and extrinsic motivators that encourage educators to assume a role in adult education in agriculture?	3.36	1.04	3.46	1.09
How are agricultural education extension departments responding to the changing need of their adult educator clientele?	3.69	1.05	3.56	0.96
How are cooperative extension departments responding to the changing needs of their adult educator clientele?	3.68	1.04	3.49	1.03

Research Questions	Teacher Educators X (N= 260)	SD	State Supervisors X (N= 94)	SD
G. The essence of adult learning in agriculture				
What is the nature of the adult learner in agriculture?	3.57	1.07	3.38	1.02
What motivates adults to participate or not participate in adult agricultural education programs?	3.97	1.12	4.20	1.09
What are the theories that explain how and why adults learn?	3.33	1.11	3.03	0.85
What is the rationale for adult education in agriculture?	3.44	1.09	3.71	1.03
How do adults in agriculture make decisions and solve problems?	3.82	1.13	3.78	1.00

•Responses were coded: 1 = no importance, 5 = utmost importance

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A NATIONAL VALIDATION STUDY OF RESEARCH PRIORITIES FOR ADULT EDUCATION - *A Critique*

Lou E. Riesenberg, University of Idaho

The NCR 158 Committee on Adult Education (primarily of the North Central Region of the American Association for Agricultural Education) is one of the few truly functioning "working groups" of AAAE. This is a report of the attempt to extend the work of NCR 158 committee to the national scene by the Adult Education Committee of AAAE. To attempt to develop a national agenda of research priorities in adult education is a welcome first step in bringing much needed focus to our profession. This research has done just that. The findings and recommendations reported by the authors are quite straight forward and unambiguous. The methods used to collect the data for the basis of this study followed acceptable procedures. All in the profession had a opportunity to influence the findings.

It would seem from this perspective, that the authors and their associates on the Adult Education Committee have completed perhaps one of the easier steps of the proposed journey - to bring focus to the research in adult education in agriculture. While it is quite easy to understand the compilation of the respondents' ratings of the research priorities which could be considered as a consensus of the respondents, one has to wonder how the authors and their associates on the Committee will attempt to focus future research on these priorities as recommended in this paper. But still, the authors are to be commended for their current effort.

As pointed out by the chairs of this research meeting, all of the papers had been reviewed and deemed useful for presentation. Therefore, consider the following as interesting observations, not as criticism.

The authors did not report the findings concerning the sex of the respondents. Perhaps that is to be the content of another research report. While the average experience and average age was reported, perhaps there was no average sex to report. The authors did report aspects of the experience and age of the respondents, but did not report any implications of those demographics.

It is most interesting to note the overall 60 percent response rate from such a small profession. With that in mind, is it really appropriate to assume respondents represent nonrespondents? Perhaps to assume the respondents represent the active membership of the two respondent organizations would be more appropriate, reasonable and adequate.

Another interesting future inquiry might be the impact of the findings of this study on the future direction of research concerning adult education in agriculture. Evidence of impact on the future research in the area by the findings of this study and the associated work of the Adult Education Committee of AAAE and the NCR 158 Committee would be valuable to the profession's effort to establish additional "scholarly work groups".

RESEARCH PRIORITIES PERCEIVED FOR THE NYFEA BY ITS LEADERS: A NATIONAL DELPHI STUDY

Maynard J. Iverson*

Introduction/Theoretical Framework

The National Young Farmer Educational Association (NYFEA) is the student organization for adults enrolled in Agricultural Education programs across the U.S. Since its beginning in 1982, the NYFEA has had a period of rapid growth as well as a sharp decline in membership. According to the 1991-92 NYFEA Directory, there were 765 chapters in 21 states with a membership of 17,750 members. The 1995 NYFEA Directory lists 538 chapters in 20 states and about 14,000 members nationwide.

Since 1993, the NYFEA leadership has adopted an assertive posture toward its mission of education and leadership development. The annual National Institute continues to be the centerpiece of the organization, but new programs such as the EAA or "Education for American Agriculture" program gives advanced degrees for member participation in a variety of activities, local, state and national. Some programs foster agricultural literacy, such as the "Pizza Project" and the "Agricultural Exchange". Others, such as the European Exchange, "Wheelbarrow Race for Hunger", and "Spokesperson for Agriculture" give publicity to the good things that are happening in agriculture. Corporate membership, partnerships with numerous agricultural organizations and agencies, and the development of a field office in Montgomery, Alabama, have given the organization a new lease on life. The NYFEA's new motto is, "Educating America's Agricultural Leaders". However, many questions regarding the organization's role and future direction remain unanswered. Clearly, research is needed to guide the development of the NYFEA.

Carpentier (1991) conducted the first comprehensive scientific study of the organization. He found that the membership generally approved the activities conducted by the national organization, but that more and better services were desired. No study of research priorities was found in the literature. In 1993 a staff study proposed by the researcher and designed to find out the research needs of the organization was approved by the Delegate Assembly at the winter Institute and later authorized by the Board of Directors. Consequently, in early February, 1994, the study was begun.

Purpose/Objectives

The primary purpose of the study was to determine the research topics thought to be important priorities by leaders in the National Young Farmer Educational

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Association. Specific objectives were to:

1. Develop a list of researchable topics of importance to the NYFEA leadership.

2. Seek consensus among leaders in the NYFEA as to the importance of selected research topics.

3. Develop a prioritized "short list" of research topics in NYFEA for immediate attention by leaders, researchers and funding agencies.

Methods/Procedures

After an extensive search of the literature, an open-ended questionnaire was developed and sent to 64 individuals who represented national committee chairs, national officers, Board members, state executive directors, and constitutional committee members. The instrument contained a list of ten areas for guiding the replies of the respondents. The areas were: I. Membership; II. Educational Activities; III. Public Relations/Image; IV. Corporate Relations; V. Finance; VI. Programs/Service Activities; VII. Organizational Structure/Constitution; VIII. Institute; IX. Collaboration/Organizational Linkages; and X. General/Other. The instrument was field tested with members of the Agricultural Education faculty and supervisory staff for face validity. After a concerted, two-month-long follow-up that consisted of mailings and telephone and personal contacts, 32 (50%) responses were received. This rate of response was consistent with that found by Carpentier (1991), when after extensive follow-up activities, he received just 45% response; he concluded that young farmers generally do not respond well to questionnaires.

A second-round instrument was then developed from the items generated in the round one instrument and trial tested with NYFEA officers and selected teacher educators. The round two instrument contained 119 items in 10 categories on a five-point Likert-type scale on which 1=low priority...and 5=high priority. This was sent to the respondents in early May, 1994. By July 1, 1994, 29 responses (90.6%) were received. The ratings of each item were analyzed by computer; any item not receiving an average of 3.5 or higher rating (<u>above</u> a "moderate priority") was deleted from the round three instrument. This level was set <u>a priori</u> by the researcher to reduce instrument size and therefore improve response rate. Thirty-nine items were deleted.

The remaining 80 items were listed on the third-round instrument along with the mean, median and the respondent's individual rating for each item. In addition, a compilation of all comments made on each item was sent to the panel. Again, after several follow-up calls and/or personal contacts, the third-round response of 28 panelists (96%) was received in early October. A Cronbach's alpha reliability coefficient of .89 was calculated on round three responses.

The 13 top-ranked items, based on mean ratings and standard deviation, were sent to the panel in mid-October, 1994, with a request to rank the top <u>five</u> topics and return the instrument by December 5, in time for a report at the National Institute. Nineteen out of 28 panelists (68%) responded in time for an interim report to the delegate assembly at the 1994 Institute; 25 (89.3%) had responded

to round four by February 1, 1995, when the researcher concluded the data-gathering phase of the study. The panel rankings for each item were totalled and divided by the number of responses to determine the group rating of each. Thus the five items with the lowest group totals were designated as the top priorities of NYFEA.

Results/Findings

Objective 1. Develop a list of researchable topics of importance to the NYFEA leadership. A total of 119 researchable topics were identified by NYFEA leaders in round one; however, only 80 items were rated as "high priority" in round two; furthermore, round three eliminated two more items, Area I - 5 & 7. The 78 high-priority items are in Table 1.

[insert Table 1. (reduced) about here]

Objective 2. Seek consensus among leaders in the NYFEA as to the importance of selected research topics. All but three of the 80 high-priority items evaluated by the panel in round three (items I-9., III-12., X-5.) were moderately or highly correlated with round two responses when compared using the Pearson "r" correlation coefficient; this is an indication of consensus among respondents on 77 or 96% of the items. In addition, 51 or 64% of the standard deviations were less than 1.0, and 51 or 64% of the standard deviations decreased between rounds two and three.

Objective 3. Develop a prioritized "short list" of research topics in NYFEA for immediate attention by leaders, researchers and funding agencies. Five items were ranked highest of the research topics that the leaders in the NYFEA want investigated. They are, in declining order: 1. How to retain membership; 2. Strategies for increasing membership; 3. Alternatives for state organizations where the department of education is not funding adult education; 4. New/innovative/effective ways to fund the NYFEA; and 5. Grassroots membership needs/wants/expectations in NYFEA programs. These items may be seen in Table 2.

[insert Table 2. (reduced) about here]

Conclusions/Recommendations/Implications

It can be concluded from the findings that the 78 highly rated items are the priority topics recognized by leaders in the NYFEA. In addition, the panel of national leaders were able to agree, in general, on the priority set for the 78 items. Furthermore, the NYFEA leader panel were in agreement on the top five priorities among the top rated items. Clearly, issues of membership, organizing in non-participating states, and funding are concerns of the NYFEA leadership.

It is recommended that the following actions be taken, based on the above:

1. Teacher educators and state staffs should work cooperatively with the NVATA to reemphasize adult education in agriculture, including the NYFEA and its state affiliates.

2. Studies should be undertaken nationally that address the concerns of the NYFEA leadership. The Council should be involved in providing funding and other incentives for accomplishing this research agenda.

3. The results of research and development activities by the NYFEA and its affiliates should be disseminated widely among teachers, administrators, politicians, university personnel, teacher educators and state supervisory staffs in order to educate those responsible for adult education as well as the recipients of this important service.

4. Leaders in the NYFEA should initiate immediate efforts to secure findings of the top-rated priority items found in the study. Special recognition should be given to those in the profession who undertake studies on the priority topics.

5. Editorial boards for the major journals in Agricultural Education should consider dedicated editions and other means to emphasize the research and development needs of the NYFEA.

Research priorities of the NYFEA have implications for agricultural educators at all levels and in all states. It is the responsibility of the profession to give thoughtful response to this request for help.

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Table 1.

High Priority Topics Identified in Round Three of the NYFEA Delphi Study

Area/Item	Mean	S.D.	"r"
AREA I. MEMBERSHIP			
1. Reasons why people join young farmers/NYFEA	3.82	945	.82
2. Strategies for organizing states not affiliated with NYFEA	4.36	.731	.76
3. Potential for non-farm/agribusiness members	4.25	.701	.79
4. Potential for female membership	4.04	.999	.64
6. Strategies for recruiting former FFA members into the NYFEA	4.29	.854	.56
8. Strategies for increasing membership numbers in the NYFEA	4.68	.476	.77
9. How to retain membership in chapter, state association, and the NYFEA	4.86	.356	.22
10. Member perceptions of NYFEA member services	4.07	.858	.75
12. Strategies for attracting corporate/contributing members	3.96	.881	.52
13. Effects of reductions in state department of education staff on NYFEA membership	4.07	1.086	.61
AREA II. EDUCATIONAL ACTIVITIES			
1. NYFEA activities wanted/needed by active members	3.96	.999	.62
2. Opportunities for educating the public about agriculture	4.11	.737	.88
4. NYFEA activities for personnel in off-farm agricultural business and industry	3.96	.693	.66
5. The effect of Education for American Agriculture (EAA) on local, state and national membership	3.86	.932	.62
6. Member perceptions of, interest in and reactions to the EAA program	3.86	.970	.89
8. Potential for NYFEA to provide educational materials/curriculum to state and local affiliates	3.64	1.129	.45
9. Strategies for implementing challenging educational activities in NYFEA	3.96	.922	.83
10. Effect of educational programs on membership in the local, state and national organization	4.04	.838	.76
12. How to address issues pertinent to today's agriculture	3.89	1.100	.87
13. Strategies for providing activities through effective and efficient non-traditional methods of delivery (e.g. distance learning, video-conferencing, correspondence, etc.)	3.79	.738	.81
14. Strategies for determining need and making educational programs available in a timely way	3.68	.983	.66
AREA III. PUBLIC RELATIONS/IMAGE			
1. Effect of communication (Newsletter, Magazine, etc.) on NYFEA image	4.21	.957	.50
2. How agribusiness corporations perceive NYFEA	4.36	.678	.53
3. What members want from the NYFEA Newsletter	3.75	.967	.64
4. What members want from the NYFEA Magazine	3.70	.912	.66
5. How the professional agriculture image of NYFEA can be "showcased" at			

national events .... 4.11 .737 .57
6. What name would appeal to a broader clientele in agriculture/agribusiness ...... 3.64 1.520 .94

AREA III. (continued)
8. Potential for improving the public image of NYFEA by using other publications/media 4.29 .659 .62
9. Image of NYFEA among ag teachers, state officials and politicians .... 4.75 .441 .57
10. Use of mass media (radio, TV, popular publications) to promote young farmer activities .... 4.00 .903 .83
12. Strategies for local, state and the national organizations to create a more positive image of farmers and agricultural industry .... 4.18 .819 .26
13. Opportunities for the NYFEA to promote the image of the farmer as steward of the land and producer of bountiful and safe food .... 4.07 .979 .45
14. Public relations program needed to portray adult education in agriculture/agribusiness 3.89 .956 .43

AREA IV. CORPORATE RELATIONS
1. Membership belief in mutual/equitable relation-ships with agribusiness corporations 3.57 .997 .80
3. Corporate involvement on the NYFEA advisory board .... 3.79 1.067 .85
4. Strategies for recruiting corporate members/support .... 3.64 .911 .70
5. Strategies for linkage with corporate public relations officers for promoting American agriculture .... 3.86 1.044 .76
6. Corporate officials' views of the NYFEA -- value, goals, structure .... 3.86 .848 .74
7. Strategies for cooperation with local/state and national producer organizations .... 4.07 .663 .77

AREA V. FINANCE
3. Opportunities for an NYFEA endowment fund .... 3.86 1.113 .88
4. Membership views on level of national dues .... 3.68 1.156 .87
5. New/innovative/effective ways to fund NYFEA .... 4.54 .744 .69
6. Strategies for funding young farmer education programs in states that have no funding /only volunteer directors, advisors, etc. .... 4.11 .875 .78
7. Impact of the national officer/executive secretary system on financial stability of NYFEA .... 4.07 1.052 .77
8. Policies for coordination of fund raising .... 3.75 1.110 .65
9. Opportunities for joint fund raising with NYFEA "partner" organizations .... 3.82 .819 .82
10. Creative ways to reduce/eliminate the NYFEA debt .... 3.71 1.182 .60

AREA VI. PROGRAMS/SERVICE ACTIVITIES
1. Grassroots membership needs/wants/expectations in NYFEA programs .... 4.30 1.171 .93
2. Availability of NYFEA programs/services to all members .... 3.82 1.090 .61
4. Strategies for developing unique programs/services not available through other agricultural groups .... 4.25 .799 .73
5. Level of effectiveness of current programs/services in NYFEA .... 3.75 1.005 .68
7. Strategies for developing new programs to include and promote new members ..... 4.29 .854 .90
8. Strategies used by states/local chapters to carry out successful projects .... 4.00 1.018 .70
9. Strategies to increase services to the local member .... 3.96 1.105 .83

AREA VII. ORGANIZATIONAL STRUCTURE/CONSTITUTION

1. Member views/beliefs about the current NYFEA constitution	3.63	1.006	.76
3. Strategies for updating/changing the NYFEA constitution to reflect a changing world	3.61	1.100	.63

AREA VII. (continued)

5. Alternatives for state organizations where the State Department of Education is not funding adult education	4.36	.621	.83
9. Capacity of agricultural education to support the NYFEA in reaching its potential	4.07	.858	.77
12. Perceived values members give the NYFEA	3.64	1.026	.69

AREA VIII. NATIONAL INSTITUTE

4. Design of the Institute to meet the needs of current members	4.00	1.122	.68
5. Effect of the Institute on participation of members and sponsors	3.82	1.090	.71
6. Role of the Institute in NYFEA structure	3.89	.956	.69
8. Opportunities for networking of members, corporate members and sponsors at the Institute	3.54	1.071	.81

AREA IX. COLLABORATION/ORGANIZATIONAL LINKAGES

1. How to effectively "partner" with other groups	4.04	.962	.85
2. Status of the relationship of NYFEA with other groups in the agricultural education "family"	4.18	1.156	.83
3. Use of technology in communicating among the organizational levels	3.79	1.134	.63
6. Values of linkages with farm organizations and similar groups located in business and industry	4.29	.600	.76
8. Effective linkages with other members of the agricultural education "family"	4.04	.999	.98

AREA X. GENERAL/OTHER

1. Opportunities for young farmer programs in urban/suburban areas	4.07	.858	.85
2. Success of young farmer education programs in states with the Adult Farm Business Management program	4.18	.834	.79
3. Status of state agency support of young farmer education activities	4.11	.685	.56
4. Creative ways to involve state executive secretaries in the NYFEA decision-making process	4.04	.999	.58
5. Needs of the National Executive Secretary	4.29	1.182	.39
6. Role of state executive secretaries in NYFEA activities	4.25	.701	.76
7. The social development function/responsibility of NYFEA	3.68	.905	.88
8. Opportunities for international activities in NYFEA	3.75	1.041	.87
9. Values of close ties with the U.S. Department of Education	4.14	.756	.89

*Note: These items were rated as "important" or "very important" (averaging over 3.5 on the 5-point scale) in the third-round. Numbers are not always in sequence because items that were 3.5 or below were eliminated from the third round.

Table 2.

Highest-rated Research Priorities for the NYFEA

Research Topic	M	S.D.	Rank
(Area I-9) How to retain membership in chapter, state association, and the NYFEA	4.86	.356	1
(Area III-9.) Image of NYFEA among ag teachers, state officials and politicians	4.75	.441	
(Area I-8.) Strategies for increasing membership numbers in the NYFEA	4.68	.476	2
(Area V-5.) New/innovative/effective ways to fund NYFEA	4.54	.744	4
(Area VII-5.) Alternatives for state organizations where the State Department of Education is not funding adult education	4.36	.621	3
(Area III-2.) How agribusiness corporations perceive NYFEA	4.36	.678	
(Area I-2.) Strategies for organizing states not affiliated with NYFEA	4.36	.731	
(Area VI-1.) Grassroots membership needs/wants/expectations in NYFEA programs	4.30	1.171	5
(Area IX-6.) Values of linkages with farm organizations and similar groups located in business and industry	4.29	.600	
Area III-8.) Potential for improving the public image of NYFEA by using other publications/media	4.29	.659	
(Area VI-7.) Strategies for developing new programs to include and promote new members	4.29	.854	
(Area I-6.) Strategies for recruiting former FFA members into the NYFEA	4.29	.854	
(Area X-5.) Needs of the National Executive Secretary	4.29	1.182	

RESEARCH PRIORITIES PERCEIVED FOR THE NYFEA BY ITS LEADERS: A NATIONAL DELPHI STUDY - *A Critique*

Lou E. Riesenberg, University of Idaho

It is interesting to note the similarities between this research report and another in this section entitled "A National Validation Study of Research Priorities for Adult Education". Both deal with research priorities for adult education in agriculture and both compiled research priorities for the profession. In the other report the respondents are the profession and here the priorities belong to the leadership in the National Young Farmers Educational Association (NYFEA). Perhaps two agendas are being developed.

While reading the introduction of this research report about the rapid growth and then sharp decline in membership in the NYFEA and knowing that eventually the paper would report out the research priorities of the leadership of the organization, it came as no real surprise that the research priorities dealt primarily with maintaining and increasing membership.

Working in a state that does not have a NYFEA presence, one has to ask if the research priorities should not focus on maintaining and/or increasing membership in the organization but possibly should focus on the value of the organization to its potential membership. Perhaps, in this case, an old quote holds true "If it has value, they will buy". The author reports consistent methodology for identifying and then prioritizing the research initiatives as delineated by the leadership of the organization. One particularly interesting comment in the methods and procedures dealt with the response rate, "This rate of response was consistent with that found by Carpentier (1991), when after extensive follow-up activities he received just 45% response; he concluded that young farmers generally do not respond well to questionnaires". It seems that the respondents, in this particular study, were not just young farmers but were leaders of their national organization and were partners in an activity to develop and prioritize a list of researchable topics deemed to be important to the organization. It would seem reasonabl, given this scenario, that each of the individuals would have a vested interest in responding and, in that light, a 45 percent response rate would be somewhat low.

The author recommends that teacher educators and state staff should work cooperatively with NVATA to re-emphasize adult education in agriculture, including the National Young Farmers Educational Association and its state affiliates. Perhaps a good point of discussion would be as to how this recommendation and others reported as a part of this paper, fit with the issues being addressed by the Adult Education Committee of AAAE.

Who does have the responsibility to secure answers to the research priorities set by the leadership of NYFEA? It is not clear whether these are priorities that the leadership of the organization will or should pursue or if the answers to these questions should be provided by the profession. The author does make reference to the Council being involved in providing funding and other incentives for accomplishing this research agenda.

GOALS MET BY ADULT ORGANIZATIONS IN AGRICULTURAL EDUCATION, NATIONALLY

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Introduction and Theoretical Framework

While information shifts, technological advances, and market changes have all influenced the direction of adult agricultural education programs, a demand still exists for these programs (Nur, Birkenholz, & Stewart, 1989; Birkenholz & Maricle, 1991; Chizari & Taylor, 1991). In a national study, Birkenholz and Maricle (1991) found agreement among head agricultural teacher educators that adult instruction should be provided through the agricultural education framework. McCracken (1992, p.11) disagrees. "The public school system has failed to provide adult education in an effective way to adults outside of production agriculture. Adult education in the public schools is a broken, torn, and worn-out wineskin."

Adult organizations like advisory committees, FFA Alumni affiliates, National Young Farmer Education Association chapters (NYFEA), and booster clubs are commonly associated with secondary agricultural education programs. Each organization has specific goals developed to enhance and support agricultural education. "Advisory committees are essential linkages between the community and the agricultural education teacher, providing nonbinding recommendations to support the operation of agricultural education programs" (Whaley & Sutphin, 1988, p. 18). The FFA Alumni Association is an organized extension of the FFA program. The association's primary purpose is to assist the agricultural education teacher/FFA advisor in increasing his/her efforts and contacts (National FFA Foundation, 1993). The NYFEA, chartered in 22 states, is an educational program aimed primarily at young men and women engaged in agriculture and/or agribusiness (NYFEA, Inc., 1992). Historically, secondary agricultural education teachers have had administrative, advising, and other responsibilities for adult organizations affiliated with their programs. Demonstrated commitment to these adult organizations can vary from a full-time adult educator to the absence of any adult programming affiliated with the agricultural education program (NCR-158 Committee on Adult Education in Agriculture, 1990).

Reductions in agricultural education programs nationwide have resulted in a decrease in the number of affiliated adult agricultural education organizations. A perception exists that national agricultural education leadership promotes an ideal of secondary agricultural education programs being affiliated with an advisory committee, FFA Alumni affiliate, and NYFEA chapter. Each of these adult organizations has unique goals that, if achieved together, should provide exhaustive and well-balanced community support, continuing education, and literacy education through the agricultural education framework. However, given the demands on agricultural education teachers, is it realistic to expect adoption of a three-organization model? To best answer that question, the profession should begin by investigating how adult organizations affiliated with secondary agricultural education programs are being utilized.

The theoretical framework for the study is a total of 21 primary goals for advisory committees (National Center for Research in Vocational Education, 1982), the FFA Alumni Association (National FFA Foundation, 1993), and the NYFEA (1992). They form the base from which conclusions will be drawn and comparisons made about how these adult organizations affiliated with secondary agricultural education programs are being utilized.

Goals of advisory committees (National Center for Research in Vocational Education, 1982):
1. To advise teachers in the agricultural education program on course content.
2. To assist the agricultural education program with student job placement.
3. To assist with public relations for the agricultural education program.
4. To assess equipment and facility needs of the agricultural education program.
5. To assist with staffing concerns for the agricultural education program.
6. To evaluate the agricultural education program.
7. To identify community resources for the agricultural education program.

Goals of the FFA Alumni Association (National FFA Foundation, 1993):
1. To support FFA youth activities.
2. To assist the agricultural education program to involve former FFA members in worthy activities.
3. To promote an appreciation of the American free enterprise system.
4. To promote the personal development aspect of the FFA.
5. To cooperate with national-level FFA support groups.
6. To promote the agricultural education program.
7. To provide a tie between former and present FFA members.

Goals of the NYFEA (1992):
1. To assist young agriculturalists through educational programs to remain in farming, ranching, or agribusiness.
2. To assist young agriculturalists to use resources to develop family relationships.
3. To cooperate with other organizations to improve the economic conditions of rural life.
4. To assist young farmers, ranchers, or agribusiness people to develop leadership skills.
5. To provide group identity to the adult organization
6. To promote the adult organization as an integral part of the agricultural education program.
7. To improve urban consumers' understanding of agricultural issues.

Purpose and Objectives

The purpose of this study was to describe perceptions and attitudes of secondary agricultural education teachers in the United States toward adult agricultural education organizations affiliated with their agricultural education programs. Specific objectives were:

1. To describe agricultural education teachers by gender, age, years of teaching agriculture completed and to describe their programs by the number of teachers in the program.
2. To determine the adult organizations affiliated with agricultural education programs.
3. To determine which goals of advisory committees, the FFA Alumni Association, and the NYFEA, are being achieved by the adult organization(s) affiliated with the agricultural education programs.
4. To determine agricultural education teachers' attitudes toward a model of three adult organizations affiliated with agricultural education programs.
5. To determine how agricultural education program graduates who remain in the community after high school graduation are receiving continuing education in agriculture.

Procedures

The population of the study was 7961 secondary agricultural education teachers listed in the National Agricultural Educators Directory (Henry, 1993). At a 95% confidence level, a sample size of 367 was needed to represent the population (Krejcie & Morgan, 1970). A random sample of teachers, stratified proportionally by state to ensure representation, was generated.

The design of the study was descriptive. A mail questionnaire containing six sections, five of which apply to this paper, was developed by the authors. Section one asked respondents to identify from a checklist all adult organizations affiliated with their agricultural education program. Section two listed a total of 21 primary goals (listed in the theoretical framework section) of advisory committees, the FFA Alumni Association, and the NYFEA. Respondents were asked to check the goals that were being addressed in whole or part by each of the adult organizations and any "other" adult organization like a booster club, affiliated with their agricultural education program. Section three assessed teachers' attitudes toward a three-adult organization model (i.e., advisory committee, FFA Alumni affiliate, and NYFEA chapter). Respondents were asked to indicated level of agreement on a Likert-type sub-scale ranging from strongly disagree to strongly agree. Using a checklist provided in section four, respondents indicated which adult agricultural organizations or institutions were utilized by students remaining in the community after high school graduation to obtain continuing education in agriculture. Gender, age, number of years teaching agriculture completed, and number of teachers in the agricultural education program were sought in section five.

All parts of the questionnaire were assessed for content and face validity by a state supervisor, teacher educator, and secondary teacher in agricultural education; a faculty member in adult education; and two faculty members in research methods and statistics. Reliability was assessed using a two-week test-retest procedure and determining percentage agreement for each question and the overall questionnaire. Forty secondary agricultural education teachers from New Mexico who were not part of the sample were randomly selected for the reliability testing. Eleven returned two fully completed questionnaires in the two-week time frame. The total questionnaire had a percentage of agreement of 86%. The section relating to the 21 adult organization goals and how they were being met had a percentage of agreement of 87%.

Data were collected from March through May 1994 following the Dillman (1978) procedure for mail questionnaire administration. Incentives were included in the mailings to increase response rate. A response rate of 68.1% (n=250) was obtained. Usable data were obtained from 244 (66.5%) of the respondents. To check for nonresponse bias, 16 teachers were randomly selected from among the nonrespondents, contacted by telephone, and asked to respond to the questionnaire. Their answers were pooled with those of 21 others who responded after the data collection deadline. These pooled nonrespondents (n=37) were compared statistically to respondents (n=207) on adult organizations affiliated with their programs; attitude toward the three adult agricultural education organization model; teacher gender, age, number of years teaching agriculture completed; and the number of teachers in the agricultural education program. The two groups differed only in that nonrespondents were more likely to have a booster club or other adult organization, limiting generalizations to the respondents for this variable. Data were analyzed with descriptive statistics (i.e., means, medians, standard deviations, frequencies, and percentages).

Results and Conclusions

Objective 1

The sample had 95% male teachers and 5% female teachers. Most came from one-teacher (76%) or two-teacher (20%) departments. The teachers had a median age of 40 and averaged 40.2 years in age (sd=9.5). They had taught a median of 13 years and an average of 14.1 years (sd=8.6). Using the formula (mean-median)/sd x 100, these last two distributions were nearly normal with 2.1% and 12.8% of possible skewness, respectively.

Objective 2

It was most common for two (n=96) or one (n=82) adult organizations to be affiliated with secondary agricultural education programs (Table 1). The most common arrangement was to have only an advisory committee (n=69 or 31.7% of the programs). Programs with two adult organizations usually had both an advisory committee and FFA Alumni affiliate (n=43) or an advisory committee and another organization like a booster club (n=37). Only twenty programs had an advisory committee, FFA Alumni affiliate, and NYFEA chapter; five of these also had a booster club or other adult organization. Almost all the programs had an advisory committee (91.3%), while 39.4%, 32.6%, and 18.3% had a FFA Alumni affiliate, another organization, or a NYFEA chapter, respectively (Table 1).

Table 1
Adult Organizations Affiliated With Secondary Agricultural Education Programs (n=218)

Organizational Category	Subtotals f	Subtotals %	Totals f	Totals %
No Adult Organizations			1	0.5
One Adult Organization			82	37.6
AC* Only	69	31.7		
Another Only	7	3.2		
FFAA* Only	6	2.8		
NYFEA Only	0	0.0		
Two Adult Organizations			96	44.0
AC and FFAA	43	19.7		
AC and Another	37	17.0		
AC and NYFEA	11	5.0		
FFAA and NYFEA	2	0.9		
FFAA and Another	2	0.9		
NYFEA and Another	1	0.5		
Three Adult Organizations			34	15.6
AC, FFAA, and YF	15	6.9		
AC, FFAA, and Another	13	6.0		
AC, YF, and Another	6	2.8		
FFAA, YF, and Another	0	0.0		
Four Adult Organizations			5	2.3
Totals			218	100.0
Total With an Advisory Committee			199	91.3
Total With a FFA Alumni Affiliate			86	39.4
Total With Another Organization			71	32.6
Total With a NYFEA Chapter			40	18.3

*Note. AC stands for advisory committee. FFAA stands for FFA Alumni affiliate.

Objective 3

According to the teachers, at least 60% of the advisory committees were meeting each advisory committee goal (Table 2). At least 50% of the FFA Alumni affiliates were meeting advisory committee goals 2, 3, and 7; at least 50% of the NYFEA chapters were meeting goals 1, 2, 3, and 7; and at least 50% of the other adult organizations were meeting goals 3 and 7. Advisory committee goal 3, "to assist with public relations for the agricultural education program," and goal 7, "to identify community resources for the agricultural education program," were being met over 50% of the time by all four adult organizations. Goal 1, "to advise teachers in the agricultural education program on course content," goal 4, "to assess equipment and facility needs of the agricultural education program, and goal 6, "to evaluate the agricultural education program," were met by nearly 90% of the advisory committees, while receiving relatively low attention from the other adult organizations.

Table 2
Advisory Committee Goals that Are Addressed By the Adult Organizations Affiliated With Local Agricultural Education Programs

Short Titles of Advisory Committee Goals	AC(n=199) f	AC(n=199) %	FFAA(n=86) f	FFAA(n=86) %	YF(n=40) f	YF(n=40) %	Other(n=71) f	Other(n=71) %
*Goal 1, Advise on course content	177	88.9	35	40.7	20	50.0	24	33.8
Goal 2, Assist w/student placem.	121	60.8	54	62.8	25	62.5	27	38.0
Goal 3, Assist w/public relations	132	66.3	72	83.7	28	70.0	49	69.0
Goal 4, Assess equip./facil. needs	174	87.4	38	44.2	15	37.5	33	46.5
Goal 5, Assist w/staffing concerns	126	63.3	27	31.4	11	27.5	14	19.7
Goal 6, Conduct prog. evaluation	179	89.9	23	26.7	8	20.0	15	21.1
Goal 7, Iden. commun. resources	148	74.4	55	64.0	26	65.0	40	56.3

*Note. The goals are listed fully in the Introduction and Theoretical Framework section of this paper.

Eighty percent or more of the FFA Alumni affiliates were meeting six of the FFA Alumni Association goals (Table 3). Goal 3, "to promote an appreciation of the American free enterprise system" was being met by only 55% of the affiliates. At least 50% of the advisory committees were meeting FFA Alumni Association goals 1, 4, and 6; at least 50% of the NYFEA chapters were meeting goals 1, 2, 3, 6, and 7; and at least 50% of the other adult organizations were meeting goals 1, 2, 4, 6, and 7. FFA Alumni Association goal 1, "to support FFA youth activities," and goal 6, "to promote the agricultural education program," were both being met over 50% of the time by all four organizations. Goal 2, "to assist the agricultural education program to involve former FFA members in worthy activities," came close to meeting this criterion. Goal 5, "to cooperate with national-level FFA support groups," appears to be the most unique to FFA Alumni affiliates. NYFEA chapters and other adult organizations appear to address most of the same goals as FFA Alumni affiliates.

At least 60% of the NYFEA chapters were meeting each NYFEA goal (Table 4). At least 50% of the advisory committees and other adult organizations were meeting NYFEA goal 1. At least 50% of the FFA Alumni affiliates were meeting goals 1, 3, 4, 5, 6, and 7. NYFEA goal 1, "to assist young agriculturists through educational programs to remain in farming, ranching, or agribusiness," was being met over 50% of the time by all four organizations. The other goals appear to be somewhat unique to the NYFEA although FFA Alumni affiliates often met the goals. Urban agricultural literacy (NYFEA goal 7) was not addressed by a high frequency of any of the adult organizations.

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Table 3
FFA Alumni Association Goals that Are Addressed By the Adult Organizations Affiliated With Local Agricultural Education Programs

Short Titles of FFA Alumni Assoc. Goals	AC(n=199) f	%	FFAA(n=86) f	%	YF(n=40) f	%	Other(n=71) f	%
*Goal 1, Support FFA activities	146	73.4	83	96.5	36	90.0	55	77.5
Goal 2, Involve former FFA mem.	76	38.2	77	89.5	29	72.5	43	60.6
Goal 3, Prom. Amer. free enterpr.	89	44.7	48	55.8	26	65.0	29	40.8
Goal 4, Promote personal develop.	103	51.8	76	88.4	18	45.0	44	62.0
Goal 5, Coop. w/ntl. FFA grps.	35	17.6	68	79.1	16	40.0	7	9.9
Goal 6, Promote the ag. ed. prog.	160	80.4	78	90.7	32	80.0	52	73.2
Goal 7, Tie w/past/pres. FFA mem.	62	31.2	80	93.0	23	57.5	46	64.8

*Note. The goals are listed fully in the Introduction and Theoretical Framework section of this paper.

Table 4
NYFEA Goals that Are Addressed By the Adult Organizations Affiliated With Local Agricultural Education Programs

Short Titles of NYFEA Goals	AC(n=199) f	%	FFAA(n=86) f	%	YF(n=40) f	%	Other(n=71) f	%
*Goal 1, Assist to remain in ag.	105	52.8	54	62.8	33	82.5	36	50.7
Goal 2, Assist w/family relation.	53	26.6	39	45.3	24	60.0	28	39.4
Goal 3, Improve rural life econ.	77	38.7	47	54.7	27	67.5	33	46.5
Goal 4, Assist w/leadership skills	76	38.2	45	52.3	35	87.5	30	42.3
Goal 5, Provide group identity	55	27.6	49	57.0	31	77.5	33	46.5
Goal 6, Integral part of ag. ed. prog.	71	35.7	50	58.1	29	72.5	28	39.4
Goal 7, Promote urban ag. literacy	63	31.7	43	50.0	27	67.5	24	33.8

*Note. The goals are listed fully in the Introduction and Theoretical Framework section of this paper.

Objective 4

Even though only nine percent of the programs had an advisory committee, FFA Alumni affiliate, and NYFEA chapter (Table 1), the teachers had positive attitudes toward having all three organizations. Of the 236 who responded to the Likert-type question, "Ideally, agricultural education programs would have all three of the following: An advisory committee, FFA Alumni affiliate, and NYFEA chapter," 65 (27.5%) strongly agreed and 109 (46.2%) agreed. Forty-seven 47 (19.9%) neither agreed or disagreed, while only 13 (5.5%) and two (0.8%) disagreed and strongly disagreed, respectively.

Objective 5

According to the agricultural education teachers, the most common means for secondary agricultural education students who stay in the community after graduation to receive continuing education in agriculture were through a local community college or other postsecondary institution (n=179), the Cooperative or Agricultural Extension Service (n=161), commodity organizations (n=98), and Farm Bureau (n=94) (Table 5). Adult organizations associated with secondary agricultural education programs were much less frequently mentioned as a means for continuing education in agriculture.

Table 5
Means By Which Agricultural Education Students Who Stay In the Community After Graduation from High School Receive Continuing Education in Agriculture (n=244)

Organization	f	%
Local Community College or Other Postsecondary Institution	179	76.5
Cooperative or Agricultural Extension Service	161	68.8
Commodity Organizations	98	41.9
Farm Bureau	94	40.2
FFA Alumni Affiliate	44	18.8
Secondary Agricultural Education Program Advisory Committee	39	16.7
NYFEA Chapter	34	14.5
Other	34	14.5

Implications and Recommendations

1. Over 90% of the local agricultural education programs had advisory committees. Nearly 90% of the time, these committees were advising agricultural education teachers on course content, assessing equipment and facility needs of the agricultural education program, and evaluating the agricultural education program. Because other adult organizations were not frequently meeting these three goals, they appear to be somewhat unique to advisory committees. Because these are extremely important goals for ensuring strength and development of local agricultural education programs, the researchers support the concept of agricultural education program advisory committees with a focus on them. We also recommend accountability for local programs to have an advisory committee and encourage teacher education and state departments of education to cooperate in offering pre-service and in-service teacher education related to establishing and maintaining effective advisory committees.

2. If we accept the fact that an adult organization goal that is being met over 50% of the time by all four organizations is a measure of its importance, the following would appear to suggest a framework for other goals an advisory committee or second adult organization might adopt.
From the advisory committee goals:
- To assist with public relations for the agricultural education program.
- To identify community resources for the agricultural education program.

From the FFA Alumni Association goals:
- To support FFA youth activities.
- To promote the agricultural education program.

From the NYFEA goals:
- To assist young agriculturists through educational programs to remain in farming, ranching, or agribusiness.

One other FFA Alumni Association goal comes close to meeting the 50% criterion:
- To assist the agricultural education program to involve former FFA members in worthy activities.

Combining similar goals, the researchers recommend the adoption of the following four goals to supplement the three advisory committee goals previously mentioned:
- To assist with public relations and promotional efforts for the agricultural education program.
- To identify community resources for the agricultural education program.
- To support FFA youth activities.

- To assist the agricultural education program in involving former students who remain in the community after graduation in worthy activities, including continuing education in agriculture.

All four goals provide assistance to the agricultural education teacher with their program while providing the adult organization with meaningful activities. If other adult education organizations in the community are accessed to accomplish the fourth goal, these goals could be accomplished by the adult organization(s) while actually reducing the responsibilities of the teacher. This is crucial for ensuring a high rate of adoption.

3. Any other goals adopted by adult organizations affiliated with local agricultural education programs should be based on local needs.

4. Agricultural education should not promote an ideal of three adult organizations (i.e., an advisory committee, FFA Alumni affiliate, and NYFEA chapter) associated with secondary agricultural education programs. While there is agreement among teachers about the merit of this model, in practice there is little adoption. Through these results, the teachers have suggested which adult organization goals are most central to the mission of agricultural education programs. State supervisors, teacher educators, and teachers should collaborate to develop achievable routes for secondary agricultural education teachers to meet these goals through one or two adult organizations. For example, why couldn't a sub-committee of an FFA Alumni affiliate, NYFEA chapter, or booster club be the advisory committee for the agricultural education program, in effect limiting the number of adult organizations affiliated with the program to one? What we call the adult organization(s) is not as important as the goals they should accomplish.

5. The researchers agree with McCracken (1992, p. 11) that "adult education in the public schools is a broken, torn, and worn-out wineskin." There appears to be more effective ways for agricultural education students who remain in the community after graduation to obtain continuing education in agriculture than through the agricultural education teacher, who has little time or funding to develop a quality program. Teachers and the students appear to be knowledgeable about continuing education opportunities through postsecondary institutions, Cooperative or Agricultural Extension, commodity organizations, and Farm Bureau. Therefore, the adult organizations affiliated with secondary agricultural education programs should not duplicate effort, but develop linkages with these other programs that have the time, funding, and other resources to provide quality continuing education programs.

6. A second publication from this study will report qualitative agricultural education teacher opinions about the three-organization model and the utility of each adult organization. In the case of programs that have multiple adult organizations, it would be valuable to determine how many persons are members of more than one organization. Another follow-up study could further measure how functional these adult organizations are.

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GOALS MET BY ADULT ORGANIZATIONS IN AGRICULTURAL EDUCATION, NATIONALLY - *A Critique*

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The concept of adult organizations such as advisory committees, FFA Alumni affiliates and National Young Farmer Educational Association (NYFEA) chapters and other booster clubs as being associated with secondary agricultural education programs is quite reasonable. Adult organizations such as advisory committees, FFA Alumni affiliates and booster clubs have the primary purpose of being boosters and promoters of the secondary agriculture program, whereas an organization such as NYFEA may have goals that would be considered more parallel to the secondary agriculture program and not necessarily as boosters of the secondary program. This may seem to be a very minor difference in semantics, but an adult organization such as NYFEA might very easily be viewed as creating additional work for the local teacher rather than be totally a source of support for the secondary agriculture program.

It is not surprising to find that most secondary agricultural education programs have advisory committees that function in conjunction with the agriculture program, only 40 percent of the programs have an FFA Alumni affiliate and less than 20 percent have a NYFEA chapter affiliated with the secondary agriculture program.

It is also not surprising that agricultural education students staying in the community after graduation from high school receive much of their postsecondary training from organizations other than the National Young Farmers Educational Association. Perhaps an additional questions may have been, "In those secondary agriculture education programs where a NYFEA chapter existed, how many of the former agriculture students utilized that organization or structure to meet their adult education in agriculture needs?"

The authors suggest a sub-committee of the FFA Alumni affiliate, the National Young Farmers Educational Association chapter or the booster club also constitute the advisory committee for the secondary agricultural education program. If the intent of utilizing an advisory committee is to seek critical advice and input from individuals in leadership and other types of positions within the community, member of the FFA Alumni affiliates and like booster clubs may have a difficult time maintaining the separate functions of their positions - advising and promoting. Members of a NYFEA chapter could very well serve on an advisory committee for adult education in agriculture, but may be too focused on their needs instead of the total program.

The researchers are to be commended for their concept of considering the presence and influence of adult organizations affiliated with secondary agriculture programs. Many secondary agriculture instructional programs do not provide for adult education and therefore may not have an affiliation with an adult organization such as NYFEA. Would the findings of this study convince those program instructors to repair the old wineskin?

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TEACHER PERCEPTIONS OF THE UTILITY OF ADULT ORGANIZATIONS IN AGRICULTURAL EDUCATION, NATIONALLY

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Introduction and Theoretical Framework

Adult organizations like advisory committees, FFA Alumni affiliates, National Young Farmer Education Association (NYFEA) chapters, and booster clubs are commonly associated with secondary agricultural education programs. Each organization has specific goals developed to enhance and support agricultural education. "Advisory committees are essential linkages between the community and the agricultural education teacher, providing nonbinding recommendations to support the operation of agricultural education programs" (Whaley & Sutphin, 1988, p. 18). The FFA Alumni Association is an organized extension of the FFA program. Its primary purpose is to assist the agricultural education teacher/FFA advisor in increasing his/her efforts and contacts (National FFA Foundation, 1993). The NYFEA, chartered in 22 states, is an educational program aimed primarily at young men and women engaged in agriculture and/or agribusiness (National Young Farmer Educational Association, Inc.,1992).

Historically, secondary agricultural education teachers have had administrative, advising, and other responsibilities with the adult organizations affiliated with their programs. Demonstrated commitment to these adult organizations can vary from a full-time adult educator to the absence of any adult programming affiliated with the agricultural education program (NCR-158 Committee on Adult Education in Agriculture, 1990). In a national study, Dormody, Seevers, and Clason (1995) found that 217 of the 218 secondary agricultural education teachers surveyed indicated at least one adult organization was affiliated with their program. Because adult organizations are a component of almost all secondary agricultural education programs nationally, it is essential to conduct research to determine which organizations are affiliated with the programs and how they function.

A perspective exists in the profession promoting an ideal of secondary agricultural education programs being affiliated with an advisory committee, FFA Alumni affiliate, and NYFEA chapter. Each of these adult organizations has unique goals that, if achieved together, should provide exhaustive and well-balanced community support, continuing education, and literacy education through the agricultural education framework. Dormody, Seevers, and Clason (1995) found that most secondary agricultural education teachers had positive attitudes toward the three-organization model, but few had adopted the model. Teacher opinions of the three-organization model are needed to explain this gap between attitude and adoption.

Dormody, Seevers, and Clason (1995) determined how frequently each of 21 primary goals for advisory committees (National Center for Research in Vocational Education, 1982), the FFA Alumni Association (National FFA Foundation, 1993), and the NYFEA (National Young Farmer Educational Association, Inc, 1992) were being met by adult organization(s) affiliated with the secondary agricultural education programs. They used several criteria to eliminate and condense the 21 goals into a framework of seven essential goals that should be addressed by an advisory committee and up to one other adult organization:

1. To advise teachers in the agricultural education program on course content.
2. To assess equipment and facility needs of the agricultural education program.
3. To evaluate the agricultural education program.

4. To assist with public relations and promotional efforts for the agricultural education program.
5. To identify community resources for the agricultural education program.
6. To support FFA youth activities.
7. To assist the agricultural education program in involving former students who remain in the community after graduation in worthy activities, including continuing education in agriculture.

This framework provides a theoretical base from which conclusions will be drawn and comparisons made about how the adult organizations affiliated with secondary agricultural education programs are functioning.

Purpose and Objectives

The purpose of this study was to describe perceptions of secondary agricultural education teachers in the United States regarding the utility of adult agricultural education organizations affiliated with their agricultural education programs. Specific objectives were:

1. To describe the secondary agricultural education teachers by gender, age, and years of teaching agriculture completed and to describe the secondary agricultural education programs by the number of teachers in the program and the adult organizations affiliated with the program.
2. To determine the teachers' perceptions of the advantages and disadvantages of a model of three adult organizations (advisory committee, FFA Alumni affiliate, and NYFEA chapter) affiliated with agricultural education programs.
3. To determine the teachers' perceptions of the most supportive activities performed by the adult organizations affiliated with their agricultural education programs.

Procedures

The population of the study was 7961 secondary agricultural education teachers listed in the National Agricultural Educators Directory (Henry, 1993). At a 95% confidence level, a sample size of 367 was needed to represent the population (Krejcie & Morgan, 1970). A random sample of teachers, stratified proportionally by state to ensure representation, was generated.

The design of the study was descriptive-qualitative. A mail questionnaire containing six sections, of which four apply to this paper, was developed by the authors. A checklist in section one determined the adult organizations affiliated with agricultural education programs. Section three sought qualitative responses regarding the advantages and disadvantages of having all three adult organizations (i.e., an advisory committee, FFA Alumni affiliate, and NYFEA chapter) affiliated with agricultural education programs. Teacher gender, age, and number of years teaching agriculture completed and the number of teachers in the agricultural education program were sought in section five. Section six asked teachers to list the three most supportive activities performed by each of the adult organizations affiliated with their agricultural education programs.

All parts of the questionnaire were assessed for content and face validity by a state supervisor, teacher educator, and secondary teacher in agricultural education; a faculty member in adult education; and two faculty members in research methods and statistics. Reliability was assessed on five sections of the instrument using a two-week test-retest procedure and determining percentage agreement. Forty secondary agricultural education teachers who were not part of the sample were randomly selected for the reliability testing. Eleven returned two fully completed questionnaires in the two-week time frame. Percentage of agreement for the instrument was 86%.

Data were collected from March through May 1994 following the Dillman (1978) procedure for mail questionnaire administration. Incentives were included in the mailings to increase response rate. A response rate of 68.1% (n=250) was obtained. Usable data were obtained from 244 (66.5%) of the respondents. To check for nonresponse bias, 16 teachers were randomly selected from among the nonrespondents, contacted by telephone, and asked to respond to the questionnaire. Their answers were pooled with those of 21 others who responded after the data collection deadline. These pooled nonrespondents (n=37) were compared statistically to respondents (n=207) on adult organizations affiliated with their programs, attitude toward the three adult agricultural education organization model, gender, age, number of years teaching agriculture completed, and the number of teachers in the agricultural education program. The two groups differed only in that nonrespondents were more likely to have a booster club or other adult organization, limiting generalizations to the respondents for this variable. Data were analyzed with descriptive statistics (i.e., frequencies and percentages).

Results

Objective 1

The sample had 95% male teachers and 5% female teachers. Most came from one-teacher (76%) or two-teacher (20%) departments. The teachers had a median age of 40 and averaged 40.2 years in age (sd=9.5). They had taught a median of 13 years and an average of 14.1 years (sd=8.6). Out of 218 respondents who provided usable data on section one of the questionnaire, 199 had an advisory committee (91.3%), while 86 (39.4%), 71 (32.6%), and 40 (18.3%) had a FFA Alumni affiliate, another organization, or a NYFEA chapter affiliated with their programs, respectively. Only 20 programs (9.2%) had an advisory committee, FFA Alumni affiliate, and NYFEA chapter; five of these also had a booster club or other adult organization. One adult organization (n= 82 or 37.6%) and two adult organizations (n=96 or 44.0%) were the most common arrangements.

Objective 2

Of the 195 agricultural education teachers who answered the question on the advantages to having three adult organizations (i.e., an advisory committee, FFA Alumni affiliate, and NYFEA chapter) affiliated with agricultural education programs, most responded with advantages related to supporting the secondary agricultural education program in some way. The most common answer was increasing overall program support and resources (n=59) (Table 1). Comments included:

1. "If each of the organizations work with the program for growth and development, they would only be a positive force."
2. "Working together they can exert much influence and provide even more support."
3. "One advantage would be the support and help each organization could give to the local chapter."
4. "You would have more support from three different organizations."

Closely related to increasing overall program support and resources was diversifying program support and resources, mentioned by 54 respondents. Representative comments were:

1. "It ensures a complete circle of involvement/responsibility that is shared by teachers, students, and adults/parents alike."
2. "Young Farmers and Alumni may overlap, but young farmers need a group to belong to after graduation from high school. Advisory board is a strong link to administration. Alumni I see as a catch-all group for FFA support."
3. "Each working from a different direction toward a common goal."

4. "You would have a better cross-section of resources. What might be difficult for one group to handle, the other two groups might be able to pick up."

Another common advantage of the three-organization model was achieving more community involvement in the program (n=35). Increasing public relations and promotion for the agricultural education program was mentioned by 29 respondents. One replied, "To promote agricultural education to the community so the citizens understand that agriculture is not just farming and ranching." Finally, 26 respondents mentioned how the model would increase support for FFA and other youth activities including fundraising (n=8).

Table 1
Advantages of a Three-Adult Organization Model (n=195)

Advantage	f	%
Increases overall program support and resources	59	30.3
Diversifies program support and resources	54	27.7
Increases community involvement in the program	35	17.9
Increases promotion/public relations for the program	29	14.9
Increases support for FFA and other youth activities	26	13.3
Increases or strengthens ties with the community or industry	19	9.7
Increases guidance for the program	18	9.2
Advantages just for the adults	10	5.1
Other advantages (16 combined categories with n<10)	50	
No advantages	9	4.6
Total comments	309	

Surprisingly, many teachers did not think the three-organization model would help make their jobs more efficient. Of the 189 teachers who responded with disadvantages of the three-organization model, most (n=103) responded that three organizations added to their responsibilities or took more time (Table 2). Representative comments were:

1. "The ag teacher does not have enough time to direct all these organizations and their activities."
2. "Too little time/energy to do justice to all three. I use my Alumni officers as my advisory committee and double up meetings!"
3. "Too many meetings for the ag instructor!"
4. "An inordinate amount of time and energy is spent by a single teacher, often at the expense of his family."
5. "I do not have time to keep up with the business of all three organizations. I am in a one-teacher department with 141 students."
6. "It's like having a second job with no salary, benefits, overtime, etc."

Teachers often (n=35) indicated there weren't enough adults in the community to support three separate organizations. For example:

1. "Around here all three are made up of primarily the same people."
2. "In small communities numbers of individuals could pose a problem."
3. "The same people may be doing all the work in all three organizations. The community may not be large enough to have all three groups."

A sizable group of teachers (n=32) mentioned how having more adult organizations would lead to more conflict in the program. One teacher said, "The more input you have sometimes leads to a decrease in resolution." Duplication of effort was listed by 22 teachers. One said, "Without cooperation all three groups might be working on identical

projects. Each group would need specific areas for focusing their attention." Twenty-seven teachers listed more people to tell them what to do or to take over their programs as a disadvantage. Comments included:

1. "One or more organizations may try to tell you how to do your job rather than make helpful suggestions."
2. "If people are in these organizations to serve their own personal agenda regarding the local program it could be more headache than help."
3. "Can get to where you have more affiliates wanting to run things than you have students."
4. "Parents get too involved and try to take over."
5. "Too many of the members tend to think that they are more qualified to advise the students than the teacher is."

Table 2
Disadvantages of a Three-Adult Organization Model (n=188)

Disadvantage	f	%
Increases teacher responsibilities and/or time to do the job	103	54.8
There aren't enough adults to support three different organizations	35	18.6
Increases conflicts within the program	32	17.0
There are more people to tell the teacher what to do and take over	27	14.4
The organizations duplicate efforts	22	11.7
Other disadvantages (6 combined categories with n<10)	11	
No disadvantages	8	4.3
Total responses	238	

Objective 3

The five most frequently mentioned supportive activities performed by advisory committees all fell into a program planning and development category (Table 3): reviewing curriculum (n=103), assisting with facility and equipment matters (n=49), evaluating programs (n=39), identifying program needs and direction (n=33), and generally supporting the program (n=29). Other activities receiving more than 20 responses all fell into a program public relations and promotion category: general program public relations and promotion (n=26), speaking to the school administration on behalf of the program (n=24), linking the program to the community (n=23), and assisting with student job placement and training (n=23). Sixty-seven responses in 15 different areas related specific forms of support for FFA and youth activities, while 45 responses in nine different areas related other specific forms of program planning and development activities undertaken by advisory committees.

The most frequently mentioned supportive activities performed by FFA Alumni affiliates among the single-category and combined-category responses (Table 4) were related to supporting FFA youth members and their activities with assistance, supervision, financing, and materials. Promoting and providing public relations also appears in both single-category (n=11) and combined-category responses (n=12). Twenty respondents cited the FFA Alumni affiliate as a source of educational services (e.g., guest speakers).

Table 3
Most Supportive Activities Performed By Advisory Committees (n=187)

Activity	f	%
Single-Category Responses		
Reviewing curriculum	104	55.6
Assisting with facility and equipment matters	49	26.2
Evaluating the program	39	20.9
Identifying program needs and direction	33	17.6
General program support	29	15.5
General public relations and promotion	26	13.9
Speaking to the school administration on behalf of the program	24	12.8
Strengthening ties with the community	23	12.3
Assisting with job training and placement	23	13.3
Combined-Category Responses (categories made up of responses with n<20)		
Specific forms of assistance or superv. for youth activities (15 combined categories)	67	
Specific forms of program planning and development (nine combined categories)	45	
Other responses (two combined categories)	3	
Total responses	465	

Table 4
Most Supportive Activities Performed By FFA Alumni Affiliates (n=84)

Activity	f	%
Single-Category Responses		
Assisting and supervising FFA activities (general)	43	51.2
Assisting with fundraising efforts and providing financial support (general)	23	27.4
Providing scholarships	18	21.4
Assisting with fairs, SOE/SAE, and other student projects	17	20.2
Assisting with contests and judging teams	17	20.2
Promoting and providing public relations (general)	11	13.1
Assisting with the FFA banquet	[illegible]	11.9
Combined-Category Responses (categories made up of responses with n<10)		
Specific forms of financial and material support (eight combined categories)	27	
Specific forms of assistance or superv. for youth activities (eight combined cat.)	20	
Specific forms of educational services provided (14 combined categories)	20	
Specific forms of promotion and public relations (six combined categories)	12	
Other responses (eight combined categories)	10	
Total responses	228	

Similar to FFA Alumni affiliates, the most frequently mentioned supportive activities performed by NYFEA chapters among the single-category and combined-category responses (Table 5) were often related to supporting FFA youth members and their activities with assistance, supervision, financing, and materials. Some respondents mentioned the NYFEA chapter as a source of program/classroom resources (n=6) and

educational services (n=17). Promoting and providing public relations was indicated by 13 respondents. Only five teachers indicated educating adults as a top supportive activity.

As for FFA Alumni affiliates and NYFEA chapters, the most frequently mentioned supportive activities performed by booster clubs and other adult organizations affiliated with the agricultural education program were related to supporting FFA youth members and their activities with financing, assistance, supervision, and promotion (Table 6). Providing support for student SOE/SAE and providing scholarships were frequently mentioned supportive activities for FFA Alumni affiliates, NYFEA chapters, and other adult organizations.

Table 5
Most Supportive Activities Performed By NYFEA Chapters (n=42)

Activity	f	%
Single-Category Responses		
Assisting and funding livestock shows	8	19.0
Providing job opportunities and placement services for students	7	16.7
Providing program resources and classroom materials	6	14.3
Assisting with the FFA banquet	5	11.9
Educating adults	5	11.9
Providing scholarships	5	11.9
Providing support for student SOE/SAE	5	11.9
Combined-Category Responses (categories made up of responses with n<5)		
Specific forms of educational services provided (13 combined categories)	17	
Specific forms of promotion and public relations (seven combined categories)	13	
Specific forms of financial and material support (seven combined categories)	11	
Specific forms of assistance or superv. for youth activities (six combined categories)	10	
Other responses (ten combined categories)	10	
Total responses	102	

Table 6
Most Supportive Activities Performed By Other Adult Organizations (n=64)

Activity	f	%
Single-Category Responses		
Assisting with fundraising efforts and providing financial support (general)	22	34.4
Providing support for student SOE/SAE	13	20.3
Promoting and assisting with FFA activities (general)	12	18.8
Providing scholarships	8	12.5
Combined-Category Responses (categories made up of responses with n<6)		
Specific forms of assistance or superv. for youth activities (10 combined categories)	16	
Other responses (nine combined categories)	16	
Total responses	102	

Conclusions, Implications, and Recommendations

1. According to the agricultural education teachers, the principal advantages of having an advisory committee, FFA Alumni affiliate, and NYFEA chapter affiliated with their program were increased levels and diversification of program support and resources, community involvement, promotion and public relations, support for FFA and other youth activities, program guidance, and strengthened ties with the community and industry. Only a few teachers cited advantages for the adults themselves. Principal disadvantages were increased teacher responsibilities and time added to their job, not enough adults to support three organizations, increased conflict within the program, and too many adults telling the teacher what to do or trying to run the program. Teachers perceived the three-organization model more as a source of headaches than a source of relief. The fact that agricultural education teachers can have positive attitudes toward the three-organizational model (Dormody, Seevers, & Clason, 1995) and yet demonstrate 91% rejection of the model indicates the teachers weigh the disadvantages more heavily than the advantages.

These results support the findings and recommendations of Dormody, Seevers, and Clason (1995). Agricultural education should not promote the three-adult organization model. To encourage adoption of adult organizations by secondary agricultural education programs, state supervisors, teacher educators, and secondary agricultural education teachers should collaborate to develop achievable routes for meeting essential goals through one or two adult organizations. An advisory committee should be part of the adult organization structure. However, the advisory committee could be a subcommittee of a FFA Alumni affiliate, NYFEA chapter, or booster club, limiting the program to one adult organization.

2. The three most supportive activities of advisory committees match the first three essential goals for the adult organization(s) affiliated with the secondary agricultural education program from Dormody, Seevers, and Clason (1995):

- To advise teachers in the agricultural education program on course content.
- To assess equipment and facility needs of the agricultural education program.
- To evaluate the agricultural education program.

The most supportive activities of FFA Alumni affiliates, NYFEA chapters, and other adult organizations overlapped greatly, generally meeting three other essential goals from the framework:

- To assist with public relations and promotional efforts for the agricultural education program.
- To identify community resources for the agricultural education program (this includes educational services)
- To support FFA youth activities.

Again, it appears that a maximum of an advisory committee and one other adult organization are needed to fully address these six goals. The teachers did not consider the goal, "To assist the agricultural education program in involving former students who remain in the community after graduation in worthy activities, including continuing education in agriculture" to be a highly supportive activity of the adult organizations. Their answers tended to focus on what the adult organizations could do for the secondary program and not on what the organizations could do for adults. Adult organizations should exist to meet the needs of the adult members as well as those of secondary agricultural education programs. Therefore, the researchers recommend that the seventh goal remain in the framework. However, as recommended in Dormody, Seevers, and Clason (1995), agricultural education teachers should develop linkages with existing continuing education programs in the community rather than duplicating effort (usually with little time, funding, or other resources) to provide quality adult agricultural education for program graduates.

3. Other goals for the adult organizations affiliated with secondary agricultural education programs should be based on local needs.

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TEACHER PERCEPTIONS OF THE UTILITY OF ADULT ORGANIZATIONS IN AGRICULTURAL EDUCATION, NATIONALLY - *A Critique*

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The authors allude to a perspective in the profession promoting an ideal of secondary agriculture programs being affiliated with an advisory committee, FFA Alumni affiliate and a NYFEA chapter. They also report that teachers involved in this research view the three organization model more as a source of headaches than a source of relief, based on the fact that agricultural education teachers can have positive attitudes toward the three organizational model and yet demonstrate a 91 percent rejection of the model, indicating the teachers weigh the disadvantage more heavily than the advantage. Perhaps the perspective, cited in the introduction of the paper, might be more aptly attributed to a theoretical model espoused by teacher education and state supervision.

Yes, many secondary agricultural education programs have reduced or eliminated teacher effort in adult education in agriculture. There also persist in the profession a perspective that secondary agriculture teachers of today do not teach as much as teachers did in years gone by. However, there could be another explanation, secondary agriculture instructors have, in many cases, been given additional secondary school teaching responsibilities either in their program or in another discipline. Many teachers have had to take on a considerable increase in student numbers in order to deal with a critical mass for their individual classes and for their program as a whole. Additionally, secondary agriculture students come from a much more diverse background which requires additional or more diverse teaching to different levels, etc. in order to accomplish the same objectives as in the past when students in secondary agriculture were much more homogenous. Yes, adult education in agriculture as a part of agricultural education has lost significant emphasis and effort, however, the reasons may vary from some of the more traditional perspectives.

The authors identified a number of advantages cited by the teachers in their study to having three adult organizations affiliated with a secondary agricultural education program. The authors also identified disadvantages as cited by a significant number of their respondents. The difference in perspective may not be necessarily related to the actual adult organizations affiliated with the secondary agricultural education program, but may be much more closely related to how a particular teacher utilizes and directs the activities of the adult organizations. Even a small five member advisory committee has the potential of being a runaway truck if that advisory committee is not structured and organized as a true advisory committee by both an individual instructor and that instructor's administration.

The two research reports in this session dealing with adult organizations affiliated and associated with secondary agriculture programs have been very intriguing and informing. The authors are to be commended for a significant in-depth look at how these adult organizations affiliate and function within the local agricultural education program.

AN ANALYSIS OF THE INSERVICE NEEDS OF BEGINNING TEACHERS OF AGRICULTURE

Bryan L. Garton Namyong Chung*

Introduction/Theoretical Framework

Agriculture teachers have had and will continue to have a need for inservice education. Historically, inservice programs have been conducted to assist agriculture teachers, especially beginning teachers, in learning the knowledge and skills necessary to perform their teaching roles (Barrick, Ladewig, & Hedges, 1983; Birkenholz & Harbstreit, 1987). Many of these inservice programs have been developed based on previous research (Kahler, 1974; Hillison, 1977; Shippy, 1981; Hachmeister, 1981; Claycomb & Petty, 1983; Veeman, 1984; Birkenholz & Harbstreit, 1987; Valli, 1992) that identified the needs of beginning teachers. But what has been concluded by the previous research?

In a study of teachers across subject matter disciplines, Veeman (1984) identified eight problems frequently faced by beginning teachers. The problems faced by beginning teachers included: classroom discipline, motivating students, dealing with individual differences, assessing students' work, relationships with parents, organization of class work, insufficient and/or inadequate teaching materials and supplies, and dealing with problems of individual students (Veeman, 1984).

Researchers (Kahler, 1974; Shippy, 1981; Hachmeister, 1981; Claycomb & Petty, 1983; Birkenholz & Harbstreit, 1987) have also identified the inservice needs of beginning agriculture teachers. Kahler (1974) concluded that the needs of the beginning teacher were somewhat different from those of the experienced teacher. However, Kahler (1974) also concluded that all teachers placed a high priority on and expressed much difficulty with the program area entitled "classroom teaching."

Hillison (1977) found that beginning teachers placed a high need for inservice on such responsibilities as completing state department reports, planning lessons, and ordering materials for the department. Shippy (1981) concluded that beginning teachers perceived their highest need in the areas of program planning, development, and evaluation; planning, execution, and evaluation of instruction; managing student behavior; and developing school-community relationships. Additionally, Birkenholz and Harbstreit (1987) found that the greatest need for inservice appeared in the areas of using computers in the classroom, developing skills in agribusiness management and electricity, training agriculture/FFA contest teams, and assisting students with SAEP records.

Although many studies have provided information with regard to the inservice needs of beginning agriculture teachers, Claycomb and Petty (1983) concluded that the

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inservice needs of beginning teachers change over time. Furthermore, Birkenholz and Harbstreit (1987) stated that the inservice needs of beginning agriculture teachers should be assessed and prioritized on a continual basis. Therefore, research is needed to assess the inservice needs of today's beginning agriculture teachers. The results will be valuable in assessing and developing beginning teacher programs.

Purpose and Research Questions

The purpose of the study was to identify and prioritize the inservice needs of beginning agriculture teachers in the state of Missouri. The following research questions were developed to guide the study:

1. What were the personal characteristics of the beginning agriculture teachers?
2. What were the perceived inservice needs of the beginning agriculture teachers?
3. What were the beginning agriculture teachers' preferred methods of receiving inservice education?

Methods and/or Procedures

The target population for the study consisted of beginning (first- and second-year) agriculture teachers in Missouri during the 1994-95 academic year (N=37). A census population was used; therefore, sampling procedures were not utilized and generalizability of the results was limited to the population in the study.

An instrument, using the Borich Needs Assessment Model (Borich, 1980), was developed to assess the beginning teachers' perceived level of importance and perceived level of competence in 50 professional competencies that were identified by previous research (Kahler, 1974; Shippy, 1981; Hachmeister, 1981; Claycomb & Petty, 1983; Birkenholz & Harbstreit, 1987). Borich (1980) maintained that a major strength of the model was that it attempted to determine the "congruence between what should be and what is, i.e. between what the teacher should be able to do and what the teacher can do" (p.42). Barrick, Ladewig, and Hedges (1983) supported using the Borich model by stating that the inservice needs of teachers should be based on more than a survey of desired felt needs and that the Borich model provided defensible data in identifying important topics in which teachers need further knowledge and skills.

The instrument was assessed for content and face validity by graduate associates and faculty in the Agricultural Education program. Reliability of the instrument was .95 (Cronbach's alpha coefficient).

The beginning agriculture teachers were asked to rate, using a five-point Likert scale, 50 professional competencies on the importance to the success of a beginning agriculture teacher. A response of one indicated the competency was not important and a five indicated the competency was very important to the success of a beginning agriculture teacher. Respondents were also asked to rate their perceived level of competence regarding the 50 professional competencies using a five-point Likert scale. A response of one indicated they were not competent and a five indicated they were very competent in performing the competency.

A *discrepancy score* for each teacher on each professional competency was calculated by taking the importance rating minus the ability (competence) rating. A *weighted discrepancy score* was then calculated for each teacher on each of the professional competencies by multiplying the discrepancy score by the mean importance rating.

A *mean weighted discrepancy score* for each professional competency was then calculated by taking the sum of the weighted discrepancy scores and dividing by the number of observations (37). Finally, the 50 professional competencies were ranked using the mean weighted discrepancy scores.

Results and/or Findings

The average age of the beginning agriculture teachers was 27, with a range from 21 to 49. Nineteen were first-year teachers, while 17 were in their second-year of teaching. Fifty four percent of the beginning agriculture teachers were married and 46% were single. It was also revealed that 68% had a bachelors degree, 22% had a bachelors degree plus 15 or more hours, five percent had earned a masters degree, and five percent had a achieved a masters degree plus 15 or more hours.

Twelve of the 50 professional competencies received a mean weighted discrepancy score greater than 4.0, indicating a greater need for inservice (Table 1). The 12 competencies with weighted discrepancy scores greater than 4.0 included: completing reports for local/state administrators (7.4), motivating students to learn (6.0), preparing FFA degree applications (5.7), developing an effective public relations program (5.5), preparing proficiency award applications (5.4), teaching agriscience - integrating science and agriculture (5.1), utilizing a local advisory committee (5.1), developing SAE opportunities for students (4.9), using computers in classroom teaching (4.5), supervising students' SAE programs (4.3), teaching using experiments (4.1), and conducting local FFA chapter activities (4.0).

Ten of the 50 professional competencies received a mean weighted discrepancy score less than 2.0, indicating less of a need for inservice. The 10 lowest rated professional competencies were: teaching knowledge and skills in agricultural construction (1.8), teaching about and agriculture's relationship with the environment (1.8), teaching knowledge and skills in plant science (1.7), conducting parent/teacher conferences (1.7), using multimedia equipment in teaching (1.7), implementing VIMS in the local program (1.4), planning and conducting student field trips (1.1), developing knowledge and skills in animal science (.8), teaching knowledge and skills in soils and soil management (.8), and teaching equine science (.4).

A majority of the beginning agriculture teachers preferred to receive their inservice education through workshops ranging from two to three hours (76%), at the summer vocational teacher conference (76%), and by participating in district inservice courses (57%) (Table 2). A majority (62%) of the beginning teachers also preferred having the opportunity to receive graduate credit for inservice courses. However, few of the beginning teachers indicated they would choose to receive inservice education through videotape (30%) or interactive television (24%).

Table 1. Ranking of the Inservice Needs of Beginning Agriculture Teachers (N=37)

Ranking	Inservice needs	Imp. level[a]	Comp. level[b]	MWDS[c]
1	Completing reports for local/state administrators	4.49	2.84	7.40
2	Motivating students to learn	4.84	3.57	6.02
3	Preparing FFA degree applications	4.39	3.08	5.73
4	Developing an effective public relations program	4.73	3.57	5.50
5	Preparing proficiency award applications	4.33	3.08	5.42
6	Teaching agriscience - integrating science and agriculture	4.30	3.11	5.11
7	Utilizing a local advisory committee	4.59	3.49	5.09
8	Developing SAE opportunities for students	4.49	3.41	4.85
9	Using computers in classroom teaching	4.08	2.97	4.52
10	Supervising students' SAE programs	4.42	3.44	4.29
11	Teaching using experiments	4.22	3.21	4.10
12	Conducting local FFA chapter activities	4.58	3.69	4.03
13	Managing student behavior problems	4.51	3.65	3.90
14	Conducting needs assessments and surveys to determine the courses that should be taught	4.16	3.24	3.83
15	Teaching students problem-solving and decision making skills	4.54	3.68	3.78
16	Developing Tech Prep programs	3.65	2.65	3.65
17	Teaching knowledge and skills in electricity	3.84	2.97	3.55
18	Evaluating the local agriculture program	4.38	3.57	3.55
19	Organizing and supervising teaching laboratories	4.19	3.35	3.51
20	Determining the content that should be taught in specific courses	4.32	3.65	3.39
21	Teaching recordkeeping skills	4.51	3.78	3.29
22	Preparing agriculture/FFA contest teams	4.08	3.31	3.29
23	Coordinating activities with local agricultural organizations and agencies	4.19	3.43	3.17
24	Teaching learning disabled students	4.03	3.24	3.16
25	Utilizing a local FFA Alumni affiliate	3.78	2.97	3.04
26	Organizing fund raising activities for the local FFA chapter	4.42	3.75	2.95
27	Assessing and evaluating student performance	4.38	3.73	2.84
28	Organizing a local FBMA program	3.17	2.31	2.73
29	Conducting an adult program	3.61	2.86	2.71
30	Locating and selecting student references and materials	4.28	3.67	2.61
31	Teaching knowledge and skills in marketing agricultural products	4.16	3.54	2.59

Table 1. (continued)

Ranking	Inservice needs	Imp. level[a]	Comp. level[b]	MWDS[c]
32	Repairing and reconditioning agricultural mechanics tools and equipment	3.95	3.32	2.45
33	Teaching knowledge and skills in forestry	3.42	2.72	2.37
34	Teaching about public issues regarding agriculture	4.14	3.57	2.35
35	Developing performance based assessment instruments	3.57	2.92	2.31
36	Developing relations with fellow teachers and administrators	4.59	4.14	2.24
37	Planning banquets	4.14	3.61	2.18
38	Teaching agribusiness knowledge and skills	4.14	3.62	2.12
39	Teaching small gas engines	3.24	2.59	2.10
40	Teaching knowledge and skills in horticulture	3.46	2.86	2.06
41	Teaching knowledge and skills in agricultural construction	4.16	3.68	1.80
42	Teaching about and agriculture's relationship with the environment	4.11	3.68	1.78
43	Teaching knowledge and skills in plant science	4.08	3.68	1.65
44	Conducting parent/teacher conferences	4.25	3.86	1.65
45	Using multimedia equipment in teaching	3.73	3.30	1.61
46	Implementing VIMS in the local program	3.19	2.76	1.38
47	Planning and conducting student field trips	3.76	3.47	1.12
48	Developing knowledge and skills in animal science	4.25	4.06	.83
49	Teaching knowledge and skills in soils and soil management	3.70	3.49	.80
50	Teaching equine science	2.75	2.61	.38

[a] Importance Level: 5 = Very Important, 4 = Important, 3 = Somewhat Important, 2 = Of Little Importance, 1 = Not Important

[b] Competence Level: 5 = Very Competent, 4 = Competent, 3 = Somewhat Competent, 2 = Little Competence, 1 = Not Competent

[c] MWDS· Mean Weighted Discrepancy Score

Conclusions/Implications/Recommendations

Only 10% of the beginning teachers indicated that they had earned a masters degree. The requirements for teacher certification, in the state of Missouri, stipulate that teachers earn a masters degree by their tenth year of teaching. Therefore, it can be

concluded that a need exists for graduate credit courses that are accessible to the beginning teachers.

Table 2. Beginning Teachers' Preference for Inservice Delivery Methods (N=37)

Forms of inservice delivery	n	%
2 - 3 hour seminar/workshop	28	75.7
Inservice sessions at summer conference	28	75.7
Course for credit	23	62.2
District inservice courses (4 meetings at 4 hours each)	21	56.8
One week short course (during summer)	14	37.8
Weekday meeting (during summer)	12	32.4
Videotapes	11	29.7
Interactive T.V.	9	24.3

Twelve of the 50 professional competencies were identified by the beginning teachers as having a greater need for inservice education. Of the 12 professional competencies, five were classified in the category of instruction, five in the category of program planning, development, and evaluation, and two in the category of program administration as defined by Shippy (1981).

The professional competency with the greatest need for inservice education was in completing reports for local and state administrators which supported the conclusions of previous research (Hillison, 1977; Claycomb & Petty, 1983). Motivating students to learn was identified as the second most needed area of inservice, which supported Veeman's (1984) conclusion of being a frequent problem faced by beginning teachers.

Many teachers graduate from teacher preparation programs claiming to lack the necessary technical expertise to be successful teachers (Claycomb & Petty, 1983). However, the technical expertise competencies were ranked lower in priority for inservice when compared to the professional competencies in the areas of instruction, program planning, development, and evaluation, and program administration. Therefore, it can be concluded that the beginning teachers perceived that technical competence was not as much a factor in the success of a beginning teacher as were the other professional competencies. This conclusion is supported by Claycomb and Petty's (1983) finding that the need for assistance in human relations and program administration increased and outweighed technical expertise during the first year of teaching.

It is recommended that the findings of this study be taken into account as teacher educators plan and develop inservice courses for beginning teachers. Inservice should focus in the areas of enhancing instruction, program planning and evaluation, and program administration. The specific inservice needs given the highest ranking should be given priority when planning and developing inservice programs for beginning teachers.

The beginning teachers preferred to receive inservice through the traditional inservice delivery methods of two-three hour workshops, sessions at the summer

vocational teacher conference, and district inservice courses. However, less than one third of the beginning teachers expressed a desire to receive inservice through videotapes or through the use of interactive television. Is it possible that the low acceptance of the use of videotapes and interactive television was due to teachers being unfamiliar with the technology and its capabilities? The issue of using these educational technologies should be further investigated. As the number of teacher educators available to conduct inservice education become fewer, alternative ways of providing inservice must be explored.

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AN ANALYSIS OF THE INSERVICE NEEDS
OF BEGINNING TEACHERS OF AGRICULTURE

Discussant: Jim Flowers, North Carolina State University

The inservice needs of beginning agriculture teachers should be a concern for the profession, and the authors should be commended for conducting a study aimed at addressing a relevant problem. The introduction for this paper demonstrated the variety and changing needs of beginning agriculture teachers. By conducting this study, the authors have made an effort to identify the most urgent needs of this group of teachers, rather than offering the "traditional" inservice programs for beginning agriculture teachers in their state.

The methods used to conduct this study appeared to be appropriate. It was not clear in the paper how data were collected, but apparently, all beginning agriculture teachers in the population provided data for analysis. The use of weighted discrepancy scores was an appropriate methods to determine the ranking of the competencies most needed by the teachers.

Perhaps this is a minor point, but I believe that the research questions developed to guide the study should be directly related to the overall purpose of the study. It is not clear to the reader how personal characteristics such as age, whether teachers were first-year or second-year teachers, and marital status help us identify and prioritize inservice needs of beginning agriculture teachers in Missouri. The type of degree the teachers held may have some impact on delivery of inservice education. There may be very good reasons to ask these questions and report these data, but those reasons were not apparent in the paper.

Borich's Needs Assessment Model was used because it "determined congruence between what should be and what is." That needs gap should be the basis of determining priorities for inservice education activities. The question I would pose is, "Who should determine what should be?" In this study, what should be was determined by teachers with less than two years of teaching experience. Should the importance of the 50 competencies be determined solely by the beginning teachers, or should we also involve more experienced teachers and state supervisory staff in determining the relative importance of the competencies--especially those that are not related to technical agriculture content that may be determined locally. It comes down to the basic question as to whether inservice programs should be based upon felt or unfelt needs of the clients.

The authors concluded that technical agriculture competence was not as important to the success of a beginning agriculture teacher as were the professional education competencies. However, teachers reported less than desirable levels of competence in the areas of forestry, horticulture, small engines, and equine science. Perhaps level of importance of technical agriculture competencies is a function of what is taught in the local programs.

This study provides a basis for determining the priorities of these beginning teachers for inservice education. When we examine the importance ratings of the 50 competencies, it also presents us with a good picture of what these beginning teachers value. In both cases, this is information needed by those who plan inservice activities for this group.

CONTENT ANALYSIS OF PAPERS PRESENTED AT NATIONAL AGRICULTURAL EDUCATION RESEARCH MEETINGS (NAERM)--1985-1994

Rama B. Radhakrishna and Lenno Mbaga*

INTRODUCTION

The First National Agricultural Education Research Meeting (NAERM) was held in 1974 in New Orleans, Louisiana. The purpose of the research meeting has been to provide an opportunity for the presentation of papers reporting agricultural education research and critiques of the paper (Moss, 1986, p. 1). Twenty-one years have passed since the first NAERM. During a span of 21 years, the conduct of NAERM has undergone a number of changes in terms of number of papers submitted, attendance at meetings, format, content and organization of the meeting itself. In recent years, a pre-session with an emphasis in research methodology has been included as a part of the NAERM.

Several scholars in the profession have examined various aspects of papers presented at NAERM. Iverson (1982) in his report on the analysis of NAERM found a steady growth of the meeting in terms of paper submissions, attendance, paper presenters, registrants and organization of the program. Iversons's analysis, however, focused more on 1981 and 1982 meetings and comparison of those two. Moss (1986) analyzed the contents of papers presented at NAERM for the years 1974-85. Moss's categorization of content areas included : 1) adult education, 2) college faculty, 3) curriculum, 4) employment opportunities, 5) FFA, 6) research methods, 7) special needs, 8) SOE, 9) teacher attitudes and problems, 10) teacher training, 11) teacher effectiveness, and 12) others. Moss found that four content areas had received considerable attention during the years 1974-1985. These were: curriculum, teacher attitudes and teacher training, employment opportunities, and SOE. When examined over a 12 year trend, the subject matter of curriculum has been investigated consistently by agricultural educators. Also, SOE emerged as an important topic in the early eighties. In addition, special needs also emerged as an important topic. However, a majority of the topics were in the "other" category. Moss concluded that priorities for research in agricultural education are not static (p. 6).

Crunkilton (1988) examined the summaries of research and development activities in agricultural education and research in extension publications, for six years (1981-82 to 1986-87). He found 67% of the studies were in senior high level, 41% in the area of curriculum/development and 54% statewide in scope. He concluded that " research in agricultural education is focused, but that focus has come about more by accident rather than through planned activities" (p. 327).

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Mannebach, McKenna and Pfau (1984) analyzed the summaries of research and development activities in agricultural education for the years 1974-1982. They found that close to one-half of the research reported were masters studies, while doctoral and staff studies accounted for approximately 30% and 22% of the research reported respectively. In addition, they found that 90% of the studies were descriptive, followed by experimental (9%), and historical (1%). Approximately 54% of the studies reported that questionnaire was the major source used to collect data, followed by appraisal instruments (19%), interviews (14%), and observation (4%). Only a third of the studies reported using statistical procedures or techniques. However, a higher percentage of doctoral studies reported the use of statistical procedures than did masters or staff studies. Finally, Mannebach, et al., concluded that there is a dearth of research on agricultural education research. They recommended that agricultural educators should: 1) conduct more historical and experimental studies; 2) encourage foreign studies as they become more involved in global problems and concerns; 3) include in the abstracts the funding sources; and 4) develop a standardized checklist for reference when writing abstracts.

Moore (1987) examined over 900 doctoral dissertations to determine the focus of doctoral research in agricultural education conducted during 1900 -1986. He found that a variety of topics in agricultural education had been researched. These included: professional and general, teacher education, extension, international, FFA, SOEP, curriculum/planning, teaching, and agricultural mechanics. Moore concluded that doctoral research in agricultural education lacked focus. However, he said doctoral research in agricultural education has focused more on addressing the problems of the profession.

Characteristics of adult education research reported at the Midwest research-to-practice conference in adult, continuing and community education for the years 1982-93 were examined by Freer, Clouse, Rocco and West (1994). They examined a total of 340 papers. They found that research papers presented were highly descriptive. Topics such as adult learning (32%), program planning (21%), and instructional materials (16%), were the subject matter topics frequently presented. They concluded that research presented at Midwest research-to-practice conference remained noncumulative and lacked theoretical base. They suggested that if theory is viewed as the foundation for practice, then the challenge is to think about practice from a variety of theoretical positions (p. 86).

Content analysis of conference proceedings provide perhaps the most current source of the state-of the art of research and development activities of a profession. However, content analysis of papers presented at NAERM by previous researchers was limited to analysis of demographic characteristics of presenters (Iverson, 1982) and research topics (Moss, 1986). A decade has passed since Moss's analysis of papers presented at NAERM. Since then no attempt has been made to examine changes and trends in research activities in agricultural education. No studies were reported relative to the analysis of research design and statistical procedures used in papers presented at NAERM. According to a study conducted by Bowen, Radhakrishna and Jackson (1991), responsibilities of agricultural education faculty are changing. To what extent these changes in responsibilities of faculty reflect the papers presented at NAERM. As indicated by Mannebach et al., (1984), if research and development are to lead the way, we must continually review and evaluate our efforts (p.15). Furthermore, like past issues of journals, papers published in conference proceedings or research meetings offer the

opportunity of content analysis of major themes or trends over the years. Thus, this study was conducted to analyze the papers presented at NAERM for the years 1985-1994.

PURPOSE AND OBJECTIVES

The overall purpose of this study was to analyze ten volumes (1985-1994) of NAERM proceedings. Specifically, this study examined the:

1. characteristics of paper presenters in terms of gender, rank, institutional affiliation, and authorship position;
2. subject matter topics presented at NAERM;
3. research methodology used in papers presented at NAERM;
4. statistical procedures used in papers presented at NAERM; and
5. instrumentation procedures used in papers presented at NAERM.

METHODS AND PROCEDURES

A census of all papers presented at NAERM during the ten years (1985-1994) was considered for this study. A total of 911 paper proposals were submitted in this ten year period. Of this 911 papers, 394 were accepted (43%) for presentation. For the purpose of this study only papers that were presented at these ten meetings were considered. A total of 394 paper presentations were analyzed to accomplish the purpose and objectives of the study. A code book was developed which included the following pieces of information: year of meeting, gender of presenter, title or rank of presenters, their institutional affiliation, subject matter topic, research design employed, statistical procedures used and information relative to procedures followed in developing instruments (validity, reliability, panel of experts, pilot test etc.). Each paper presentation was given a code number to facilitate data entry.

Gender of the author was determined by first name. Title or rank of presenters included: 1) professor, 2) associate professor, 3) assistant professor, 4) instructor/research associate, 5) specialists, 6) teachers, 7) graduate students, and 9) others. For determining institutional affiliation, the <u>Directory of Teacher Educators in Agriculture,</u> 1993-94 (Whaley, 1993) was consulted. Subject matter topics for the papers presented at NAERM were determined according to the classification made by Kahler (1991). Kahler's classification included 18 topics: 1) adult/post secondary, 2) elementary ag programs, 3) evaluation, 4) experiential learning, 5) extension, 6) inservice education, 7) international, 8) learning theory, 9) philosophy, 10) policy, 11) program development, 12) recruitment, 13) research methodology, 14) secondary ag programs, 15) special needs, 16) teaching methods, 17) youth/youth organization, and 18) others.

Categories for research designs were determined based on a review of research methodology text books (Tuckman, 1994; Bordens and Abbott, 1991; and Borg and Gall,

1989). For categorizing statistical procedures, the classification developed by Bowen, Rollins, Baggett and Miller (1990) was used. Their classification included 14 procedures: 1) Means/SD/frequencies, 2) t-tests, 3)ANOVA /ANCOVA, 4) multiple regression, 5) factor/cluster analysis 6) modeling 7) meta analysis, 8) multivariate, 9) LISREL, 10) Non-parametric, 11) qualitative, 12) simulation, 13) psychometric theory, and 14) others.

Information relative to procedures used in developing instruments included validity, reliability, using panel of experts, field testing and pilot testing. All data were recorded in the code book. The data thus recorded was entered into the computer. A simple statistical program (SPSS) was developed to analyze the data. Data were summarized using frequencies, percentages and means.

FINDINGS

Details of number of papers submitted, number accepted, acceptance rate, conference location and conference chairs/co-chairs are shown in Table 1. As shown in Table 1, a total of 911 papers were submitted during this ten years (1985-1994). Of this 911 papers, 394 were accepted (43% acceptance). The number of papers submitted ranged between 74 in 1991 to 119 in 1993. Similarly, the number of papers accepted ranged from 27 (34%) in 1985 to 48 (42%) in 1993 and 1994.

Table 1. Details of Paper Submissions, Paper Acceptance, Acceptance Rate, Conference Location and Conference Chair/Co-chairs for NAERM (1985-1994)

Year	# of Papers Submitted	# of Papers Accepted	Acceptance Rate (%)	Conference Location	Conference Chair/Co-Chair
1985	79	27	34.2	Atlanta	Bob Stewart
1986	-	39	-	Dallas	Alan Kahler
1987	91	36	39.5	Nevada	Al Mannebach
1988	98	36	36.7	St. Louis	Edgar Yoder
1989	130	36	27.7	Orlando	Michael Burmett
1990	111	44	39.6	Cincinnati	Robert Martin
1991	74	36	48.6	Los Angeles	Larry Arrington
1992	96	44	45.8	St. Louis	John Mundt
1993	119	48	40.3	Nashville	Dennis Scanlon
					Thomas Bruening
1994	113	48	42.0	Dallas	David Lawver
					Robert Terry Jr.
Total	**911**	**394**	**43.0**		

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Objective 1--Presenter Characteristics

Of the 394 paper presentations, 335(85%) were made by males, while the remaining 15% by female (Table 2). The majority of paper presenters were assistant professors (192), followed by associate professors (160), professors (151), other (89), graduate students (69), instructors/research associates (53), and teachers and specialists (17) (Table 3). Most paper presenters were from Ohio State, Iowa State, Louisiana State, Penn State, University of Nebraska and Mississippi state (Table 4). A majority of papers had two presenters (63%), followed by single presenter (19%), three presenters (13%) and more than three presenters (5%) (Table 5).

Table 2. Total Number of Presentations by Gender of First Authors and Year

	YEAR											
Gender*	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**	%
Male	24	36	32	33	31	36	31	41	35	36	**335**	**85**
Female	3	3	4	3	5	8	5	3	13	12	**59**	**15**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**

Table 3. Total Number of Presentations by Presenter Type and Year

	YEAR										
Presenter Type*	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**
Professor	11	13	12	17	16	16	20	16	14	16	**151**
Associate Professor	11	16	10	13	16	19	15	12	25	24	**161**
Assistant Professor	11	15	15	28	15	18	14	26	27	27	**196**
Instructor/Res. Assoc.	4	2	2	-	7	8	5	6	11	8	**53**
Specialists	-	2	1	1	3	4	5	-	-	1	**17**
Teachers	1	2	2	-	4	1	2	4	-	-	**16**
Graduate Students	3	7	8	3	4	10	5	12	2	15	**69**
Others	2	4	7	9	9	16	8	7	16	11	**89**
Cannot be determined	8	5	12	8	1	-	1	10	4	2	**51**
Total	**51**	**66**	**69**	**79**	**75**	**92**	**75**	**93**	**99**	**104**	**803**

* includes titles of all presenters

Table 4. Total Number of Presentations by Institution and Year

	YEAR										
Institution*	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**
Ohio State	3	3	10	5	9	5	3	7	2	3	**50**
Iowa State	2	4	2	1	1	3	-	6	6	4	**29**
Louisiana State	3	6	4	4	3	1	-	1	-	2	**24**
Penn State	1	-	-	3	1	4	1	4	3	5	**22**
U. of Nebraska	2	6	1	2	3	-	4	1	1	-	**20**
Mississippi State	1	1	1	1	2	2	1	2	4	4	**19**
NC State	-	-	2	-	1	3	4	1	2	1	**14**
U. of Idaho	-	-	-	1	2	1	2	2	3	1	**12**
U. of Missouri	1	1	1	1	1	-	-	2	1	3	**11**
U. of Arizona	1	1	1	1	1	-	-	-	2	3	**10**
U. of Florida	1	-	-	2	3	-	1	1	-	2	**10**
Other institutions listed in directory	3	7	11	4	3	8	5	-	6	6	**53**
Other institutions not listed in directory	9	10	3	11	6	17	15	17	17	15	**120**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**

* includes institutions represented by first authors

Table 5. Total Number of Presentations by Position of Authorship and Year

	YEAR											
Authorship Position	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**	**%**
Single	5	15	7	4	8	7	8	5	9	8	**76**	**19**
Two authors	19	22	25	24	22	27	19	31	31	29	**249**	**63**
Three authors	3	2	4	5	3	9	6	6	6	9	**53**	**13**
More than Three	-	-	-	3	3	1	3	2	2	2	**16**	**5**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**

Objective 2--Subject Matter

The contents of the research meeting's 394 papers were grouped according to 18 categories identified by Kahler (1991). Secondary ag programs accounted for 82 (21%) of the papers; ag instructors, 64 (16%); adult and post secondary, 53 (13%); others 48 (12%); extension education, 42 (11%); learning theory, 24 (6%); teaching methods, 16 (4%); and inservice education, 15 (4%). The remaining 11 content areas accounted for 50 (13%) of the presentations.

Table 6. Total Number of Presentations by Subject Matter Topics and Year

	YEAR											
Subject Matter	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**	%
Secondary ag programs	2	8	6	11	6	8	7	11	11	12	**82**	**21.0**
Ag instructors	4	10	7	3	8	14	6	8	2	2	**64**	**16.2**
Adult/post secondary	7	7	6	4	5	6	4	5	5	4	**53**	**13.4**
Extension Education	1	4	1	6	3	6	7	4	6	4	**42**	**10.6**
Learning theory	3	-	3	2	3	1	-	4	4	4	**24**	**6.0**
Teaching methods	-	1	2	-	1	1	4	2	4	1	**16**	**4.0**
Inservice Education	3	1	2	1	-	-	-	2	3	3	**15**	**3.8**
Philosophy/Historical	2	1	2	2	1	-	4	-	-	-	**12**	**3.0**
International	1	1	-	-	1	1	1	-	3	2	**10**	**2.5**
Program development/ curriculum	-	1	-	1	3	-	-	1	-	1	**7**	**1.8**
Recruitment	-	2	-	-	1	-	-	-	3	-	**6**	**1.5**
Evaluation	-	1	-	1	-	1	-	-	-	2	**5**	**1.3**
Experiential learning	1	-	-	1	-	-	-	-	1	-	**3**	**0.8**
Elementary ag programs	-	-	-	-	-	-	-	3	-	-	**3**	**0.8**
Youth/youth organizations	-	-	-	-	1	-	-	1	-	-	**2**	**0.5**
Research Methodology	-	-	-	-	-	-	-	-	1	-	**1**	**0.3**
Policy	-	-	-	-	-	-	-	-	-	-	-	-
Special needs	-	-	-	-	1	-	-	-	-	-	**1**	**0.3**
Others	3	2	7	4	2	6	3	3	5	13	**48**	**12.2**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**

Objective 3--Research Designs

The research design of the majority of the papers presented was descriptive, with 265 papers (67%) placed in this category (Table 7). Forty (10%) of the papers presented were correlational, followed by 32 (8%) experimental/quasi experimental; 18 (5%), Delphi; 13 (4%) historical/philosophical, and 13 (3%) qualitative. However, evaluation, as a research design was rarely used.

Table 7. Total Number of Presentations by Research Methodology and Year

	YEAR											
Research Methodology	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**	**%**
Descriptive	20	29	23	24	23	32	21	26	33	34	**265**	**67**
Correlational	4	2	4	3	4	5	4	7	4	3	**40**	**10**
Experimental/Q expt	1	4	5	4	1	3	3	5	5	1	**32**	**8**
Delphi	1	-	1	3	1	2	3	2	1	4	**18**	**5**
Historical/philosophical	1	2	2	-	-	-	4	1	-	3	**13**	**3**
Qualitative	-	-	-	1	6	-	-	-	2	2	**11**	**3**
Others	-	2	1	1	1	2	1	3	3	1	**15**	**4**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**39**	**48**	**48**	**394**	**100**

Objective 4--Statistical Procedures

The statistical procedures used in the 394 papers presented were grouped according to 14 categories identified by Bowen, et al., (1990). A total of 604 statistical procedures were used in preparing these 394 papers (Table 8). Findings indicate that basic statistical procedures such as means, standard deviations, frequencies and percentages were frequently used in reporting research. The next most frequently used statistical procedures were t-test, ANOVA, multiple regression/correlation, and qualitative. Factor analysis was used in fewer number of papers presented. The other statistical procedures were seldom used by agricultural educators.

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Table 8. Total Number of Presentations by Statistical Procedures Used and Year

	YEAR										
Statistical Procedures	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**
Means/SD/Freq/%	26	37	35	35	32	43	32	41	46	41	**368**
T-Tests	10	10	12	7	5	13	7	6	11	8	**89**
Anova/Manova/Ancova	5	13	9	8	8	10	5	4	11	11	**84**
Multiple Regression	2	3	6	5	4	6	4	2	3	1	**36**
Multivariate Analysis	-	-	-	2	1	1	1	1	-	-	**6**
Qualitative	1	1	2	1	1	5	2	2	3	3	**20**
Factor/Cluster Analysis	-	-	-	-	-	-	-	1	-	-	**1**
LISREL	-	-	-	-	-	-	-	-	-	-	-
Nonparametric	-	-	-	-	-	-	-	-	-	-	-
Modeling	-	-	-	-	-	-	-	-	-	-	-
Meta Analysis-	-	-	-	-	-	-	-	-	-	-	-
Simulation	-	-	-	-	-	-	-	-	-	-	-
Psychometric Theory	-	-	-	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-	-
Total	**44**	**64**	**64**	**58**	**51**	**78**	**51**	**56**	**74**	**64**	**604**

Objective 5--Instrumentation Procedures

Instrumentation procedures reported in 394 papers presented at NAERM included panel of experts, validity, pilot test, reliability, and use of instruments developed by other professionals (Table 9). Fifty-eight percent of them indicated that they had used panel of experts to assure validity. Seventy-one percent of the presenters reported establishing validity. Sixty-nine percent reported estimates of reliability. Further examination of procedures section of these 394 papers revealed that 38% had piloted tested their instruments, while 28% cited using instruments developed by other researchers or professionals.

Table 9. Total Number of Presentations by Instrumentation Procedures and Year

	YEAR											
Instrumentation Procedures	19-85	19-86	19-87	19-88	19-89	19-90	19-91	19-92	19-93	19-94	**Total**	**%**
Panel of Experts												
Yes	14	16	21	14	23	28	21	33	29	30	**229**	**58**
No/not reported	13	23	15	22	13	16	15	11	19	18	**165**	**42**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**
Establishing Validity												
Yes	19	24	24	19	25	35	25	36	36	36	**279**	**71**
No/not reported	8	15	12	17	11	9	11	8	12	12	**111**	**29**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**
Pilot Test												
Yes	5	18	14	10	15	22	19	7	19	22	**151**	**38**
No/not reported	22	21	20	25	14	22	13	36	26	21	**243**	**62**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**
Reliability												
Yes	19	24	22	23	24	35	25	31	35	36	**274**	**69**
No/not reported	8	15	14	13	12	9	11	12	13	13	**120**	**31**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**
Use of Established Questionnaire												
Yes	8	8	9	11	7	10	13	18	14	11	**109**	**28**
No/not reported	19	31	27	25	29	34	23	26	34	37	**285**	**62**
Total	**27**	**39**	**36**	**36**	**36**	**44**	**36**	**44**	**48**	**48**	**394**	**100**

CONCLUSIONS AND RECOMMENDATIONS

The number of papers submitted at NAERM has increased over the years from 79 in 1985 to 113 in 1994, with the lowest (74) in 1991 and highest (130) in 1989. Acceptance rate of papers has also increased from 34% in 1985 to 42% in 1994 with an overall acceptance rate of 43%. A prototype NAERM paper would have two presenters, mostly male, and assistant professors employed in land grant universities.

Secondary ag programs as a content area has shown significant growth over the years starting with two presentations in 1985 to 12 presentations in 1994. Findings also suggest modest growth in paper presentations relative to extension education and learning theory. Topics such as research methodology, philosophy, evaluation, recruitment and special needs were seldom presented at NAERM. This finding partly mirrors results of an

earlier study by Moss (1986). In Moss's study, topics such as teacher attitudes, special needs and curriculum development were identified as most prevalent topics. Further, the subject matter topics presented at NAERM may also confirm the changing responsibilities of agricultural education faculty identified by Bowen, et al, (1991), which may have resulted in increased number of paper presentations in the areas of extension education and international.

Research designs used in a majority of papers presented at NAERM was descriptive followed by correaltional and experimental. These results in general corroborate findings from Mannebach et al., (1984) and Bowen et al., (1990). However, the percentage of papers using descriptive designs was much less in this study (68%) compared to 90% in Mannebach et al., (1984) study. Agricultural educators are using other research designs as well. However, usage of other designs is somewhat less. According to Borg and Gall (1983), descriptive designs are primarily concerned with what is. It appears that agricultural educators are good in showing what is, but they should shift their focus from what is to what ought to be, what will be and cause and effect.

Agricultural educators are doing a nice job in reporting procedures (validity, reliability, pilot test etc.) in the development of instruments. However, this review suggests that instrumentation sources were not reported in many cases. Agricultural educators should cite sources of questionnaires used. Citations provides a basis for not only recognizing a colleagues work but also helps in establishing validity. As indicated by Kochen (1987), citing or reporting a colleagues work is a way of acknowledging the intellectual debt. Furthermore, providing information on instrumentation procedures will help reviewers judge and critique the quality of papers constructively.

It has been said that agricultural education is still traditional, in that men present most of the papers. However, review of NAERM papers indicate that this trend is changing. More number of females in the profession are conducting research and presenting papers. Paper presentations by females have increased from 3 in 1985 to 12 in 1994. This suggests that the profession is moving in the right direction in implementing its goal two of the Strategic Plan.

Finally, we must continually examine our research and scholarly activities as these tell us what we are doing and where we should be going as a profession. Therefore, it is recommended that periodic review of proceedings of NAERM and premier journals of the profession should be undertaken. An undertaking like this will help us build a strong foundation to address problems and uniquely position ourselves to face future challenges.

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CONTENT ANALYSIS OF PAPERS PRESENTED AT NATIONAL AGRICULTURAL EDUCATION RESEARCH MEETINGS (NAERM)--1985-1994

Discussant: Jim Flowers, North Carolina State University

It is interesting to be reminded of where we have been and where it appears the profession is headed relative to research in agricultural and extension education. Certainly, the papers presented at the National Agricultural Education Research Meeting offer us an opportunity to analyze our past and present research efforts. Studies of this type may serve to prevent us from unnecessarily repeating studies on certain topics. We may also be able to observe, more readily, areas in which we should place more effort in the future.

The findings of this study will undoubtedly become a part of the National Agricultural Education Research Meeting's history. In fact, the historical record seems to be the major reason for the inclusion of the information in Table 1, since this information does not address any of the research objectives.

Some questions that come to mind as I read this paper were:

1. The universities represented in the paper presentations were analyzed on the basis of the first author only. Does this accurately represent where the research was conducted?

2. Are the numbers of assistant professors, associate professors, and full professors who present papers at NAERM representative of the numbers of faculty at each rank in the profession? Is one group overrepresented?

3. Is the trend toward multiple authors considered a strength or a weakness in our research?

This paper is primarily descriptive research. With the number of papers to be reviewed it is difficult to do much in-depth analysis of the content, but (given the title of the paper) I was hoping to seen more content analysis than was presented. Perhaps the profession should focus on the information in Table 6, the topics we are researching, and determine if we are addressing the most critical issues facing the profession. Hopefully, this study will assist us in examining our priorities and determining future direction for our research efforts.

CONDUCTING AGRICULTURAL EDUCATION RESEARCH USING ELECTRONIC SURVEYS

Jodee L. Kawasaki C. Van Shelhamer Matt R. Raven*

Introduction/Theoretical Framework

The Future Application of Communication Technology report (ES-USDA and ECOP, 1992) states there is a need to increase staff knowledge and skills in communication and information technologies. Shill (1992) noted that:

> "The agriculture information dissemination infrastructure is in a state of significant transition. Traditional institutions, such as the state agricultural extension services, have been forced to adapt to the emergence of electronic dissemination channels while still making active use of print and face-to-face communication mechanisms" (p. 313).

One area that ES can utilize information technologies is in the gathering of data about Extension personnel, clients, and programs. Computer-administered surveys are an example of an information technology that agents, specialists, and other extension educators could use to gather data currently done with mailed questionnaires.

Rosenfeld, Doherty, Vicino, Kantor, and Greaves (1989) have written that:

> "Computers have been used as a means of assessment on psychological instruments for over two decades. During the 1960s, clinicians began using computers to administer and score standardized psychological tests, such as the MMPI. .... The advantages of computerized psychological testing attractive to clinicians (e.g. ease of administration and scoring, increased accuracy and standardization, time savings) are also true of its applications to other areas. Only recently, however, have researchers within social, behavioral, and management sciences utilized computer technology to administer surveys and questionnaires" (p. 147).

Computer-administered survey, as a concept, covers many different types of computerized surveys. Most of the literature covers a survey programmed on one computer terminal that one person uses at a time. Sproull (1986) wrote a comprehensive article on using a computer-administered survey simultaneously sent by email to multiple computer users in a Fortune 500 company.

Rosenfeld, Booth-Kewley, and Edwards, (1993) followed Sproull's suggestions and obtained more relevant findings in support of computer-administered surveys. While

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working with U.S. Navy personnel, Rosenfeld et al. (1993) felt that if an organization was linked to an existing email system such as BITNET or the Internet, then it would be possible to conduct a low-cost electronic survey. Rosenfeld et al. (1993) suggested their "own experience recommends computer surveys as a preferred mode for sample sizes of 500 or less" (p. 495). Additionally, the level of response on surveys applied either by computer or papers were nearly identical, and internal consistency and reliability (coefficient alpha) of psychological and organizational scales were very similar. Kiesler and Sproull (1986) came up with similar results corroborating that paper and electronic surveys show considerable similarity after using an electronic survey on students and employees at Carnegie-Mellon University. Rosenfeld et al. (1989) found that a computerized survey "administered on virtually any type of computer in general use today can produce...responses at least as reliable and valid as would be obtained if paper and pencil were used" (p. 153).

The literature supports the use of computer-administered surveys in a Fortune 500 company (Sproull, 1986) and United States Navy personnel (Rosenfeld et al. 1989, Rosenfeld et al. 1993, Booth-Kewley, Edwards, and Rosenfeld, 1992). However, the use of computer-administered surveys with agriculture studies and audiences has not been studied. The question that arises is would computer-administered surveys used to collect data from Extension agents, specialists, and other ES stakeholders regarding extension related issues be effective and accurate.

Purpose / Objectives

The purpose of this part of a larger study was to determine the feasibility of using a computer-administered survey to gather data from Extension Service (ES) personnel. To fulfill the purpose of this study the following research questions were identified.

1. Were there differences between ES county agents and state specialists in their method of returning the survey, (email or regular mail)?
2. Were there differences between response date by method of returning the survey?
3. Were there differences between selected demographic factors by method of returning the survey?

Methods

The population consisted of specialists and county agents employed by a western state Extension Service. County agents included agriculture agents, home economists, and 4-H agents. Names and addresses were obtained from a directory titled County Extension Agents, printed by the ES Office of the Director in September 1993; the directory has a comprehensive list of all staff and faculty involved with ES. Names from the directory were placed into the appropriate group for the study. All lists were compared and duplicated names removed to avoid selection error.

A descriptive study was conducted following a design described by Borg and Gall (1989). An Internet electronic mail survey, prepared in part using the Total Design

Method (Dilllman, 1978), was used as the data collection instrument. Neither Dillman nor the researcher had any experience with computer-administered surveys, so trial surveys were sent by the researcher to members of the researcher's graduate committee. On the basis of these trial tests, it was concluded that specific directions would be needed depending on the email system available to the respondent.

Another trial test was conducted between the researcher and the researcher's colleagues. The colleagues all use email but there were vast disparity of email skills among the group. The second trial test helped to determine format and layout of the instrument. Dillman highly recommended placing the response categories and numbers in a vertical format with the response space to the left of the category. The researcher found that this format can be used if specific directions are given to NOT use the return or enter key after placing the answer on the line. The directions told the respondent to use the arrow keys to move one line at a time. This strategy allowed the respondent to answer a question and move down to the next question without adding numerous, blank lines to the survey instrument. The researcher, also, discovered that the layout of questions was not as crucial in email surveys as in paper (mailed) surveys (Kawasaki, 1994). Unless the researcher knew that the respondents all had the same computer software and hardware to work with, the researcher could not control page breaks, fonts, and characters per line.

Sproull (1986) suggested that a researcher should send a cover letter in hard copy, because sending it electronically lost the effects that Dillman promoted. These effects include letterhead and a signature from someone with authority in the organization who would influence response rates. This researcher heeded Sproull's advice on sending a hard-copy cover letter. Along with the cover letter, a set of directions was sent that exactly matched the directions sent with the email survey. Sproull recommended this tactic for the infrequent user of email, and this was confirmed during one of the trial tests the researcher carried out. These recommendations were followed in an effort to control non-response error. The email survey followed three days later. Assurance of the needed return rate was provided through two follow-up email messages to non-respondents. The double dip technique (Borg & Gall, 1989) was employed to assure non-respondents were no different from other respondents. Four weeks were given for the survey to be returned. The response rate was 82.8 percent, 96 surveys of the 116 were returned.

Responses to questions were analyzed by a personal computer statistical package. Statistical Package for the Social Sciences (SPSS/PC+) (Norusis, M.J. & SPSS, Inc., 1988). The data were tested by t-test or analysis of variance, at the 0.05 significance level, for each competency by email versus regular (postal) mail return method, date of return, by agents by method of returning the survey, by specialists by method of returning the survey, and by selected demographic factors.

Results

Research Question 1:

The data in Table 1 reveal the method by which agents and specialists returned the survey. The agent stratum had 40 (60.6%) respondents return the survey via email and 26 (39.4%) through regular postal mail. The specialists returned 13 (43.3%) of the surveys via email. Seventeen (56.7%) of the specialists returned the survey by regular mail. Of the 96 returns, 53 (55.2%) were returned via email and 43 (44.8%) came back through the regular mail.

Table 1. Method respondents used to return the survey.

	Agents		Specialists		Total	
Method of return	n=66	%	n=30	%	N=96	%
Email	40	60.6	13	43.3	53	55.2
Regular mail	26	39.4	17	56.7	43	44.8

T-tests, using the significance level of 0.05, showed no statistical difference among the means of the method of returning the survey (email versus regular mail) and method of returning the survey by stratum.

Research Question 2:

Respondents were classified as early, middle, or late respondents as shown in Table 2. Of the early respondents, prior to any follow-up messages, 28 (68.3%) surveys were returned through email and 13 (31.7%) surveys arrived by postal mail.

Table 2. Method of return by response date.

	Early		Middle		Late	
Method of response	N=41	%	N=35	%	N=20	%
Email	28	68.3	18	51.5	7	35
Regular mail	13	31.7	17	48.5	13	65

The middle returns, surveys received between the two follow-ups, had 18 (51.5%) come back through email and 17 (48.5%) return by regular mail. Late returns, after the follow-ups, seven (35%) surveys returned arrived via email and 13 (65%) came by postal mail. These late returns included the double dip respondents. Analysis of variance indicated no statistical difference using the 0.05 level for date of returning the survey.

Research Question 3:

The survey asked respondents to indicate their knowledge and level of importance of 36 competencies and weighted discrepancy scores (WD) were calculated using Borich's (1980) needs assessment model. Based on the method of returning the survey (email or postal mail), subgroups were formed by selected demographic factors . T-tests or ANOV, using the significance level of 0.05, were run for each WD against these

selected demographic factors: gender, years in the profession, years in current position, age, degrees held, or organization memberships. There was no statistical difference among the means of the subgroups.

Conclusions / Recommendations / Implications

Even though ES professionals had prior email training, the data suggests they need more training. This conclusion is based on the number of surveys (45%) returned through postal mail. With the specialists on campus, closer to training and email access less costly, one would have assumed that the specialists would have returned the survey by email more readily than the agents. One would think that a much smaller percentage would have come by postal mail or that there would have been a significant difference between respondents based on the method of returning the survey. The lack of difference among method of returning the survey and date of responding leads the researcher to conclude that a state's ES agents and specialists need training using email as a correspondence tool.

The findings support the conclusions of Sproull (1986), Rosenfeld et al. (1989), Booth-Kewley et al. (1992), and Rosenfeld et al, (1993) that electronic surveys did not adversely effect the return rate or responses. A majority of surveys in this study were returned via email. Email responses were similar to postal responses. This study showed that selected demographic factors of years in the profession, years in current position, age, degrees held, gender, specialist or agent, or organization memberships had no influence on using email to answer the survey. Nothing indicates that respondents would have answered questions differently on a paper survey, thus email surveys can be expected to yield the same results as a paper survey.

Early respondents used email more readily than late respondents. One might assume that the late respondents represent the "Laggers" of adapting to email correspondence. The Extension Administrators could mandate that certain types of correspondence be done only via email among the Extension professionals. This would increase the amount of time "Laggers" use email, thus becoming more familiar with the email system. The sole use of email for some types of information can be used as means to create the need for training as well as a training tool.

Further research is needed in the development of training and update sessions for Extension professionals to use email. Training needs to be in different segments such as system protocols, email etiquette, potential uses of email other than the basic memo or letter correspondence, and security concerns for ES professionals to be successful with electronic correspondence. Studies could be conducted on clientele of Extension to see if they would go to ES for training or help with email, or pay for the use of email at a County Extension office.

Electronic surveys are a cost effective method which save envelopes, paper, stamps, and staff time. In this age of shrinking budgets, email surveys are a practical way of saving time and money for any university, organization, or individual. The turn-around time for completing an email survey will save time for a researcher. Email letters and follow-ups can be individualized or personalized, if necessary and appropriate.

Graduate students and faculty, in the future, can use this tool and be confident of its results. This research study demonstrates email surveys as a convenient method of collecting data for extension and agricultural educators.

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CONDUCTING AGRICULTURAL EDUCATION RESEARCH
USING ELECTRONIC SURVEYS

Discussant: Jim Flowers, North Carolina State University

This paper should be of interest to anyone in the profession who uses survey research methodology. Many of the studies reported in this conference used mailed questionnaires to collect data. The cost of postage and printing is often a limiting factor that results in sampling versus census surveys. Certainly electronic survey methods, as an emerging technology, should be considered as an alternative.

The authors recognized the need to field test the data collection method in an effort to reduce potential problems encountered by respondents. This was one example of the care that was taken in controlling errors common to survey research. The overall response rate was excellent.

It is important to select the right statistical tool to answer the research questions that are posed. The authors used t-tests to examine differences in the return rate between the electronic surveys and the mailed surveys. These data were frequencies of responses (categorical data), and therefore there would be no mean scores to use in the analysis. Therefore, a nonparametric statistic, such as chi-square, would have been more appropriate to examine the difference in the method used to return the questionnaire.

One of the underlying questions posed by this study seems to be "Why don't people respond to surveys?" The authors seem to suggest that ease of response (electronic mail) might be a factor influencing the response rate. The researchers concluded that failure to return surveys electronically was due to a lack of training in using e-mail. Is it possible that other reasons were responsible for a lower than expected return? Some possible reasons, other than lack of training, could have been the timing of the survey, the lack of interest in the topic, or a general negative attitude toward survey research.

As an interested reader, I would suggest an additional research question. Was there a difference in the quality of responses (in the form of incomplete instruments) between those who responded by electronic mail or mailed survey?

While the researchers may have expected (and possibly hoped for) improved response rates for email participants, it is good for the profession to know that the response rate is at least equal to the response from mailed instruments. This study shows us that another form of data collection can be effectively used with populations that have electronic mail technology available to them.

USING ASSESSMENT INFORMATION IN EDUCATIONAL DECISION MAKING: A STUDY OF OHIO VOCATIONAL TEACHER'S ASSESSMENT PRACTICES

Isaac Kershaw N.L. McCaslin

Introduction / Theoretical Framework

There has been widespread concern voiced throughout the country about low achievement among the nation's school children. The National Commission on Excellence in Education (1983) declared the United States to be a nation at risk, awash in a rising tide of mediocrity. Since that time there has been no lack of reports criticizing curriculum, administrators, teachers, parents, and students. Concerns for international competitiveness, renewed calls for restructuring, and the accountability movement has prompted a search for the means to achieve excellence in our schools.

In response to requests for change, educational organizations around the country have sought ways to document the effectiveness of their educational programs. State after state has sought to initiate mechanisms which serve to promote accountability for educational outcomes. California, Connecticut, Iowa, Kansas, Maryland, and New Jersey have taken measures to make their educational systems more accountable for student outcomes (McCaslin, 1990). *The Action Plan for Accelerating the Modernization of Vocational Education in Ohio* (Ohio Department of Education, 1990) required that a comprehensive accountability and evaluation system be developed and integrated with the statewide management information system.

On the federal level, the Carl D. Perkins Vocational and Applied Technology Education Act of 1990 required accountability of all states who accept federal funds to support vocational programs. This was to be achieved through a system of specified performance measures and standards which track both academic and occupational competency gains.

Testing at all grade levels has increased due to accountability demands, the information demands of objective-based instructional systems, and competency-based evaluation trends (Green & Stager, 1986). Norm-referenced standardized tests have become the tool of choice in obtaining data for decision making at the state and local level. Those in favor of standardized testing have asserted that such tests promote high standards for learning, facilitate more accurate placement decisions, yield information for the improvement of curriculum and instruction, and help the public hold schools accountable (Dorr-Bremme, 1983).

Standardized testing in American schools has been and continues to be a subject of controversy from the local to the national level. Such tests have proven to be a time and cost effective means for measuring achievement however questions have arisen when significant emphasis was placed on the outcomes of these assessment methods. Worthen and Spandel (1991) have implied that standardized tests do have value when used correctly but provide only part of the picture and have their limits.

Statewide assessment cannot attempt to measure and thereby reflect all that local schools are able to achieve in terms of student outcomes. It has become necessary for schools to measure the attainment of their unique educational objectives (Perlman, 1991). Public outcries for school reform have increased the pressure on teachers to not only construct tests to assess students mastery of skills but to also promote more rigid standards for student accountability (Carter, 1984).

It has become necessary to document that students have more than seat time to account for the learning that was to have taken place in the classroom or laboratory. How

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teachers use assessment information in the classroom and whether its use is effective can play a major role in enhancing and documenting both instruction and learning. How are vocational education teachers using student assessment data? Literature has revealed very little about the assessment practices of this group of teachers. Only recently has the measurement community focused research emphasis upon teacher assessment practices in the academic classroom. Research conducted on the quality and effectiveness of non-vocational teacher training in measurement and assessment has implied that these teachers may not be gaining the appropriate skills necessary for effective use of assessment. If this is true for academic teachers what of the assessment skills of vocational education teachers?

The drive towards increased accountability has placed a demand on teachers to improve instruction and promote higher levels of achievement. To achieve these goals it is important to generate and utilize information which accurately measures effectiveness of instruction and the outcomes of learning. The more accurately teachers judge student achievement and performance the more effective they will be in directing student learning. An increased understanding of teacher practices in assessment use should aid in making more intelligent decisions in directing pupil progress toward worthwhile educational outcomes.

Purpose / Objectives

The purpose of this descriptive-correlational study was to describe Ohio secondary vocational education teachers' use of student assessment information in making instructional decisions. The specific objectives of this study were to:

1. Describe vocational education teachers' perceptions of their use of student assessment data for making instructional decisions.
2. Describe vocational education teachers' perceptions of their competence in the assessment process.
3. Describe vocational education teachers' perceptions of their attitude towards the assessment process.
4. Examine the relationship between teacher use of assessment information and level of competence in the assessment process, and their attitudes towards assessment.
5. Determine the proportion of variance in vocational education teachers' perceived use of assessment information in instructional decision making that could be explained by the independent variables of attitude towards assessment and competence in the assessment process.

Methods / Procedures

The target population for this study was all teachers who taught full time, secondary vocational education programs in Ohio public schools. The study utilized a random sample of 393 secondary vocational education teachers stratified by program area.

A mailed questionnaire was designed by the investigator for use in measuring the variables of interest. To obtain a measure of the dependent variable, teacher use of student assessment information, respondents were asked to indicate the extent to which they use information derived from six types of assessment methods in addressing 10 different instructional decisions. The six types of assessment methods used in the study included; objective paper and pencil items, informal observations, standardized test scores, performance assessments, portfolios, and essay type items. The 10 decision areas where assessment results are commonly used were identified as: plan for instruction, diagnose student weakness, monitor student progress, communicate achievement,

motivate students, evaluate instruction, evaluate instructional materials, group students, encourage self-assessment, and assign grades.

Teacher competence in the assessment process was measured with a series of competency statements based on "Standards for Teacher Competence in Educational Assessment of Students" (American Federation of Teachers, National Council on Measurement in Education, & National Education Association, 1990). A 5-point Likert scale, which ranged from "not competent" to "extremely competent", was used. Teacher attitudes towards assessment was measured using a semantic differential scale. The scale was comprised of nine bi-polar adjectives which described the concept "assessment".

A panel of experts was used to establish content and face validity. The 13 member panel was comprised of university faculty, doctoral students, vocational education teachers, and state department of education staff. Following a review of the instrument, recommendations provided by the panel were incorporated into the instrument where appropriate.

A revised instrument was pilot tested for reliability using a subsample of the population not selected for participation in the main study. A test-retest procedure was used with a two week interval between implementation. The results were compared for percent agreement with values that ranged from .64 to 1.0 for each item. Items were said to be in agreement if the score from the initial test was no more than ± 1.0 of the score on the retest. Measures of internal consistency were calculated from data obtained from the first phase of the test/retest procedure. Cronbach's Alpha ranged from .81 - .96 with a level of significance established a priori at .05.

Usable questionnaires were received from 290 participants during the six week data collection phase. With 100 participants not responding, a 74% response rate was achieved. Ten percent of the non-respondents were randomly selected and interviewed by phone. Differences between non-respondents and respondents on the dependent variable were examined with a t-test. No significant differences were found between groups on the dependent variable or on the selected teacher characteristics.

Pearson's r coefficient, was used to summarize the magnitude and direction of the relationship between variables. The conventions by Davis (1971) were used to describe the measures of association. Semi-partial, simultaneous multiple regression analysis was used to determine the variance in use of assessment information that was explained by selected independent variables.

Results / Findings

The descriptive statistics related to use of assessment information from each of the six assessment methods are presented in Table 1. Teachers rated information provided from performance assessments ($\underline{M}$=4.28) as being of more use in addressing day to day classroom decisions than information obtained from the other five assessment methods. This stands in slight contrast to Stiggins and Conklin (1992) who found that academic teachers placed more reliance on their own objective type assessment activities rather than on performance assessments for addressing instructional decisions. Given that vocational education teachers use a competency based curriculum, it was not surprising to the researcher that a performance based method of assessment was of more use than objective methods.

Table 1
Descriptive Statistics for the Use of Assessment Information Generated From Six Assessment Methods (n=290)[a]

Decision Areas	Objective Items		Standardized Test Scores		Performance Assessment		Informal Observation		Portfolios		Essay Items	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1.	3.68	.91	2.28	1.05	4.13	.91	4.04	.83	2.57	1.15	2.55	1.11
2.	3.79	.91	2.60	1.19	4.25	.85	4.25	.76	2.70	1.21	2.61	1.12
3.	3.93	.84	2.19	1.11	4.28	.87	4.20	.76	2.69	1.20	2.59	1.16
4.	3.91	1.01	2.40	1.19	4.31	.88	4.03	.93	3.06	1.36	2.46	1.18
5.	3.40	1.01	2.10	1.06	4.34	.83	4.20	.86	2.81	1.29	2.36	1.15
6.	4.02	.91	2.37	1.22	4.45	.73	4.31	.80	2.85	1.29	2.70	1.34
7.	3.67	1.02	2.27	1.19	4.15	.90	3.99	.95	2.62	1.26	2.51	1.25
8.	3.35	1.18	2.28	1.18	4.11	1.04	4.16	1.00	2.44	1.23	2.22	1.12
9.	3.67	1.08	2.19	1.23	4.27	.88	3.90	1.06	2.94	1.43	2.51	1.33
10.	4.17	.89	1.90	1.12	4.50	.74	3.94	1.14	2.77	1.42	2.77	1.34
Overall Means	**3.76**		**2.26**		**4.28**		**4.10**		**2.74**		**2.53**	

Educational Decision Areas:
1. Plan for instruction
2. Diagnose student weakness
3. Monitor student progress
4. Communicate student achievement
5. Motivate students
6. Evaluate instruction
7. Evaluate instructional materials
8. Group students
9. Encourage self-assessment
10. Assign grades

Prior studies in assessment use found that teacher made objective tests and informal observations were the assessment methods upon which academic teachers primarily relied (Dorr-Bremme and Herman, 1986; Stiggins & Bridgeford, 1985; Gullickson, 1984). The results from this research study, as indicated in Table 1, corroborate the findings from previous studies and supported the conclusion that vocational education teachers placed a heavy reliance on the use of objective paper and pencil methods (M=4.10) and informal observations (M=3.76).

Portfolios (M=2.74) and essay type assessments (M=2.53) were not found to be of much use for generating information in decision making (Table 1). Although portfolios continue to be promoted in education circles today vocational education teachers did not give particular emphasis to the information generated. Such a low reliance on portfolios may be accounted for by the relative newness of the assessment method. Vocational teachers may have yet to grasp the importance of a long term assessment method and build an assessment method of this type into their overall assessment system.

Standardized test scores (M=2.26) were found to be the least used source of information for decision making (Table 1). This study supported the findings from other studies (Goslin, 1967; Yeh et al., 1981; Green, 1990; and others) regarding the lack of use of standardized test scores in addressing educational decisions. After years of standardized testing, the use of standardized test scores by vocational teachers continues to be minimal.

The frequency distribution of vocational education teachers' competency scores is presented in Table 2. Vocational education teachers in this study reported that they perceived themselves to be moderately to very competent in the assessment process. Eight percent considered themselves to be extremely competent in the assessment process, 63% to be very competent, and 29% to be moderately competent. These results were congruent with findings by Gullickson and Hopkins (1987) which described teachers as being comfortable in their knowledge of assessment. Dorr-Bremme (1983) also concluded that teachers perceived their use of assessment techniques as accurately measuring the effects of their instruction.

Table 2
Frequency Distribution of Summed Teacher Competency Scores (n=290)

Scale Value	Summed Score	f	%
Not Competent	26 - 38	0	0.00
Slightly Competent	39 - 64	2	.69
Moderately Competent	65 - 90	84	28.97
Very Competent	91 - 116	182	62.76
Extremely Competent	117 - 130	22	7.59

Mean= 97.24 SD= 12.89 Minimum= 61 Maximum= 130

An analysis of teacher attitude towards assessment is presented in Table 3. The majority of teachers (59%) reported having a positive attitude towards assessment (M=41.6). Thirty percent of the teachers reported being neutral in their attitude towards assessment and 12% percent perceived themselves to have a negative attitude towards assessment. The generally positive attitudes found by this study are in agreement with current findings (Green, 1990 & Green and Stager, 1986) where opinions of both experienced and preservice academic teachers towards classroom assessment were positive.

Table 3
Frequencies for Teacher Attitude Towards Assessment Scores (n=290)

Summed Attitude Scores		f	%
9 - 13	Most negative attitude	1	.34
14 - 22		1	.34
23 - 31		33	11.38
32 - 40	Neutral	86	29.66
41 - 49		126	43.45
50 - 58		43	14.83
59 - 63	Most positive attitude	0	.00
	Mean= 41.6		

The correlational analysis between competence in assessment, attitude towards assessment, and use of individual assessment methods is presented in Table 4. Competence in assessment had a moderately positive association with teachers' use of information from objective paper and pencil methods and performance assessments and a low positive association with use of informal observations. Attitude towards assessment had a low association with the use of performance assessments. Use of portfolios, standardized tests, and essay items had only a negligible association with competence in and attitude towards assessment.

Table 4
Intercorrelations Between Selected Independent Variables and Assessment Methods (n=290)

	Intercorrelations						
	X2	Y1	Y2	Y3	Y4	Y5	Y6
Competence (X1)	.27	.30	.05	.32	.20	.17	.18
Attitude (X2)	1.00	.17	.05	.26	.10	.11	.12
Objective (Y1)		1.00	.15	.26	.23	-.04	.27
Standardized (Y2)			1.00	.03	-.13	.30	.29
Performance (Y3)				1.00	.51	.21	.10
Informal (Y4)					1.00	.05	.05
Portfolio (Y5)						1.00	.28
Essay (Y6)							1.00

Regression analyses are found in Tables 5-7. Competence in assessment was found to contribute 7.1% of the variation in teachers use of objective paper and pencil methods (Table 5), 5.7% in use of performance assessment (Table 6), and 3.9% in use of informal observation (Table 7). Attitude towards assessment was found to explain only 3% of the variation in teachers use of performance assessments.

Table 5
Semi-Partial Regression of Use of Objective Paper and Pencil Assessment Methods on Selected Characteristics (n = 290)

Variables	sR^2	b	t	p
Competence	.071	.151	4.78	<.001
Attitude	.007	.076	1.49	.138
(Constant)		18.77		

Standard error = 6.637 — Adjusted R^2 = .105
R^2 = .115 — For model: F = 12.36, p<.001

Table 6
Semi-Partial Regression of Use of Performance Assessment on Selected Characteristics (n= 290)

Variables	sR^2	b	t	p
Competence	.057	.125	4.46	<.001
Attitude	.030	.146	3.23	.001
(Constant)		24.14		

Standard error = 7.726 — Adjusted R^2 = .169
R^2 = .201 — For model: F = 6.32, p<.001

Table 7
Regression of Use of Informal Observation on Competence in Assessment (n= 290)

Variables	r^2	b	t	p
Competence	.039	.090	3.40	<.001
(Constant)		32.230		

Standard error = 5.812 — Adjusted r^2 = .035
r^2 = .039 — For model: F = 11.54, p<.001

Conclusions / Recommendations / Implications

Through a review of literature, the findings of this study, and the subsequent conclusions the researcher has proposed the following recommendations:

1. Given the competency based nature of the programs in vocational education, and given the findings from this study which document the high level of use of performance assessments by vocational education teachers, it is recommended that teacher preservice assessment curriculum pay particular attention to the development of competence in the use of performance assessments.

2. Teachers are not using standardized test results yet it is expected that they use the results of current and upcoming standardized assessments for enhancing instruction and learning. Since the Ohio Department of Education is taking a leadership role in promoting the use of standardized assessment, it should also be responsible for promoting activities which will motivate and assist teachers in using standardized test information.
3. The use of portfolio assessment is currently being promoted in education circles as a means to complement point-in-time assessment techniques. Yet, the use of portfolio assessment was not shown to be of much use to vocational education teachers nor was there a relationship with any of the independent variables investigated. The researcher believes that vocational education teachers may only be in an awareness stage in terms of their adoption of the portfolio assessment method. It is recommended that research be conducted to further investigate the use of portfolio assessment in vocational education settings.
4. It was concluded that attitude towards the overall assessment process contributed little to understanding the use of assessment. It is recommended that future research focus on an examination of attitude towards use of specific assessment methods. Given the current trends in assessment it would be appropriate to focus research on vocational education teachers' attitude towards standardized testing and the use of authentic assessment methods.
5. Overall competence in assessment explained only a small proportion of the variation in teachers use of three of the most used assessment methods. It is recommended that a competency measure oriented toward a specific assessment method be used to more clearly identify specific strengths and weaknesses related to the use of that particular assessment method.

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USING ASSESSMENT INFORMATION IN EDUCATIONAL DECISION MAKING: A STUDY OF OHIO VOCATIONAL TEACHERS' ASSESSMENT PRACTICES

Discussant: Jim Flowers, North Carolina State University

Assessment and accountability--how many times have we heard those two words used together in recent years? Accountability is being demanded, and rightfully so, by those who providing funding for education. We must be prepared to provide real data to support the value of our programs. One form of data we should have available is the assessment of student performance. As a result, this study is both timely and important.

The introduction provided an adequate conceptual framework for the study, leading to a clear statement of the problem. The research objectives provided a basis for examining vocational teachers' use of assessment information from a variety of perspectives. In addition, the methods used to collect data were appropriate and consistent with the objectives stated. Although the population size was not stated, 393 subjects should be adequate to represent Ohio vocational teachers, especially when one considers that stratified samples have smaller sampling variances than simple random samples. A 74% response rate with a follow-up of nonrespondents indicated that nonresponse error was controlled. The paper did not specifically state which instruments were examined by the panel of experts for content validity. Since the attitudes toward assessment instrument was a semantic differential scale, describing the overall concept of "assessment", one might question whether the members of the panel were "expert" in the construction of semantic differential scales, or in assessment.

The data presented in Table 1 provides the reader with a great deal of information on teachers' use of assessment information in those 10 decision areas. The authors did not describe the scale or the descriptors used, making it difficult to determine what a mean of 4.28 represented. The authors also reported that performance assessment (M=4.28) was of more use than the other five assessment methods. The mean score for informal observations was 4.10. Was this difference of any statistical or practical importance?

It is not clear in the paper whether teachers' perceived competence in assessment was measured using statements that determined general competence in assessment or competence in using the six assessment methods described in the paper. The data seem to indicate that perhaps teachers feel a general level of competence in assessment, but do not feel as competent when dealing with assessing portfolios or essay items. This could explain the relatively low proportion of variance in the use of specific assessment methods that is attributed to teacher competence in assessment. The same could be true for teacher attitudes toward assessment, making recommendations 4 and 5 particularly relevant.

I realize that there is a great deal of data presented regarding the teacher use of assessment methods, but what would the authors conclude concerning the use of assessment methods in making educational decisions? Are they doing a good job? Is improvement needed?

Given the importance of accountability in education, we do need to know more about how teachers use assessment information. This paper provides some valuable information for the profession, and hopefully will cause us to want to examine this area in more detail.

PERCEPTIONS OF SECONDARY SCHOOL PRINCIPALS TOWARD AGRICULTURAL EDUCATION

Larry R. Jewell*

Introduction and Theoretical Framework

Since school administrators have authority and influence in programs and curricula at the school and school system levels, changes in vocational education will require their approval and support. Thompson (1986) reported in an Arkansas study that administrators' opinions are very important, since administrators' decisions often drastically affect program operations and directions. An example of administrators' influence was found in a study of Kansas school districts that did not have agricultural education programs (Parmley, 1982). The study concluded that rural residents and agribusiness representatives wanted programs in agriculture. However, when the administrators did not want the programs they cited a lack of student interest, inadequate facilities, inadequate funding, and the lack of a need for agricultural education as reasons for not implementing the programs (Parmley, 1982). A 1979 national study found that a significant number of school administrators did not support programs providing high school students opportunities to develop salable job skills through vocational programs. These same administrators will determine whether or not vocational education is available in the secondary schools (United States Department of Education, 1979).

The National Research Council (1988) found that agricultural education programs were essentially existing in isolation and that they were not a part of the communities and businesses in which the schools existed. The Council recommended that formal and informal cooperative efforts between schools and their communities become a top priority for agricultural education programs. However, the United States Department of Education (1979) reported that public support for vocational education programs continued to be strong. Jewell (1987) also reported that administrators in North Carolina perceived that a majority of the people in their communities regarded agricultural education as an important and essential part of a high school education.

In a study involving Arizona administrators, principals listed teaching technical agriculture and agricultural mechanics as the most important responsibility of agricultural education teachers (Cox, 1986). North Carolina administrators indicated that students who enrolled in agricultural education courses for four years received an adequate high school education, although the percentage of the administrators indicating those beliefs decreased between 1978 and 1986 (Jewell, 1987). According to Jewell (1987), principals believed that the programs should be general in nature and should provide a general knowledge of agriculture. Warmbrod and Bobbitt (1987) recommended that the introductory course in agricultural education be general in nature, followed by courses in succeeding years that increase in specificity. Administrators in an Indiana study also believed that vocational education should be a part of the education of all pupils. They also indicated that vocational education at the secondary level should be specific, not broad and general (Nasstrom and Baker, 1979). The National Research Council concluded in a 1988 study that systematic instruction about agriculture should begin in kindergarten and continue through the twelfth grade to help Americans become agriculturally literate. Jewell (1987) also recommended that consideration be given to increasing the number of general and/or introductory agriculture courses and that this recommendation might be accomplished by expanding agricultural offerings to the middle and elementary schools. Frantz et al. (1988)

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recommended that polices should be established at the local and state levels to protect the comprehensiveness of schools and student access to vocational education programs.

Administrators are the instructional leaders in their schools and/or school systems, and their leadership in curriculum and instructional reforms are important. Administrators with negative attitudes toward vocational education and/or reform recommendations will probably not be successful in implementing these initiatives in their schools or school systems. This study provides vocational educators with information that can be analyzed to overcome or improve situations that could have a negative effect on agricultural education. Strategies may also be developed to enhance agricultural education programs so they can continue to be important and viable components of public education.

Purpose/Objective

The purpose of the study was to determine building-level administrators' attitudes toward programs in agricultural education at their schools. More specifically, the objective of this study was to determine the attitudes of North Carolina secondary school principals concerning issues related to their agricultural education programs.

Methods and/or Procedures

Population

The population for the study included the building-level administrators (principals) in North Carolina who had agricultural education as a part of their school curricular offerings during the 1992-93 academic year. The population was selected by first identifying the schools that offered agricultural education ($\underline{N} = 244$), and then identifying the principals of those schools. A random sample ($\underline{n} = 150$) was drawn from this population, utilizing a computer-generated random selection process.

Instrumentation

The data collection instrument for the study was researcher developed and addressed the administrators' attitudes toward agricultural education course offerings and programs. Content validity was assessed by a committee of experts, consisting of agricultural education consultants from the North Carolina Department of Public Education and teacher educators at North Carolina State University. The instrument was field tested to determine clarity. The same sample of school administrators selected for the field test was used to determine the reliability of the research instrument, using a test-retest reliability procedure. The coefficient of stability was found to be .94 for the instrument.

Data Collection

The instrument, along with a cover letter, was mailed to the research sample and they were asked to return the completed surveys within three weeks. The vocational directors from the local education agencies who had principals selected in the research sample were also sent a letter, asking them to contact their principals and urge them to complete and return the survey instruments. A follow-up mailing was sent to those members of the sample who failed to respond to the first mailing within the specified time period and they were asked to return the completed follow-up survey within two weeks. The surveys returned by the late respondents (follow-up mailing) were kept separate from those received after the first mailing. A total of 112 responses was received from the after the first mailing, and 20 additional responses were received as a result of the follow-up mailing. Responses received from the follow-up mailing were statistically compared on all variables with the initial responses using Hotelling-Lawley Trace statistics. Hotelling-

Lawley Trace statistic is the appropriate multivariate analysis of variance (MANOVA) when using two independent samples. No significant differences were found ($F = 0.543$, $p = 0.4641$). According to Miller and Smith (1983), late responses have been found to be very similar to non respondents. Therefore, since no statistically significant differences between early and late respondents were found, the data sets were combined for statistical purposes. The combined total usable response from the sample was 132 or 88%.

Analysis of Data

The data for this study were analyzed by descriptive statistical procedures. Descriptive statistics were utilized for all items in the study, and frequencies, means, standard deviations, and percentages were reported. Descriptive statistics were used to answer the research objective.

Results and/or Findings

Demographic Information of the Principals

The principals of the agricultural education programs ranged from 32 to 62 years of age and averaged 47.46 years. The administrators' tenure as principals ranged from one to 28 years, with a mean of 10.42 years. Approximately 42% ($n = 54$) of the administrators took at least one agricultural education course in high school and 18.95% ($n = 25$) of those taking agricultural courses received four or more credits in agricultural education. Sixty-five percent ($n = 84$) of the administrators took at least one vocational education course other than agricultural education during high school. Administrators who have been vocational education teachers in areas other than agriculture accounted for 7.58% ($n = 10$) of the sample, and 7.58% ($n = 10$) of the principals were former agricultural education teachers. An average of 3.04 visits to student SAE programs were made during the 1992-1993 academic year by the respondents. Fourteen percent ($n = 18$) of the administrators have attended at least one State FFA Convention, and 3.04% ($n = 2$) have attended at least one National FFA Convention during the period from 1987-1992. Eighty percent ($n = 97$) of the principals indicated they would attend state and national FFA conventions and participate in SAE visits if they were invited by their agricultural education teachers to do so. Approximately 74% ($n = 98$) of the principals classified their schools as being in a rural setting. However, approximately 30% ($n = 38$) indicated that 1000 or more students were enrolled at their schools.

Attitudes of Building-Level Administrators Concerning Agricultural Education Programs and Course Offerings

The administrators were asked to rate each of the statements on the data collection instrument according to the following scale: 1 = Strongly Disagree (Respondent disagreed with the statement without exception); 2 = Disagree (Respondent disagreed with the statement, but was not 100% opposed to the statement); 3 = Slightly Disagree (Respondent disagreed with some elements of the statement, but not the whole statement); 4 = Slightly Agree (Respondent agreed with some elements of the statement, but not the whole statement); 5 = Agree (Respondent agreed with the statement, but not 100% supportive of the statement); or 6 = Strongly Agree (Respondent agreed with the statement without exception).

The research objective was addressed by categorizing 64 statements, used to obtain the attitudinal data, into seven categories: Curriculum Issues; Program Accountability Issues; Descriptive Program Issues; Program Image; Academic Integration; Vocational Student Organization (FFA); and Teacher Performance. Descriptive statistics, means, standard deviations, and frequencies were used to describe the attitudes registered by the principals for each of the statements.

Table 1 contains mean ratings of the attitudes of the principals toward statements designed to address agricultural education curriculum issues. The principals indicated that horticulture courses were the most appropriate agriculture courses to be included in a contemporary high school curriculum. However, they felt that all the agricultural

Table 1

Attitudes of Secondary School Principals Toward Agricultural Education Curriculum Issues

Statement	n	M[a]	SD
The agricultural education curriculum should provide students with occupational specific skills which are needed to obtain jobs or to pursue further training at the post-secondary level.	130	5.22	0.93
Academic and agricultural education curricula should be integrated so students will be provided fundamental academic skills that are enhanced in agricultural education courses.	132	5.18	1.12
The following types of agricultural education course offerings should be included in a contemporary high school curriculum:			
Horticulture	130	5.09	0.74
Resources Management	130	4.99	0.98
Introduction to Agriscience	128	4.89	1.01
Agricultural Engineering Technology (Agricultural Mechanics)	130	4.81	1.10
Specialty Courses (i.e. aquaculture, small animal care, biotechnology, floral design, applied zoology, horse management, swine management, poultry management)	130	4.75	1.04
Agricultural Production and Management	130	4.68	1.20
Agricultural Cooperative Training	127	4.35	1.41
Agricultural education courses, such as horticulture or aquaculture, should be taught by certified agricultural education teachers.	132	5.08	1.08
The articulation of agricultural education training between secondary and post-secondary institutions should be increased.	132	5.05	0.77
Agricultural education programs should be fully articulated with community college programs through TECH-PREP agreements.	132	5.00	1.11
A substantial amount of international agriculture should be infused into the high school agricultural education curriculum.	128	4.59	0.87
Students should enroll in programs requiring work experience, such as Agricultural Cooperative, while attending high school.	132	3.56	1.42
All students should complete at least one agricultural course in order to meet graduation requirements.	130	2.68	1.62
Agricultural education courses should be moved from high schools to community colleges.	132	2.33	1.08

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

education course currently being offered in the public schools of North Carolina were appropriate for a contemporary high school curriculum. They also indicated that agricultural education courses should be taught by certified agricultural education teachers. However, they slightly disagreed with the recommendation of requiring all students to complete at least one agriculture course in order to meet graduation requirements.

The principals reported they agreed that agricultural education programs should be fully articulated with community college programs through a TECH-PREP agreement. However, the principals disagreed with the statement "agricultural education courses should be moved from high schools to community colleges."

As reported in Table 2, principals agree that schools with agricultural education programs should have active advisory councils. They also indicated that one objective of

Table 2

Attitudes of Secondary School Principals Toward Agricultural Education Program Accountability Issues

Statement	n	M[a]	SD
One objective of agricultural education programs should be to prepare students for gainful employment in the fields of agriculture and natural resources.	130	4.76	1.21
Each school with a program in agricultural education should have an active advisory council.	130	4.62	1.25
Employment of graduates in jobs requiring skills acquired in agricultural courses should be increased for accountability.	130	4.57	1.24
When fully implemented, VoCATS (Vocational Competency Achievement Tracking System) will be a vehicle to effective assess vocational competence of agricultural education students.	132	4.48	1.04
The primary focus of secondary agricultural education should be occupational training.	130	3.92	0.99
School administrators should have an in-depth knowledge and understanding of agricultural education programs.	132	3.76	1.37
Agricultural education programs should consist of individual courses rather than multi-course, multi-year programs.	130	3.69	1.24
School administrators should be held accountable for the success of agricultural education students and consequently, agricultural education programs.	130	3.65	1.58
The rate of student placement in agricultural occupations should not be a major factor in continuation of agricultural programs.	130	3.38	1.33
Funds currently spent on agricultural education programs would be better spent on other vocational and/or academic programs.	130	2.46	1.16

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

agricultural education programs should be to prepare high school students for gainful employment in jobs related to agricultural and natural resources.

The principals only slightly agreed that the primary focus of secondary agricultural education programs should be for occupational training or that agricultural programs should consist of individual courses rather than multi-course, multi-year programs. The principals also indicated they only slightly agreed that VoCATS will be an effective means of assessing the vocational competence of students enrolled in agricultural education courses.

The administrators indicated they agreed that employment of high school graduates in jobs that use the skills acquired in high school agricultural courses should be increased for program accountability. However, they disagreed with the opinion that funds currently being spent on agricultural education programs would be better spent on other vocational and/or academic programs.

Table 3 presents the attitudes of the principals toward selected statements concerning descriptive issues about agricultural education programs. The principals disagreed with the statement that "only students who wish to pursue a career/job in agriculture should enroll in agricultural education courses." The principals also slightly disagreed with the statement that agricultural education teachers should have smaller teaching loads than other teachers because of extra duties with FFA, SAE, laboratory management, and adult education. The administrators slightly disagreed that provisions should be made so that agricultural education courses receive recognition to meet admission requirements for the University of North Carolina system. However, they agreed with the opinion that agricultural courses are appropriate for college bound students.

Table 3

Attitudes of Secondary School Principals Toward Descriptive Issues About Agricultural Education Programs

Statement	n	M[a]	SD
In setting the future course for agricultural education, educational leaders should consider employment opportunities in the service or business sectors related to agriculture.	130	5.05	0.79
Agricultural courses are appropriate for college bound students.	132	4.64	1.09
Provisions should be made so that agricultural education courses receive recognition to meet admission requirements for the University of North Carolina system.	132	3.35	1.68
Agricultural education teachers should have smaller teaching loads than other teachers because of extra duties with FFA, SAE, laboratory management, and adult education.	128	2.62	1.50
Only students who wish to pursue a career/job in agriculture should enroll in agricultural education courses.	130	2.49	1.28

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

Table 4 displays the attitudes of the principals toward statements concerning the image of agricultural education programs. The administrators indicated they strongly disagreed with the statement that agricultural education was an exemplary model of the educational reform movement. However, they also disagreed with the statements, "agricultural education courses are not important components of the high school curriculum," "agricultural education is no longer needed in the public schools," "instruction in agriculture does not support or enhance the goals of general secondary education," and "the benefits students derive from agricultural education are no longer important."

The findings of this study indicated that the principals in North Carolina slightly agreed that the majority of the people in their school communities regarded agricultural education as an important part of the high school program. However, they slightly disagreed with the statement "agricultural courses should be credited toward satisfying high school graduation requirements for science courses."

Table 4

Attitudes of Secondary School Principals Concerning the Image of Agricultural Education Programs

Statement	n	M[a]	SD
Agricultural education provides motivation for students to continue their education beyond high school.	130	4.25	1.15
The majority of the people in my community regard agricultural education as an important part of the high school program.	130	3.89	1.21
Agricultural courses should be credited toward satisfying high school graduation requirements for science courses.	132	3.28	1.58
Students who enroll in agricultural education courses compromise their social status among students not enrolled in agricultural education courses.	128	2.80	1.38
The curriculum in agricultural education has kept pace with the changes in agricultural technology.	128	2.77	1.33
Instruction in agriculture does not support or enhance the goals of general secondary education.	130	2.45	1.13
Agricultural education is no longer needed in the public schools.	130	2.13	1.18
Agricultural education courses are not important components of the high school curriculum.	130	2.08	1.05
The benefits students derive from agricultural education are no longer important.	130	1.96	1.07
Agricultural education is an exemplary model of the educational reform movement.	132	1.00	0.00

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

Based on the findings presented in Table 5, it appears that public school principals in North Carolina agree that agricultural education courses provide an effective vehicle for integrating academic and vocational education skills and they slightly agree that agricultural courses provide an effective vehicle for developing computer literacy competencies. They also agreed that ongoing efforts should be expanded to upgrade the scientific content of agricultural courses and that a substantial amount of applied science principles and concepts should be infused into the high school agricultural education curriculum.

Principals in North Carolina public schools appear to be supportive of the FFA component of their agricultural education programs as indicated by reviewing the findings displayed in Table 6. The principals disagreed with the statement, "vocational student organizations such as the FFA are outdated ideas whose time have passed," and agreed with the statement, "vocational student organizations, like FFA, should be part of every high school's co-curricular activities." Further, the principals indicated they slightly agreed with the statements, "all schools with agricultural education programs should have FFA chapters" and "the primary purpose of the FFA is to develop leadership among agricultural education students."

Table 5

Attitudes of Secondary School Principals Toward Statements Concerning Academic Integration in Agricultural Programs and Course Offerings

Statement	n	M[a]	SD
A substantial amount of applied science should be infused into the high school agricultural education curricula.	130	5.15	0.75
Teacher education programs in agriculture should stress applied learning, but should also strengthen instruction in science, marketing and management, and international agriculture.	130	5.14	0.81
Ongoing efforts should be expanded and accelerated to upgrade the scientific content of agriculture courses.	130	5.04	0.84
Agricultural education courses provide an effective vehicle for the integration of academic and vocational education skills.	132	4.67	1.07
The agricultural education program needs to more effectively meet the needs of special population groups.	132	4.17	1.03
Agricultural education courses provide an effective vehicle for developing computer literacy competencies.	131	3.90	1.45
Agricultural education teachers should serve on committees for selecting math and science instructional materials and math and science teachers should serve on committees for selecting instructional materials for agriculture.	130	3.88	1.42
The emphasis of secondary school should be on developing basic academic skills; therefore, there should be less emphasis on the teaching of technical agriculture content/skill courses.	132	2.94	1.31

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

Table 6

Attitudes of Secondary School Principals Toward the Vocational Student Organization (FFA) Component of the Agricultural Program

Statement	n	M^a	SD
The FFA should revise the nature and focus of its contests and activities to open new categories of competition in addition to those in production agriculture and leadership.	130	4.68	1.07
Vocational student organizations, like FFA, should be part of every high school's co-curricular activities.	130	4.61	1.06
The FFA should encourage membership of students unable or unwilling to enroll in a 4-year program of agricultural education.	130	4.57	1.05
A substantial amount of agricultural marketing and distribution techniques should be infused into agriculture courses.	130	4.55	0.99
All schools with agricultural education programs should have FFA chapters.	130	4.38	1.40
Vocational student organizations, like FFA, should be part of every high school's intra-curricular activities.	130	4.15	1.35
The primary purpose of the FFA is to develop leadership.	130	3.98	1.30
Changing the name of the student organization in agriculture from the "Future Farmers of America" to "FFA" broadened the public perception of the organization to one with a contemporary, forward-looking image.	128	3.65	1.32
Agricultural education teachers are unduly driven by FFA contests and activities and place little emphasis on instruction in technical agriculture content or curriculum reform.	130	3.42	1.44
The FFA is the primary reason students enroll in agricultural education courses	130	2.60	1.20
Vocational student organizations such as the FFA are outdated concepts whose time have passed.	130	2.26	1.22

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

As indicated in Table 7, the North Carolina public school principals tend to agree that their agricultural education teachers are doing an above average to superior job in each of the eight areas identified by the State's Teacher Performance Appraisal System. The principals agreed that their agricultural education teachers were performing at an above average to superior level in the areas of managing the behavior of students and performing non-instructional duties. The principals also indicated they slightly agreed that their agricultural education teachers were performing at an above average to superior level in the area of housekeeping and classroom/laboratory organization and management.

Table 7

School Administrator's Attitudes Toward the Teaching Performance of Agricultural Education Teachers

Statement	n	M[a]	SD
The agriculture teacher(s) at my school does an above average to superior job:			
Managing the behavior of his/her students.	132	4.99	1.52
Performing non-instructional duties.	132	4.65	1.20
Communicating within the educational environment.	132	4.39	1.26
Providing his/her students with instructional feedback.	132	4.37	1.25
With his/her instructional presentations.	132	4.33	1.23
With his/her instructional monitoring of student performance.	132	4.33	1.27
Facilitating instruction.	132	4.32	1.29
Managing his/her instructional time.	132	4.22	1.40
With his/her housekeeping and classroom/laboratory organization and management.	132	3.95	1.45

a. Means were based on responses to a six-point scale where 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree

Conclusions

The following conclusions were formulated as a result of the findings of this study:

1. In general, principals were very supportive of the agricultural education programs being offered in the public schools of North Carolina. They felt that the agricultural education teachers were doing an excellent job in the areas of managing the behavior of their students and performing non-instructional duties.

2. North Carolina principals felt that articulation of agricultural education training between secondary and post-secondary institutions should be increased, and secondary agricultural education programs should be fully articulated with community college programs through TECH-PREP agreements. However, it appears that they felt that agricultural education courses should remain at the secondary level and not be moved to the community colleges. They tended to support the notion that current agricultural education course offerings are appropriate for the curriculum of today's high schools. They also felt that agricultural education courses should be taught by fully certified agricultural education teachers.

3. North Carolina principals felt that school system with programs in agricultural education should have active advisory councils for their programs. Representatives from business should also be utilized to help school officials identify ways of infusing more instruction about agriculture into public school curricula.

4. While the secondary school principals did not feel that the agricultural education program should be viewed as an exemplary model of the educational reform movement, they agreed that funds being spent on agricultural education programs would not be better spent on other vocational and/or academic programs. They also indicated that agricultural education courses were appropriate for college bound students, and that there is a need for agricultural education programs in the public schools of North Carolina.

5. The benefits students derived from agricultural education were still deemed important by public school principals, and they felt that teachers in all grade levels and subject areas should be encouraged to incorporate materials about the economic aspects of agriculture in their instruction.

6. The principals stated that the FFA was an important component of the secondary agricultural education curriculum and that it was an appropriate co-curricular activity for today's contemporary high schools. However, the administrators felt the contests and awards used by the organization needed to be revised to opened up in more areas of competition which are not tied to agricultural production or leadership.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are suggested:

1. Local vocational directors should work with local principals in establishing teams consisting of agricultural education and general academic teachers to identify opportunities for increasing the instructional content about agriculture in the academic curricula and for increasing integration of science content into the agricultural education curricula.

2. If not in place, fully articulated TECH-PREP agreements should be developed for all agricultural education programs.

3. Local directors of vocational education should monitor the hiring of agricultural education teachers and insist that only fully certified teachers be hired by their local school systems.

4. Local advisory councils should be established at the school building-level for all agricultural programs. Local teachers should provide leadership on the organization and establishment of advisory councils, but principals and local directors of vocational education should be heavily involved in the creation of the councils.

5. Agricultural education teachers should increase the number of computer literacy competencies in their local curricula. If computers are not available for instructional purposes, Agricultural education teachers should work with their local directors of vocational education to address the possibility of obtaining appropriate computer equipment and software.

6. Agricultural education teachers should extend invitations to their principals and local directors of vocational education to accompany them to state and national vocational student organization (FFA) activities. Agricultural education teachers should also extend invitations to their principals and directors to accompany them on selected SAE visits.

7. Agricultural education teachers should give more attention to addressing the instructional areas evaluated by the North Carolina Teacher Performance Appraisal System, and should make an effort to improve their housekeeping and classroom/laboratory organization and management skills.

8. Agricultural education teachers should work closely with their guidance counselors to encourage the counselors to direct college-bound students to enroll in their courses.

9. Additional research should be conducted to determine the attitudes of school level administrators for vocational programs other than agricultural education. Attitudes toward vocational education programs and course offerings by administrators other than principals, such as local directors of vocational education, superintendents, and guidance counselors, should also be investigated.

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PERCEPTIONS OF SECONDARY SCHOOL PRINCIPALS
TOWARD AGRICULTURAL EDUCATION: A CRITIQUE

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The author did a fine job in highlighting the important findings within the conclusions and recommendations. In fact, the recommendations followed the findings logically and if implemented could have a very positive effect in North Carolina. If gaining science credit is ever going to be a reality in North Carolina, recommendation number one is absolutely essential. The other recommendations fall into place as appropriate items for successful contemporary agricultural education programs for today's students and educational environment. However, several findings caused me great concern.

There is not much support for qualifying agricultural education courses for science credit for either high school graduation requirements or for university admissions. The principals' perceptions were clear, they do not believe that current agricultural education courses deem the same level of academic respect as science courses. Yet, the administrators encouraged programs to upgrade their scientific content and to increase articulation efforts. Both steps are necessary for obtaining science credit.

The administrators unanimously strongly disagreed that, "agricultural education is an exemplary model of the educational reform movement." Not one administrator, and 10 were former agricultural education teachers, rated this statement higher then one, strongly disagree. Regardless of all of the other findings, this result bothered me the most. In all of my readings on current educational reforms, contemporary agricultural education programs fit the description almost perfectly. So, there is a problem. There are either no model contemporary agricultural education programs in North Carolina or the agricultural education teachers are not communicating to the administrators all of the good aspects of their programs. I would content that, to a degree, both problems exist.

Most agricultural education programs in the United States could improve in some areas, especially involving all students in all three components of the program. But, probably communicating to administrators is the main problem. How do administrators develop their perceptions of a local agricultural education program? The answer is simple, "it's based on what they hear, see or read." Therefore, it is imperative to pursue their response that 80% of them would attend a state or national FFA convention and participate in SAE visits. The benefits of making this a priority goal in North Carolina will pay off tremendous dividends. Maybe they will, then, believe that a primary purpose of the FFA is to develop leadership.

Arizona's Superintendent of Public Instruction recently said that what happens between a student and teacher once the door shuts is nothing less than magic. I content that what happens between an agricultural education teacher and student during a SAE visit or during an FFA event is beyond magic. The challenge is to get North Carolina administrators to witness the "beyond magic" events that occur daily by the dedicated agricultural education teachers. Their perceptions will change drastically for the better.

ARKANSAS AGRICULTURE TEACHERS' OPINIONS CONCERNING SCIENCE CREDIT FOR AGRICULTURE

Donald M. Johnson*

Introduction

According to Moore (1994, p.1), "The purpose of agricultural education research is to find answers to meaningful questions and problems." The research reported in this paper was sponsored by the Arkansas Vocational Agriculture Teachers Association (AVATA) in order to provide information needed to answer a significant question facing agricultural educators in Arkansas.

Background

During their July 1994 business meeting, AVATA members voted to investigate the possibility of securing science credit for agriculture. An *ad hoc* committee, composed of six teachers, was appointed and charged with the responsibility of evaluating the feasibility and possible methods of securing science credit for agriculture.

The committee met for the first time in August 1994. Also participating in the meeting were the executive director of the state advisory council on vocational-technical education, four state agricultural education supervisory staff members, and a teacher educator. During the course of the meeting, participants realized that meaningful plans could not be made until more was known about teachers' opinions concerning science credit for agriculture. Also, committee members expressed the need for more information about the science content currently taught in agriculture, and about the teachers' academic preparation in science and mathematics. Due to this need for information, the AVATA requested and funded this study.

Theoretical Framework

Hammonds (1950) provided a compelling argument for teaching agriculture as a science. According to Hammonds:

> The "organized body of knowledge" we call the science of agriculture is deeply rooted in the sciences that contribute to agriculture. If we strip away from agriculture the portions of other sciences that bear upon it, we perhaps do not have left a science of agriculture. To teach agriculture as a science is to recognize that it is a science. (p.5)

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More recently, the National Research Council (1988) recommended that science credit should be granted for certain agriculture courses. Dormody (1993), in a nationwide study, found that approximately 34% of agriculture teachers were teaching one or more agriculture courses that received science credit.

Several states have implemented new agricultural education curriculums that place additional emphasis on the science of agriculture. In Mississippi, agricultural educators introduced two pilot agriscience courses in 41 public secondary schools during the fall 1991 semester. An end-of-year evaluation found that administrators, guidance counselors, science teachers and agriculture teachers in the pilot-test schools strongly supported the agriscience courses and agreed that students completing the courses should receive science credit (Johnson and Newman, 1993; Newman and Johnson, 1993).

Michigan agricultural educators also adopted an agriscience and natural resources (ANR) curriculum during the Fall 1991 semester. In an evaluation study, Conners and Elliot (1994) found Michigan agriculture teachers supported the new curriculum and strongly agreed that students should receive science credit for ANR courses.

Peasley and Henderson (1992) studied Ohio agriculture teachers' attitudes toward adoption of an agriscience curriculum. The researchers found that, while teachers had a positive attitude toward agriscience, some were concerned about the possible effects of offering science credit for agriculture. One teacher wrote (p.42), "If we grant science credit, we will become just another science class and administrators will use this as a reason to treat ag. [sic] classes as just another general science class." A second teacher wrote (p.42), "If we grant science credit, what happens to the FFA? I think this is a big mistake."

Science credit for agriculture would constitute a dramatic change in current practice for Arkansas agricultural educators. According to Norris and Briers (1989, p.42), "Teachers' perceptions toward the change process (need for the change, manner in which the change was managed, and amount of teacher input into the change process, etc.) [is] the single best predictor of the teacher's ... decision concerning adoption of the change." Goodland (1975) and Owens (1987) also noted that teacher readiness is one of the most important variables associated with the success of school change in terms of student outcomes. Thus, the current study was conducted to both gather information needed by the planning committee and to serve as a mechanism for Arkansas agriculture teachers to have input into the change process.

Purpose and Objectives

The purpose of this study was to determine the opinions of Arkansas secondary agriculture teachers concerning science credit for agriculture. Specific objectives were to determine:

1. the level of support for granting science credit for agriculture, as perceived by agriculture teachers;

2. agriculture teachers' perceptions of the effects of offering science credit for agriculture;

3. agriculture teachers' level of support for five methods of granting science credit for agriculture;

4. agriculture teachers' level of support for four methods of certifying teachers to offer agriculture for science credit;

5. the extent to which agriculture teachers provided instruction related to objectives listed in the Arkansas Science Curriculum Framework (Arkansas Department of Education, 1993); and

6. the number of undergraduate semester credit hours completed and grades earned in science and mathematics courses, as reported by agriculture teachers.

Methods and Procedures

The population for this census study was composed of all Arkansas agriculture teachers employed in state reimbursed agricultural education programs during the fall 1994 semester (N=259). Personnel in the agricultural education section of the Arkansas Department of Education provided the researcher with a current database containing the name and school address of each teacher.

This study employed the descriptive research design using a mailed survey instrument. Based on input from the *ad hoc* committee, a 12-page instrument was designed to collect information on: (a) teacher, school and community support for offering science credit for agriculture (six items); (b) effects of offering science credit for agriculture (20 items); (c) preferred methods of offering science credit (six items); (d) preferred teacher certification methods (five items); (e) science content currently taught (26 items); (f) college science and mathematics course work and grades (10 items); and (g) teacher/program characteristics (eight items). Additionally, the back cover of the instrument contained both space and an invitation for written comments concerning science credit for agriculture.

A draft version of the survey instrument was administered to 11 senior agricultural education students enrolled in the professional (student-teaching) semester to determine if the instructions, items, and response modes were clear. Based on individual written input and group discussion of instructions and items, minor wording changes were made.

Next, the revised instrument was reviewed for face and content validity, as well as clarity, by a committee of state agricultural education staff members attending a fall planning meeting. The committee was composed of the AVATA president, three district supervisors and the state supervisor of agricultural education, one post-secondary agriculture instructor, and seven teacher educators from three universities. The committee judged the instrument to be valid and no changes were suggested.

Finally, the instrument and a draft cover letter were mailed to the six teachers on the AVATA *ad hoc* committee on science credit for agriculture. The teachers were instructed to critically examine the survey instrument for face and content validity and clarity using specified criteria. The committee members responded positively to each of the six specified evaluation criteria. Based on these two reviews (by the state staff and the teacher committee), the instrument was judged to possess face and content validity, as well as clarity.

In order to establish test-retest reliability, a pilot test was conducted with seven upper division pre-service agricultural education teachers enrolled in a methods of teaching agriculture course. The students completed the instrument twice (at 14 day intervals). The reliability estimates were as follows: (a) teacher, school and community support for offering science credit for agriculture ($r = .67$); (b) perceived effects of offering science credit ($r = .92$); (c) preferred methods for offering science credit ($r = .83$); (d) preferred teacher certification methods ($r = .83$); (e) science content currently taught ($r = .70$); and (f) college science and mathematics course work and grades ($r = .96$).

Following data collection, test-retest reliability was also estimated for the main study using a random sample of 10 respondents. The 10 respondents were contacted by telephone, and using the mailed survey instrument as an interview guide, responses to 26 selected items were obtained. The overall coefficient of stability for the instrument was .72. The period between completion of the mailed survey and the telephone interview varied from 3 to 12 weeks.

Data were collected during October-December 1994 following the Dillman (1978) procedure for mail questionnaire administration. An 82% (213 of 259) response rate was obtained after three mailings. To determine if non-response bias was a threat to the study, a random sample of six (13%) non-respondents was contacted by telephone and data were obtained on 32 (39.5%) survey items. A comparison of respondents to non-respondents did not indicate any significant differences between the two groups. Therefore, the researcher determined that the results were generalizable to the population.

Results

The average teacher-respondent was 39.1 years of age (SD = 9.4), had taught agriculture for 14.2 years (SD = 9.0), and worked in a single-teacher department (74.5%). The mean student enrollment per teacher was 84.4 students (SD = 30.8).

Over one-half (56.1%) of the respondents reported the bachelors degree as the highest degree earned; 42.9% reported earning the masters degree; and 0.9% held the associate degree. Approximately one in every four (26.9%) respondents reported they currently held a valid certificate to teach science in Arkansas. Of those certified to teach science, 57.6% indicated having taught science in an Arkansas public school.

Objective One -- Support for Science Credit

As a group, the teachers were strong in their support for granting science credit for agriculture. In response to the statement, "I believe students should receive science credit toward high school graduation for agriculture courses," 88.8% agreed, 6.1% were undecided, and 5.1% were opposed.

The teachers also felt that agriculture should be recognized as a science for admission to post-secondary institutions. In response to the statement, "I believe Arkansas colleges and universities should accept agriculture courses as a science credit toward meeting admission requirements," 85.3% agreed, 9.5% were undecided, and 5.2% were opposed.

A majority of the teachers believed that selected educators and parents in their school districts would support granting science credit for agriculture. As shown in Table 1, perceived support was highest for parents and lowest for science teachers.

Table 1
Support for Granting Science Credit for Agriculture, as Perceived by Agriculture Teachers

Statement	Disagree %	Neutral %	Agree %
Parents in my school district would support granting science credit toward high school graduation for agriculture courses. (n=210)	2.4	12.9	84.7
My building administrator (principal or vocational director) would support granting science credit toward high school graduation for agriculture courses. (n=208)	6.3	17.8	76.0
The guidance counselor(s) in my school would support granting science credit toward high school graduation for agriculture courses. (n=208)	5.3	19.7	75.0
The science teacher(s) in my school would support granting science credit toward high school graduation for agriculture courses. (n=209)	10.5	25.4	64.5

Objective Two -- Effects of Offering Science Credit

As a group, teachers indicated that offering science credit for agriculture would have positive effects on their programs. As shown in Table 2, over 80% of the teachers agreed that offering science credit for agriculture would: (a) increase enrollment in agriculture, (b) benefit students, (c) enhance the image of the agriculture program, and (d) cause the agriculture and science teachers to work together more closely.

As indicated previously, a large percentage (86.3%) of teachers agreed that offering science credit for agriculture would increase their student enrollments. As shown in Table 2, 63.7% of the teachers agreed that offering science credit would increase the enrollment of average-ability students, 58.2% agreed that high-ability student enrollments would increase, and 50% agreed that the enrollment of low-ability students would increase.

The data in Table 2 also indicate that a sizeable minority of teachers have concerns about offering science credit for agriculture. For example, 27.9% of the teachers agreed that offering science credit would cause them to teach fewer practical skills in their classes, while 27.3% agreed that their agriculture courses would be thought of as "watered-down" science courses.

Table 2
Effects of Offering Science Credit for Agriculture, as Perceived by Agriculture Teachers

Statement	Disagree %	Neutral %	Agree %
Offering science credit for agriculture will:			
Increase enrollment in my agriculture program. (n=212)	3.8	9.9	86.3
Benefit students in my school. (n=212)	3.3	10.8	85.9
Enhance my agriculture program's image. (n=212)	5.7	11.8	84.7
Cause me to work more closely with the science teacher(s) in my school. (n=212)	4.2	15.6	80.2
Improve students' attitudes toward agriculture as a possible career. (n=212)	5.2	15.6	79.2
Increase the importance of my agriculture program within the school. (n-213)	9.4	12.2	78.4
Increase student interest in agriculture. (n=212)	2.8	19.3	77.8
Make science more meaningful for students in my school. (n=212)	6.1	19.3	74.5
Increase student interest in science. (n=213)	7.0	29.1	63.9

Table 2 (cont.)

Statement	Disagree %	Neutral %	Agree %
Cause more average-ability students to enroll in my agriculture courses. (n=212)	4.2	32.1	63.7
Require me to increase the science content in my agriculture courses. (n=212)	22.6	16.0	61.3
Cause more high-ability students to enroll in my agriculture courses. (n=213)	19.7	22.1	58.2
Result in higher student achievement in science. (n=212)	8.5	36.8	54.8
Cause more low-ability students to enroll in my agriculture courses. (n=212)	23.1	2[illegible].9	50.0
Cause me to teach <u>fewer</u> practical skills in my agriculture courses. (n=212)	53.3	18.9	27.9
Cause my agriculture courses to be thought of as "watered-down" science courses. (n=212)	51.4	21.2	27.3
<u>Prevent</u> me from teaching my students important vocational skills. (n=212)	60.4	21.7	18.0
<u>Not</u> serve the needs of the agricultural industry in my school district. (n=212)	72.7	15.1	12.3
Make me feel like a "second-rate" science teacher. (n=212)	72.2	17.9	9.9
<u>Weaken</u> my FFA chapter. (n=212)	75.5	17.0	7.5

Objective Three -- Support for Methods of Granting Science Credit

To satisfy this objective, teachers first rated their level of support for each of five methods of granting science credit for agriculture. As shown in Table 3, three of the methods were supported by 60% or more of the respondents. These three methods involved restricting science credit to a specified group of currently existing, modified, or new courses. Less than one-third of the teachers supported granting science credit for all agriculture courses, either with or without changes to enhance the science content of the courses.

Next, teachers selected their one most preferred method of granting science credit for agriculture from the list of five options. The two most favored methods both involved specifying a group of currently existing courses to receive science credit, either with (34%) or without (32%) changes made to enhance the science content of the courses. A sizeable percentage (23.9%) of the teachers preferred granting science credit for new agriculture courses specifically developed to emphasize science applications in agriculture. Small percentages of teachers preferred granting science credit for all agriculture courses, either with (4.6%) or without (5.6%) changes made to enhance the science content of the courses.

Table 3
Teachers' Level of Support for Methods of Granting Science Credit for Agriculture

Method	Oppose %	Neutral %	Support %
Award science credit for any one of a specified group of agriculture courses, with changes made to enhance the science content of the courses. (n=212)	16.0	18.4	65.6
Award science credit for any one of several new agriculture courses, specifically designed to teach science applications in agriculture. (n=212)	16.0	20.3	63.7
Award science credit for any one of a specified group of agriculture courses, with no changes in course content. (n=211)	19.9	18.5	61.6
Award science credit for all agriculture courses, with changes made to enhance the science content of the courses. (n=211)	53.6	15.2	31.2
Award science credit for all agriculture courses, with no changes in course content. (n=211)	64.0	15.2	20.9

Objective Four -- Support for Methods of Certifying Teachers

For this objective, teachers first rated their level of support for each of four methods of certifying teachers to teach agriculture for science credit. The largest percentage of teachers (71.7%) supported granting an endorsement in agricultural science to all teachers currently holding a valid agriculture teaching certificate. Granting an agricultural science endorsement to only those teachers holding valid certificates in both agriculture and science was supported by the smallest percentage (17.9%) of teachers. Table 4 shows the response percentages for each of the four certification methods.

Next, respondents selected their one most preferred method of certifying teachers to teach agriculture for science credit from the list of four options. Granting an agricultural science endorsement to all teachers currently holding a valid agriculture certificate was the method most favored by 43.3% of the respondents. A sizeable percentage (37.8%) of teachers most favored granting an agricultural science endorsement to only those certified agriculture teachers completing an agriscience in-service education workshop. Endorsing only teachers certified in both agriculture and science was the method most preferred by 11.9% of respondents. Finally, 7.0% of respondents most preferred granting an agricultural science endorsement to only those certified agriculture teachers scoring above a designated level on an agricultural science achievement test.

Table 4
Teachers' Level of Support for Methods of Certifying Agriculture Teachers to Offer Science Credit for Agriculture

Method	Oppose %	Neutral %	Support %
Grant an endorsement in agricultural science to all teachers currently holding a valid agriculture certificate. (n=212)	13.8	14.7	71.5
Grant an endorsement in agricultural science to only teachers holding a valid agriculture certificate, and completing a special agricultural science education in-service workshop. (n=212)	24.1	19.3	56.6
Grant an endorsement in agricultural science to only teachers holding a valid agriculture certificate, and scoring above a designated level on an agricultural science achievement test. (n=212)	54.0	25.1	20.8
Grant an endorsement in agricultural science to only teachers holding valid certificates in both agriculture and science. (n=212)	64.6	17.5	17.9

Objective Five -- Science Content Currently Taught

The Arkansas Science Curriculum Framework (Arkansas Department of Education, 1993) contains 50 learner outcomes (objectives) for secondary school science. These objectives are divided into five strands (content areas): (a) scientific inquiry, eight objectives; (b) connections and applications, six objectives; (c) physical systems, 17 objectives; (d) life systems, nine objectives; and (e) earth and space systems, 10 objectives.

To assess the degree to which agriculture teachers were currently teaching content related to the state secondary school science objectives, a random sample (proportionally stratified by strand) of 26 objectives (52%) was listed in the survey instrument. For each objective, respondents were instructed to circle "yes" if the objective described content they currently taught in one or more agriculture courses; respondents were instructed to circle "no" if the objective described content they did not currently teach in any agriculture course.

The respondents taught the highest percentage of objectives in the connections and applications strand, which emphasizes the relationship between science and its common applications. Respondents taught the lowest percentage of objectives in the physical science strand, which emphasizes chemistry and physics. Overall, the teachers reported providing instruction related to slightly over one-half of the 26

objectives investigated. Table 5 summarizes data concerning the science objectives currently taught, as reported by the respondents.

Table 5
Science Objectives Currently Taught, as Reported by Agriculture Teachers

Strand (Example objective)	Number of Objectives Sampled	Objectives Taught $\overline{X}$	SD	%
Connections & Applications (n=206)	3	2.66	.73	88.7
Life Systems (n=201)	5	3.79	1.26	75.8
Scientific Inquiry (n=208)	4	2.18	1.20	54.5
Earth/Space Systems (n=202)	5	2.29	1.33	45.8
Physical Science (n=199)	9	3.53	2.65	39.2
Total (n=188)	26	14.32	5.57	55.1

Objective Six -- Credit Hours and Grades in College-Level Science and Mathematics

The final objective of the study was to determine the number of credit hours and average grades earned by the respondents in college-level science and mathematics. The respondents reported earning the most semester credit hours in biology followed by chemistry. Teachers reported earning the least number of credit hours in physics; fewer than 20% of the teachers had taken any coursework in this area. Teachers reported earning the highest average grades in earth sciences (including soils), while earning the lowest average grades in chemistry. Table 6 summarizes data related to the credit hours and grades earned in science and mathematics, as reported by the teachers.

Table 6
College Science and Mathematics Credit Hours and GPAs, as Reported by Agriculture Teachers

	Semester Credit Hours				GPA Earned*			
Area	n	$\overline{X}$	SD	Med.	n	$\overline{X}$	SD	Med.
Biology	204	11.58	6.29	10.0	204	2.74	0.66	3.0
Chemistry	210	10.00	3.39	10.0	206	2.43	0.74	2.0
Earth Sciences	209	6.55	4.29	6.0	202	3.04	0.65	3.0
Mathematics	207	4.91	2.83	3.0	203	2.58	0.74	3.0
Physics	197	0.76	1.79	0.0	36	2.78	0.76	3.0

*Note. Based on A=4, B=3, C=2, D=1, and F=0.

CONCLUSIONS AND RECOMMENDATIONS

1. Because of the perceived level of support by selected educators and parents, any initiative to secure science credit for agriculture should be planned and conducted as a cooperative effort involving these individuals.

2. Agriculture courses offered for science credit must contain relevant, rigorous science content that is taught in an applied context. Such courses would help alleviate concerns that science credit for agriculture will decrease the teaching of practical skills or result in agriculture being perceived as "watered-down" science.

3. Science credit should only be sought for a specified group of agriculture courses. A committee of agricultural and science educators should examine the content of currently existing courses to determine if they qualify for science credit, either with or without modification. Consideration should also be given to implementing new courses specifically designed to teach science in agriculture. Knowing that a majority of agriculture teachers support each of these three methods should allow decision makers to select the most educationally sound option(s).

4. Majority support exists for granting certified agriculture teachers an endorsement to teach agriculture for science credit either through blanket certification (certify all teachers holding valid agriculture certificates) or through successful completion of an agriscience education in-service workshop. Even though the blanket endorsement is most popular with teachers, the researcher recommends that certification be earned through successful workshop completion.

5. As a group, the teachers reported that they taught material related to over one-half of the Arkansas science curriculum objectives studied. Further research should be conducted to determine the depth and rigor of the instruction provided.

6. Initial efforts to identify agriculture courses for science credit should focus on those related to the life sciences (e.g. plant- and animal-related courses). This recommendation is based on both the distribution of science objectives currently taught by the respondents and on their college science coursework.

7. In-service workshops should be conducted to assist teachers in infusing science (especially physics) into agricultural mechanics courses, regardless of whether science credit is sought for such courses. This recommendation is based on the teachers' lack of coursework in physics and on the low percentage of physical science objectives taught by the respondents.

8. On average, Arkansas agriculture teachers reported having earned the credit hours and grades necessary to qualify for science certification (biological and general science endorsement). Eligible teachers should be encouraged to complete the NTE science specialty exam and become science certified, especially if they desire to teach agriculture for science credit.

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ARKANSAS AGRICULTURAL TEACHERS' OPINIONS CONCERNING SCIENCE CREDIT FOR AGRICULTURE: A CRITIQUE

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It is extremely interesting to watch the various states move into and through the agriscience change process. Some states, like Michigan and Arizona, have encouraged its teachers to be certified in science for decades. Many teachers in the state of Washington, for example, have been able to offer secondary agricultural courses for science credit since at least the 70s. There are pockets of success throughout the United States. Based on previous research and responses to an AAAE e-mail question earlier this year asking states to acknowledge statewide efforts for documenting science content and establishing science credit courses at both the high school and postsecondary levels, Arkansas is attempting the process in a fashion that should result in positive outcomes. Initially, the researcher obtained funding from the Arkansas Vocational Agriculture Teachers Association. This step ensures that the secondary teachers have more than a passing interest in the process.

However, several concerns emerged from the study. The first concern revolves around the theme, "science content." This term produces images that range from sterile lecture format education without any thought of a youth organization to incorporating the state's science objectives into our successful three component applied educational process. Of course, the three components include classroom/laborartory, experiential education and leadership development. Gaining science credit for agricultural education does not imply departing from our successful three component educational process. Incorporating and/or documenting the state's science objectives within agricultural curriculums is an approach that has been successfully implemented in many states.

My greatest concern is the certification question. If Arkansas is concerned about the acceptance of agricultural science as "real science" then the agricultural teachers must be certified in the same manner as regular science teachers. Anything less will be perceived as "watered-down" science. The findings indicate that agricultural teachers have enough credits to be certified in science and an NTE science specialty exam must be passed.

The final concern is why aren't science teachers involved with this process? I would take every question in Table 1 and ask the appropriate parties their feelings toward granting science credit for agriculture. This advice seems to be the key ingredient in states that have model agriscience programs.

The Arkansas agricultural teachers are ready for change. The question is, are the science teachers ready for this change? The only answer to this question is to involve them early in the process and to have agricultural teachers become fully certified in science. I encourage the Arkansas state leaders to continue to review the literature and to visit with leaders from other states that have model agriscience programs in place. Many bits of wisdom can be shared for a very small price.

ATTITUDES OF ILLINOIS HIGH SCHOOL SCIENCE TEACHERS TOWARD THE AGRICULTURAL INDUSTRY AND EDUCATIONAL PROGRAMS IN AGRICULTURE

Edward W. Osborne James E Dyer*

Introduction/Theoretical Framework

Thus far, curriculum redesign efforts in the 1990s in agricultural education have converged on identifying promising strategies that incorporate more science into high school agricultural curricula. Individual states have developed varying models for this new "agriscience" instruction, from selective incorporation of science principles into agriculture courses to developing completely new agriscience courses designed to attract a broader clientele. Illinois has been a leading state in the development and implementation of this latter type of agriscience instruction. Four, one-semester Science Applications in Agriculture courses were developed from 1990 through 1994. These included two semesters each in Biological Science Applications in Agriculture (BSAA) and Physical Science Applications in Agriculture (PSAA). These new courses were designed to teach science as both content and process by connecting science concepts and principles to specific applications/practices in agriculture. Experiments have served as the predominant teaching method in these laboratory-based courses. These courses were developed to boost the image of secondary agriculture programs and to attract a larger and more diverse student body into high school agriculture courses (Osborne, Moss, and Stahl, 1990).

Efforts to highlight the scientific side of agriculture have also been dramatically stepped up by Colleges of Agriculture across the nation as they have sought to boost their enrollments. Many administrators in these programs have turned their attention toward high school science teachers and classrooms as a prime recruiting arena. Thus, science teachers' attitudes toward agriculture and the extent to which they discuss agricultural issues in their classes have the potential to encourage or discourage students in choosing agriculture as a college major or professional pursuit. Perceptions of educational programs in agriculture, at both the secondary and postsecondary levels, may also influence the career "advice" that science teachers give to their students.

Calls for closer collaboration between basic science and applied science have been issued from both the basic disciplines and applied fields. The American Association for the Advancement of Science has recommended that applications of science be taught in relevant technological fields, such as agriculture (American Association for the Advancement of Science, 1993). As the past five years of curriculum reform indicate,

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agricultural education is certainly in agreement with this recommendation.

The theoretical/conceptual model for this study consisted primarily of the factors that influence high school science teachers' decisions to (1) encourage students to pursue agricultural careers and (2) collaborate with secondary agriculture teachers in offering agriscience courses like BSAA and PSAA. The fundamental theoretical basis for this study lay in the work of Fishbein and Ajzen (1975). As adapted to this context, this theory suggests that science teachers' personal experiences, observations, knowledge, and values about agriculture affect their attitudes about agriculture, which in turn affect their beliefs, their intentions, and finally, their decisions to participate. Thus, knowledge of science teachers' attitudes about the agricultural industry and educational programs in agriculture is a likely determinant of the extent to which science teachers encourage their students to pursue agricultural careers. These attitudes also influence their tendencies to collaborate with agriculture teachers in offering new agriscience courses.

Illinois has been a leading state in the development and dissemination of innovative secondary agriscience curricula. Successful implementation of the BSAA and PSAA courses has assumed support and collaboration from local science teachers. Yet, the attitudes of science teachers toward the agricultural industry and educational programs in agriculture, which theoretically influence science teachers' decisions to support and collaborate, have not been investigated.

Increases in student achievement have been found in courses that integrate agriculture and science (Enderlin, 1992; Enderlin, 1991; Roegge and Russell, 1988). Science teachers are important stakeholders in agriscience courses (Osborne, 1994; Johnson and Newman; 1993). Extensive resource sharing and collaboration among science and agriculture teachers has been documented in several recent studies (Ohene-Adjei, 1995; Whent, 1994). However, in a national study Dormody (1992) found that levels of resource sharing among science and agriculture teachers were low (one to two times per year), even though a majority of agriculture and science teachers reported that they shared resources with each other. In terms of recruitment of students into Colleges of Agriculture, high school science teachers have been identified by students as an important influence in their decisions to choose agriculture as their field of study (Scofield, 1995).

Purpose and Objectives

The purpose of this study was to determine the attitudes of Illinois high school science teachers toward agriculture and secondary level educational programs in agriculture. The following research questions were addressed:

1. What were the attitudes of high school science teachers in Illinois toward agriculture as a career field and agricultural technologies?

2. What were the attitudes of high school science teachers in Illinois toward secondary agriculture programs?

3. What were science teachers' perceptions of secondary science and agriculture program quality?

4. What was the influence of Science Applications in Agriculture courses on science teachers' attitudes toward agriculture?

5. What was the influence of science teacher presage variables on their attitudes toward agriculture?

Procedures

A descriptive survey research design was used in the study. The target population ($N = 2758$) was all high school science teachers in Illinois during the 1994-95 school year, as identified by the Illinois State Board of Education. Using Krejcie and Morgan's (1970) formula, a sample size of 336 teachers was needed, based upon a 5% degree of accuracy and a 95% confidence level. The simple random sample of teachers was selected using random number generation with the Microsoft Excel computer program.

The mailed questionnaire was adapted from one developed by the researchers for a previous study on high school guidance counselors attitudes toward agriculture. Reliability estimates for the original version of the questionnaire ranged from .80 to .99. The final questionnaire consisted of five parts, including a section on teacher demographics. Estimates of internal consistency (reliability) for this study ranged from .56 to .93 on the constructs as follows: agriculture program quality (.93), agriculture as a career field (.87), agricultural technologies (.72), high school agriculture programs (.56), and science program quality (.86). While the reliability estimate for one construct, high school agriculture programs, was lower than desirable, the researchers were reluctant to make additional modifications in the questions comprising this construct, since it was also used in an earlier study with guidance counselors (Dyer & Osborne, 1994). Reliability estimates in that study were .80 or better for all constructs. Five-point, Likert-type scales were used to measure teacher attitudes and perceptions. Four mailings yielded a total response rate of 63.1% and a usable return of 62.2% (211). Due to the unlikelihood of obtaining additional responses, a comparison of early and late respondents was made. No significant differences were found on the major constructs of the study; therefore, the results from the data sample were generalized to the target population of high school science teachers in Illinois. Measures of central tendency and association, as well as analysis of variance were used to summarize and analyze the data. Post hoc group comparisons were made using the Tukey-B test.

Findings

Approximately one-third (36.8%) of the science teachers were female. The average school size was 1452 students, with 25.6% of the schools having 600 or less students. Years of experience as a science teacher ranged from 1 to 38 ($\underline{M}$ = 15.56, $\underline{M}_o$ = 15.0).

Nearly one-fourth (24.2%) of the science teachers indicated they were familiar with the Science Applications in Agriculture courses, and 8.4% reported that they had participated in an SAA workshop. A large majority of the teachers (80.5%) reported that they were at least somewhat familiar with the agricultural industry (see Table 1). Similarly, when science teachers were asked if they would like to learn more about the agricultural industry, 58.2% responded "yes," and another 36.8% said "maybe."

Table 1
Frequency and Percentage of Science Teachers' Familiarity with the SAA Courses and the Agricultural Industry

	SAA Familiarity		Ag Industry Familiarity	
	f	%	f	%
Very familiar	8	3.9	39	19.0
Somewhat familiar	42	20.3	126	61.5
Not familiar	157	75.8	40	19.5

Science teachers who taught in high schools with an agriculture program were asked to indicate the extent to which they collaborated with the local agriculture teacher in teaching science and agriscience. As shown in Table 2, the greatest collaboration occurred in the areas of sharing lab materials and teaching materials and discussing teaching strategies and course content. Approximately one-half of the science teachers reported some collaboration with agriculture teachers in each of these areas. However, in no areas did at least 10% of the science teachers report much collaboration with the agriculture teacher(s) in their school.

Table 2
Frequency and Percentage of Science Teachers by Extent of Collaboration with Agriculture Teachers

	Much		Some		None	
	f	%	f	%	f	%
Sharing lab materials[A]	5	8.62	28	48.28	25	43.10
Sharing lab space[B]	1	1.75	8	14.04	48	84.21
Sharing teaching materials[A]	4	6.90	25	43.10	29	50.00

Discussing teaching strategies[B]	4	7.02	23	40.35	30	52.63
Discussing course content[B]	3	5.26	28	49.12	26	45.62
Team teaching[B]	1	1.75	5	8.77	51	89.48

[A]58 responses, [B]57 responses

Teachers were asked to report the size of the community in which they grew up and lived at the time of the study. Approximately three-fourths of the teachers grew up in an urban location, and a similar percentage reported that they now lived in urban areas (see Table 3).

Table 3
Frequency and Percentage of Science Teachers by Community Where They Grew Up and Now Live

	Grew Up		Now Live	
	f	%	f	%
Large urban (over 100,000)	59	28.8	48	23.4
Medium urban (25,000-100,000)	51	24.9	67	32.7
Small urban (2,500-24,999)	36	17.6	45	22.0
Rural town (<2,500)	15	7.3	24	11.7
Rural area, but not on a farm	16	7.8	13	6.3
On a farm	28	13.7	8	3.9

Teachers were also asked to indicate all the areas of science that they teach. As expected, biology and chemistry were the most often listed science teaching areas, but a considerable percentage of the teachers were also found to teach in other areas as well (see Figure 1).

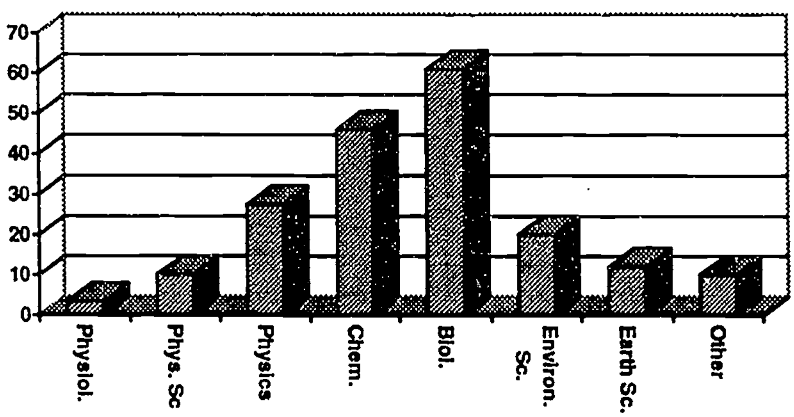

Figure 1. Percentage of Science Teachers by Science Teaching Area

Science teachers reported their most positive attitudes toward agricultural technologies (summated $\underline{M} = 37.43$ on 9 items). Positive attitudes were also found for the constructs pertaining to agriculture as a career field and high school science program quality. Science teachers were uncertain about their attitudes toward high school agriculture programs and rated agriculture program quality as average (see Table 4).

Table 4
Summated Mean of Science Teacher Attitudes and Perceptions by Construct

Construct	No. of Items in Construct	Summated Mean	Standard Deviation	Range*
Agricultural Technologies	9	37.43	3.80	agree
Agriculture as a Career Field	11	43.94	5.62	agree
Science Program Quality	8	33.22	3.84	high
H.S. Ag Program Quality	8	27.47	6.46	average
High School Educational Programs in Agriculture	17	56.03	4.71	uncertain

Note: Summated mean scores were interpreted by extrapolating the following scale which has been frequently used for interpreting individual Likert-type items on a five-point scale: 1.0-1.49, strongly disagree/very low; 1.5-2.49, disagree/low; 2.5-3.49, uncertain/average; 3.5-4.49, agree/high; and 4.5-5.0, strongly agree/very high.

Science teachers agreed with eight of the nine statements comprising the "Agricultural Technologies" scale. These included: (a) agricultural technologies have a positive impact on the U.S. standard of living, (b) biotechnology in agriculture will provide safe, beneficial products for society, (c) science-based technologies in agricuiture can help resolve environmental concerns, (d) sustainable agriculture practices can help protect the environment, (e) more biological control of pests should be used, (f) agriculture has the scientific capacity to develop new, useful technologies, and (g) agriculture should do more to publicize its scientific contributions to society. Teachers were uncertain as to whether agriculture has greatly contributed to deterioration of the environment.

Teachers strongly agreed that agriculture is one of Illinois' most important industries. They also agreed with eight of the remaining ten items in the "Agriculture as a Career Field" scale. These included: (a) there are numerous employment and science-based career opportunities in agriculture, (b) the field of agriculture incorporates many applications of scientific principles, and (c) agriculture as a field of study is a blend of science principles and agricultural practices. They also agreed that agriculture is a scientific area of study, a highly technical field, a good career choice for students today, and a constantly changing field. However, they disagreed that they encourage their students to pursue agriculture as a career field, and they were uncertain whether science teachers in their school had a positive image of agriculture.

Teachers rated the overall quality of the science programs in their schools as high, but rated the quality of the agriculture program at their high school as only average. As shown in Table 5, science teachers rated their science programs as high in all areas, and very high in "value of the science program to students who attend college." By contrast, science teachers rated the agriculture program in their school as high on five of the eight dimensions and average in the areas of academic ability of students, value of program to those who attend college, and reputation of the program among students.

Table 5
Mean and Standard Deviation of Program Quality Rating by Science Teachers

	Science Program Quality		Ag Program Quality	
	M	SD	M	SD
Competency and preparation of teachers	4.37	.64	3.84	.85
Academic ability of students	3.59	.77	2.78	.77
Value of the program to students who plan to work upon graduation	3.56	.81	3.50	.90
Value of the program to students who attend college	4.54	.54	3.12	1.10
Quality of instruction	4.36	.61	3.81	.98
Reputation of the program among faculty and administration	4.40	.66	3.52	1.17
Reputation of the program among students	4.13	.70	3.21	.12
Overall quality of the program	4.26	.61	3.67	.91

Science teachers were also uncertain about their attitudes toward high school agriculture programs (see Table 4). Science teachers felt that (1) high school agriculture courses are beneficial for higher achieving students; (2) stronger ties should be made between agriculture and science curricula; (3) agriculture programs, including lab instruction, should become more science based; (4) courses like BSAA make scientific principles more meaningful; and (5) selected agriculture courses, like BSAA, are appropriate for lab science credit. They also agreed that basic study in science, followed by applications of science in agriculture, is a good approach for learning science. The range of mean scores for these items was 3.53 to 3.89 on the five-point scale.

However, science teachers were uncertain about the statements that follow (item mean scores ranged from 2.62 to 3.45). In addition, they disagreed that high school agriculture courses are better suited for male students.

(1) College bound students should be encouraged to enroll in high school agriculture courses;

(2) High school agriculture teachers have limited background/preparation in science;
(3) Science applications in agriculture are best taught by agriculture teachers;
(4) High school study in agriculture is easier than most other subjects;
(5) High school agriculture courses are beneficial for lower achieving students;
(6) High school agriculture programs should primarily be offered in rural communities;
(7) High school agriculture courses should focus on preparing students for further study in agriculture;
(8) Most high school students should take some course work in agriculture; and
(9) High school agriculture programs are too vocationally oriented.

Analysis of variance results showed that science teachers' attitudes toward agriculture as a career field were significantly higher if they (1) were familiar with the SAA courses, (2) grew up on a farm, (3) lived in a rural area, (4) were familiar with the agricultural industry, and (5) wanted to learn more about agriculture (see Tables 6 and 7). In addition, science teachers from smaller schools tended to hold more positive attitudes toward agriculture as a career field ($r = -.37$, $p<.05$).

Table 6
Summary Data for Science Teacher Attitudes Toward Agriculture by Group

Variable/Group	n	M	SD	SE
Familiarity w/ SAA Courses				
Very familiar	7	47.86	6.26	2.34
Somewhat familiar	41	46.27^{A}	5.34	.83
Not familiar	149	43.12^{A}	5.46	.45
Familiarity w/ Ag Industry				
Very familiar	39	47.39^{A}	6.39	1.02
Somewhat familiar	117	43.99^{A}	4.97	.46
Not familiar	39	40.31^{A}	4.48	.72
Want to Learn More About Ag				
Yes	114	45.45^{AB}	5.18	.49
Maybe	68	41.76^{A}	5.25	.64
No	9	41.00^{B}	7.71	2.57
Grew Up				
Large urban area	58	42.93^{A}	5.35	.70
Medium urban area	47	42.62^{B}	5.66	.82
Small urban area	34	43.68	4.90	.84
Rural town	14	44.43	7.60	2.03
Rural area	15	45.80	5.12	1.32
On a farm	27	47.41^{AB}	4.90	.94

Now Live				
Large urban area	47	43.28	5.12	.75
Medium urban area	62	42.76^{A}	5.03	.64
Small urban area	42	43.70	5.52	.85
Rural town	23	46.91^{A}	6.66	1.34
Rural area	13	44.85	6.07	1.68
On a farm	8	48.13	6.34	2.25

Note: Means with the same letter superscript within categories are significantly different.

Table 7
Analysis of Variance of Science Teacher Attitudes by Group

Source	df	SS	MS	F	p
Familiarity w/ SAA Courses					
Between groups	2	423.10	211.55	7.09	<.01
Within groups	194	5785.66	29.82		
Total	196	6208.75			
Famil. w/ Ag					
Between groups	2	977.60	488.80	18.12	<.001
Within groups	192	5180.53	26.98		
Total	194	6158.13			
Want to Learn More About Ag					
Between groups	2	658.55	329.28	11.55	<.001
Within groups	188	5358.42	28.50		
Total	190	6016.97			
Grew Up					
Between g oups	5	523.51	104.70	3.51	<.01
Within groups	189	5634.62	29.81		
Total	194	6158.13			
Live					
Between groups	5	463.99	92.80	3.08	<.05
Within groups	189	5694.14	30.13		
Total	194	6158.13			

Analysis of variance results showed that attitudes toward educational programs in agriculture were significantly higher if teachers were (1) familiar with the SAA courses, (2) wanted to learn more about agriculture, and (3) lived on a farm (see Table 8). In addition, higher mean scores for perceptions of high school agriculture program quality

were reported by science teachers who had participated in SAA workshops (yes - M = 32.50, no - M = 26.61) ($F = 6.13, p < .05$). In addition, those who taught in smaller schools ($r = -.32, p = <.05$) and had fewer years of teaching experience ($r = -.32, p = <.05$) tended to have more positive attitudes toward educational programs in agriculture. No significant relationships were found between science teaching area and attitudes toward agriculture or educational programs in agriculture.

Table 8
Summary Data for Science Teacher Attitudes Toward Educational Programs in Agriculture by Group

Variable/Group	n	M	SD	SE
Familiarity w/ SAA Courses*				
Very familiar	8	58.50	3.07	1.09
Somewhat familiar	39	57.69^{A}	4.55	.73
Not familiar	148	55.39^{A}	4.58	.38
Want to Learn More About Ag**				
Yes	108	55.67^{A}	4.64	.45
Maybe	71	55.41^{B}	4.03	.49
No	10	51.40^{AB}	5.32	1.68
Now Live***				
Large urban area	46	55.43^{A}	3.59	.53
Medium urban area	64	55.00^{B}	4.63	.58
Small urban area	41	56.29^{C}	4.93	.77
Rural town	22	56.59^{D}	4.70	1.00
Rural area, not on a farm	12	56.25^{E}	4.09	1.18
On a farm	8	62.00^{ABCDE}	4.50	1.59

Note: Means with the same letter superscript within categories are significantly different.
*$F = 5.27, p<.01$; **$F = 7.11, p<.01$; ***$F = 3.82, p<.01$

Conclusions, Recommendations, and Implications

Illinois science teachers perceive agriculture as a scientific field that is a good career choice for students today. Although they have positive attitudes toward agriculture, they do not encourage their students to pursue agriculture as a career field. Further research needs to be conducted to identify the reasons for this conflict. In addition, Illinois science teachers have positive attitudes toward agricultural technologies, including biotechnology in agriculture. They feel they have an awareness of the agricultural industry but would like to learn more. This teacher group appears to be receptive to targeted information about agriculture. Results from this study suggest that as science teachers learn more about the agricultural industry and educational programs in agriculture, their attitudes become more positive. Thus, educational and promotional efforts targeted to this group may push attitudes to a higher plateau, one that begins to

change beliefs, intentions, and actions that will more strongly encourage students to pursue agricultural careers.

As a whole, Illinois science teachers are uncertain about their attitudes toward high school agriculture programs. They also feel that high school agriculture programs are of average quality. Science teachers in Illinois are uncertain as to the student clients, setting, and purpose of high school agriculture programs, as well as agriculture teacher preparation in science. Efforts/programs to inform and build a more positive image of high school agriculture programs should be directed toward science teachers. A large majority of secondary science teachers in the state teach in schools with no agriculture program, and thus, have little direct experience from which to form impressions about agriculture programs. Most high school agriculture programs in Illinois are located in smaller schools, and this study found that science teachers in smaller schools have more positive attitudes toward agriculture and educational programs in agriculture. Thus, garnering more widespread support for secondary agriscience curricula from the science teacher group will likely require an expansion of agriculture programs into larger schools. In the immediate future, Colleges of Agriculture may be more successful in their recruiting from science classes/teachers if they work with teachers in smaller schools where SAA courses are offered. A long-term informational campaign aimed at science teachers in larger schools may bring higher recruitment returns in the future.

Many secondary science teachers in Illinois are collaborating with agriculture teachers in key areas, but this collaboration does not appear to be extensive or continuous. Greater information sharing and collaboration among agriculture and science teachers could improve science teachers' attitudes. Effective strategies for collaboration should be identified through research and shared with agriculture and science teachers.

In addition, implementation of BSAA and/or PSAA in more Illinois high schools will likely increase science teachers' attitudes toward agriculture and agricultural education. Science teachers are supportive of the SAA courses. Those familiar with the courses have more positive attitudes toward agriculture and educational programs in agriculture. In addition, those who have participated in SAA workshops have higher perceptions of agriculture program quality. Workshops should continue to be offered that involve agriculture and science teacher teams. Science teachers are supportive of agriscience in general, and the SAA courses in particular, feeling that these courses merit lab science credit. Implementation of BSAA/PSAA in additional schools may be well received and could be expected to have a positive influence on science teachers' attitudes toward agriculture.

Areas of further research include: (a) identifying effective collaboration strategies for science and agriculture teachers; (b) development and testing of a model for expanding agriculture programs into larger secondary schools, giving an emphasis to agriscience curricula; (c) determining why science teachers do not encourage their students to pursue agricultural careers, even though they view agriculture positively; (d) monitoring science teacher's perceptions of agriculture program quality as informational and promotional

programs are implemented; (e) determining effective strategies for involving science teachers from schools without agriculture programs in agricultural activities; (f) identifying ways to address science teachers' concerns about high school agriculture program quality.

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ATTITUDES OF ILLINOIS HIGH SCHOOL SCIENCE TEACHERS TOWARD THE AGRICULTURAL INDUSTRY AND EDUCATIONAL PROGRAMS IN AGRICULTURE: A CRITIQUE

Jack Elliot, The University of Arizona

The authors are to be commended for involving science teachers in the study and for using a visual other than a table in their paper. The researchers are to be complemented for following a sound research design and for presenting their findings in a clear format.

I would like to focus on several statements found in the conclusions. The first one is, "Results from this study suggest that as science teachers learn more about the agricultural industry and educational programs in agriculture, their attitudes become more positive." Prior to this statement it is noted that science teachers are receptive to targeted information about agriculture. Later in the paper the authors point out that science teachers support agriscience and, in fact, feel that the SAA courses merit lab science credit. It seems to me that science teachers are ready and open to dialogue and interaction with agriscience educators, but are agriscience educators up to the challenge? Are there enough agriscience resources (time, energy and money) to develop and then provide targeted information about agriculture to science teachers? Should it be an extremely high priority for the profession?

The uncertainty that science teachers feel toward high school agricultural programs, as the authors point out, is directly related to their experiences with high school agricultural programs. That experience is, for the most part, sporadic. And, as stated above, does the profession have enough resources to provide positive agriscience experiences for science teachers?

This study raises some excellent issues and the authors offer some intriguing areas for further research. Other future studies could focus on identifying agricultural content within existing science courses or attitudes of agricultural education teachers toward science teachers who incorporate agricultural content within their courses or assessing the agricultural literacy of science teachers. The most important aspect of this study is that, "positive involvement with science educators, results in positive attitudes toward agriscience programs." The choice is simple, positive experiences must increase.

A FACTOR ANALYSIS OF ATTITUDES OF ILLINOIS GUIDANCE COUNSELORS TOWARD AGRICULTURE PROGRAMS

James E. Dyer Edward W. Osborne[1]

Introduction

Throughout much of its existence, agricultural education has prepared students for entry into the production phase of agriculture. Over the past decade, however, the focus and content of agricultural education have been criticized as outdated (National Research Council, 1988). The National Research Council (NRC) recommended that applied science courses in agriculture be available as optional elective science courses, incorporating more agriculture into the curriculum, and providing for more effective teaching of science.

Research findings have supported the NRC's contention that integration of science into agriculture curricula is a more effective way to teach science (Enderlin & Osborne, 1991, 1992; Enderlin & Petrea, 1993; Roegge & Russell, 1990; Whent and Leising, 1988). However, according to Enderlin and Osborne (1992), for science-intensive courses to be effective, various school personnel and educational leaders must feel a change is needed and work closely together to promote and support the concept.

Especially important is the support of guidance counselors. A review of literature produced several studies which show guidance counselors to play an important role in the educational and career plans of students (Holder, 1973; Slocombe, 1986; Thompson & Russell, 1993). Other investigators have documented counselors' support for agricultural and/or vocational education (English, 1992; LaBorde, 1973; Matulis, 1988; McGhee, 1975; Pryor, 1984; Thompson, 1989).

In one of the most recent studies, Arizona counselors viewed agricultural education as too vocational. They expressed opinions that agricultural education needs to adapt to a changing technological society (English, 1992). In Illinois that adaptation has taken place. In 1991, Biological Science Applications in Agriculture (BSAA) and Physical Science Applications in Agriculture (PSAA) courses were offered for the first time in an attempt to upgrade the quality of agriscience instruction. No study determining Illinois guidance counselors' attitudes toward agricultural education has been conducted since that inclusion.

Thompson (1989) and Matulis (1988) conducted studies in Illinois in the mid-1980s. Both researchers reported counselor attitudes as "neutral"--perceiving agricultural education programs to be of only average quality. Have Illinois guidance counselors' attitudes changed since the inclusion of science-intensive agriculture classes in the agricultural education curriculum? In attempting to find an answer, Thompson's and Matulis' studies readily served as a base from which a change in attitudes could be measured.

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The theoretical framework for this study was provided by Fishbein and Ajzen (1975). They determined that intentions to participate in an activity could be predicted based upon knowledge, observation, or other information about some issue. Greenwald (1989) supported this theory, reporting that individuals with positive attitudes toward a subject or situation tend to evaluate them positively. This suggested that a counselor's intentions to direct students to study or be involved in a field of agriculture may be predicted by analyzing his/her beliefs about agriculture as a career field and/or agricultural education in general.

Several factors contribute to the need to study the attitudes of counselors. The field of agriculture has changed so dramatically over the past decade that past attitudinal studies are now obsolete. As agriculture has become more scientifically and technologically oriented, those attitudes likely have changed. Of interest to agricultural educators today is how counselors have reacted to recent changes in both the focus and curriculum of agriculture programs. A review of literature revealed two deficiencies: (a) a lack of current information regarding the attitudes of Illinois counselors toward agricultural education, and (b) the influence of recent curriculum changes on those attitudes.

Purpose and Objectives

The primary purpose of this study was to determine the attitudes of Illinois guidance counselors toward agricultural and science education programs. A secondary purpose was to investigate the relationships of guidance counselor attitudes and selected demographic variables. Specifically, the study addressed the following research questions:

1. What were the attitudes of Illinois guidance counselors toward agricultural and science education programs?
2. What was the influence of applied science in agriculture courses on guidance counselors' attitudes toward agricultural education?
3. What was the relationship between counselors' attitudes about agriculture and the demographic characteristics: gender, age, school size, experience as a counselor, familiarity with course offerings, and background in agriculture?

Procedures

The study utilized a descriptive survey design. The target and accessible populations consisted of all Illinois high school guidance counselors ($\underline{N}$ = 1975). The Illinois State Department of Education roster of guidance counselors served as the population frame. Using Krejcie and Morgan's (1970) formula for determining sample size, 316 counselors were randomly sampled. Additional random samples of 50 principals and 50 agriculture teachers were selected from participating schools to triangulate counselors' responses as outlined by Borg and Gall (1989).

A five-part questionnaire specific to the questions addressed by the study was developed by the researchers, reviewed for face and content validity by an expert panel, and pilot tested using 25 counselors randomly selected from the target population and not included in the study. A reliability estimate was determined for constructs I-IV using Cronbach's alpha (range of $\underline{r}$ = .80 - .99).

A five-point Likert-type scale (1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree) was used for the 50 items which comprised Parts I, II, and III of the instrument. The 16 questions comprising Part IV of the questionnaire were also measured on a five-point Likert-type scale (1 = Very Low, 2 = Low, 3 = Average, 4 = High, 5 = Very High), but assessed counselors' attitudes toward agriculture and science program quality. The 11 demographical questions that comprised Part V of the instrument were close-ended and partially close-ended items. Triangulating instruments contained all but the demographical data.

Questionnaire packets were mailed to all participants with two-week and four-week follow-up mailings. Nonresponse error was controlled by contacting 20% of the nonrespondents and comparing their responses with those already received. Summated means of each of the questionnaire constructs were compared. An analysis of variance indicated no significant statistical differences between responses obtained from respondents and nonrespondents, or between early or late respondents at alpha .05, allowing generalization from the respondents to the sample and target populations. A total of 65.8% (n = 208) of the counselors, 84% (n = 42) of the principals, and 68% (n = 34) of the agricultural educators returned questionnaires. Questions for this analysis were selected based on their relationship to agricultural education programs.

Findings

Results obtained from questionnaires mailed to agriculture teachers and principals confirmed that the responses obtained from guidance counselors were indeed their true attitudes and perceptions. Responses obtained from agriculture teachers disagreed with those of counselors in only one area of perceptions: Agriculture Program Quality. Agriculture teachers believed that counselors perceived agriculture program quality to be higher than counselors actually rated it. However, principals confirmed the counselors' attitudes in this area. Both agriculture teachers and principals confirmed the attitudes of counselors about the remaining constructs.

Of the 208 counselors responding to the questionnaire, 106 (51%) were male. Respondents reported from 1 to 34 years of experience as a counselor (M = 16.52). Experience as a teacher ranged from 0 to 36 years (M = 8.61). Counselors' ages ranged from 25 to 66 years (M = 48.15). Fifty-six counselors reported paid work experience in agriculture. Of that group, 42 were male. Whereas a total of 10 counselors reported college agriculture coursework, five of those had no previous high school coursework. School size varied from 55 to 3,100 students (M = 1,320.22). In schools with agriculture programs, a range of 5 to 120 students was noted (M = 55.8).

A factor analysis was performed on the survey questions which measured attitudes and perceptions of agricultural education programs. A goal of factor analysis is to use as few factors as possible in representing relationships among non-observable factors utilizing observable variables. The basic assumption of factor analysis is that these underlying factors can be used to explain complex phenomena.

Bartlett's test of sphericity was used to test the hypothesis that the correlation matrix was an identity matrix. The hypothesis was rejected, indicating that the model was appropriate. Squared multiple correlations were used as estimates of the communality of

the items. Iterated principal-axis factoring with oblimin rotation was used to extract factors, providing oblique rotations. Items with rotated factor loadings of less than .40 were excluded from further analysis.

Five factors were identified as having Eigenvalues greater than or equal to one. However, three of those factors contained only two variables each and were not retained for further analysis as factors. The study focused on the two remaining factors which accounted for 38% of the total variance.

The two subscales of the Educational Programs construct are displayed in Table 1, along with the statements which comprise each factor. Those factors were labeled as "Program Emphasis" and "Scientific Nature of Agriculture." A high score on the Program Emphasis factor reflected more positive attitudes about the emphasis guidance counselors place on agricultural education programs. Reliability for this nine-item scale was .63.

Table 1
Factor Loadings of Educational Programs

Statement	Loading	M	SD
Factor 1: Program Emphasis		3.54	.50
More students should be encouraged to enroll in university agriculture programs.	.64		
More students should be encouraged to enroll in high school agriculture.	.74		
College bound students should be encouraged to enroll in high school agriculture courses.	.66		
High school courses are beneficial for higher achieving students.	.48		
High school agriculture courses should be primarily offered in rural communities.	.57		
Every high school student should take some course work in agriculture.	.67		
Selected high school agriculture courses, such as BSAA, are appropriate for lab science credit.	.46		
All high school students should be aware of the scientific nature of agriculture.	.57		
Stronger ties should be made between high school agriculture and science curricula.	.62		
Factor 2: Scientific Nature of Agriculture		4.33	.48
Agriculture is a scientific area of study.	.83		
Agriculture is a highly technical field.	.79		
There are numerous science-based career opportunities in agriculture.	.78		
Agriculture incorporates applications of scientific principles.	.76		

Factor 2 reflected counselors' perceptions about the Scientific Nature of Agriculture. A high score on this subscale indicated counselors' beliefs that agriculture is a science-based field of study. Reliability for this four-item scale was .83.

Research Question One

What were the attitudes of Illinois guidance counselors toward agricultural and science education programs?

The highest level of agreement was in the factor of Scientific Nature of Agriculture (M = 4.33). Of the 207 counselors who responded in this category, 202 either agreed or strongly agreed with statements comprising this factor. Counselors also expressed attitudes generally in agreement with the factor Program Emphasis (M = 3.54). This agreement contradicts findings from studies conducted by Matulis (1988) and Thompson (1989), indicating that Illinois guidance counselors have more favorable attitudes toward agricultural education today than in the mid-1980s.

As shown in Table 2, counselors perceived the work value of agricultural education to be greater than that of science programs. In each of the other seven areas of comparison, however, counselors perceived science programs to be higher in quality. The greatest mean differences resulted from comparisons in the categories of "academic ability of students," "reputation of program among faculty," and "reputation of program among students." Also. the size of the standard deviations indicates attitudes of counselors vary greatly from counselor to counselor.

Table 2
Comparison of Means of Counselor Attitudes Toward Agriculture and Science Programs

Variable	Agriculture	Science	M_{diff}
Teacher competency and preparation	3.80 (.82)	4.11 (.74)	-0.31
Academic ability of students	2.95 (.58)	3.81 (.65)	-0.86
Work value of program	3.86 (.80)	3.38 (.75)	0.48
College value of program	3.40 (.96)	4.25 (.80)	-0.85
Quality of instruction	3.76 (.91)	4.10 (.71)	-0.34
Reputation of program among faculty	3.25 (.98)	4.12 (.79)	-0.87
Reputation of program among students	2.97 (.88)	4.05 (.83)	-1.08
Overall quality of program	3.52 (.83)	4.08 (.71)	-0.56

Note. Numbers in parentheses are standard deviations. n = 63.

Research Question Two

What was the influence of applied science in agriculture courses on guidance counselors' attitudes toward agricultural education?

Counselors familiar with BSAA/PSAA courses (n = 40) expressed significantly higher perceptions of agricultural education (p = .004) as it pertained to the factor Program Emphasis than did counselors unfamiliar with BSAA/PSAA courses (Table 3). However, no significant differences were noted in the factor "Scientific Nature of Agriculture."

Both counselors who were familiar with BSAA/PSAA courses and those who reported that they were unfamiliar with the two courses perceived agriculture to be scientific in nature. All of the respondents agreed that science and agriculture are closely related. However, those familiar with BSAA/PSAA courses expressed significantly different and more favorable attitudes toward both the college value ($p = .031$) and work value ($p = .016$) of agricultural education.

Table 3
Comparison of Means of Counselor Attitudes as Influenced by Science Applications in Agriculture Courses

Factor	Familiar $n = 40$	Unfamiliar $n = 168$	F
1 - Program Emphasis	3.74 (.55)	3.49 (.48)	8.23**
2 - Scientific Nature of Agriculture	4.34 (.54)	4.32 (.47)	0.06

**$p < .01$.
Note. Numbers in parentheses are standard deviations.

Research Question Three

What was the relationship between counselors' attitudes about agriculture and the demographic characteristics: gender, age, school size, experience as a counselor, familiarity with course offerings, and background in agriculture?

Female counselors expressed significantly more positive attitudes toward the factor Program Emphasis ($p = .02$), indicating broad support from both a student-quality aspect and scientific approach (Table 4). This finding supports earlier results reported by Thompson (1989) pertaining to Illinois guidance counselors. Matulis (1988), however, reported no significant gender differences in attitudes of Illinois counselors toward agricultural education. No significant differences were found in counselor attitudes pertaining to Factor 2.

Table 4
Mean Levels of Counselor Attitudes as Influenced by Gender

Factor	Male	Female	F
1 - Program Emphasis	3.46 (.53)	3.62 (.46)	5.23*
2 - Scientific Nature of Agriculture	4.32 (.49)	4.33 (.48)	0.06

*$p < .05$
Note. Numbers in parentheses are standard deviations.

No significant differences were found between attitudes of counselors when the demographics of paid work experience, age group, high school or college coursework, school size, or subject taught were considered.

Conclusions

1. Illinois guidance counselors' attitudes have become more positive toward agricultural education programs over the past decade.
2. Guidance counselors in Illinois believe agriculture to be a scientific field of study.
3. Counselor attitudes toward agriculture programs are positively influenced by the presence of applied science in agriculture courses in the agricultural education curriculum.
4. Guidance counselors perceive agriculture programs to be superior in work value to science programs.
5. Female guidance counselors perceive agricultural education programs to be of more value to students than do male counselors.
6. The demographic characteristics of age, paid work experience, high school or college agriculture coursework, counselor experience, school size, and teaching experience do not significantly influence counselor attitudes and perceptions toward agriculture program emphasis or the scientific nature of agriculture.
7. Guidance counselors perceive science programs to be of higher quality than agricultural education programs.

Recommendations

1. Agricultural educators should act on improved counselor attitudes to build student enrollments.
2. Agricultural educators need to upgrade program quality where it is lacking. In addition, they should teach scientifically-oriented subject matter in the agriculture curriculum.
3. Science teachers should strive to make science more practical and applicable for students who plan to enter the work force upon completion of secondary school.
4. Agricultural educators should promote the scientific nature of their programs to guidance counselors.
5. Additional studies should be conducted to continue to update the current knowledge base concerning counselor attitudes and their influence on agricultural program enrollment.

Implications

Findings from this study reinforce the belief that counselor attitudes are positively influenced by upgrading the scientific emphasis of agricultural education curricula to more effectively address the needs of the students being served by the program. Guidance counselors reported attitudes toward agricultural education programs which were more positive than those reported nearly a decade ago (Matulis, 1988; Thompson, 1989). Likewise, agricultural education programs that are perceived to be scientific in nature and contributing to the college preparation of students garner increased perceptual support from guidance counselors. This support should translate into increased enrollments in agricultural education courses. Agricultural educators, administrators, and state staff

members should utilize applied science in agriculture courses in building agricultural education program enrollment and enhancing program perceptions.

Because of the positive attitudes toward agriculture and agriculture programs, it is an opportune time for agricultural educators and supporters to capitalize on this support and attempt to expand programs into urban school settings not currently being served, and/or to revitalize existing programs.

An alarming percentage of counselors responded that they were "uncertain" as to various aspects of agricultural education courses at high school and university levels. Since a primary function of guidance counselors is to advise students on course selection and career goals, this level of uncertainty was unexpected. Clearly, agricultural educators must assume a leadership role in providing guidance counselors with information pertaining to secondary and university agricultural education programs if those agriculture programs are to reap the benefits of improved perceptions.

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A FACTOR ANALYSIS OF ATTITUDES OF ILLINOIS GUIDANCE COUNSELORS TOWARD AGRICULTURAL PROGRAMS: A CRITIQUE

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"Guidance counselors in Illinois believe agriculture to be a scientific field of study." This concluding statement coupled with an improved attitude toward agricultural education indicate that Illinois secondary agricultural education programs are becoming well received by guidance counselors. The survival of the profession is dependent upon meeting the needs of today's students which leads to offering contemporary curriculums within the confines of current educational efforts or movements. The authors selected an important topic and conducted appropriate research techniques. Most of their findings, conclusions, recommendations and implications follow a logical line of reasoning. I need further explanation on recommendation #3, "Science teachers should strive to make science more practical and applicable for students who plan to enter the work force upon completion of secondary school." My concerns with this recommendation include, "What data or findings support this statement?" "Why is practical and applicable science education only targeted for students who plan to enter the work force upon completion of secondary school? Isn't practical and applicable science education appropriate for all students?"

Probably the most important finding in this study is that counselors who were familiar with the Biological Science Applications in Agriculture (BSAA) and Physical Science Applications in Agriculture (PSAA) courses had a more positive attitude toward agricultural programs. No difference was found between the two groups when it came to acknowledging the scientific nature of agricultural education. Both groups agreed that agricultural education was a scientific discipline. The question to the authors is, "How can BSAA and PSAA courses be introduced to all of the Illinois guidance counselors?" When was the last time that an agricultural education program was presented at a guidance counselor conference? Are there other avenues for Illinois agricultural educators to inform guidance counselors and administrators?

Another unanswered question is, "Do BSAA and PSAA qualify as science credit for high school graduation requirements and the university admissions process?" If agricultural education is to meet the needs of today's students and if science principles are taught in agricultural education, then the answers to the question posed at the start of this paragraph should be, "yes."

In conclusion, the authors have identified some very positive findings concerning secondary agricultural education. A tremendous amount of work still needs to be done as agricultural education attempts to improve and become appropriate for today's audiences. I would hope that the practical applications of this study are the focus of our discussion.

TOWARD A MODEL FOR INCREASING COGNITIVE LEVEL REACHED BY STUDENTS IN COLLEGE CLASSROOMS: PHASES I & II

M. Susie Whittington*

Introduction

According to Brookfield (1987), mastering "higher order thinking" is one of the most significant activities of life. If so, it is important that educators and researchers understand "higher order thinking" and further investigate techniques necessary for teaching these thinking processes.

Understanding Higher Order Thinking

Various components of the concept of higher order thinking have been studied by numerous researchers (as cited in Brookfield, 1987): logical reasoning abilities (Hallet, 1984; Ruggiero, 1975), reflective judgment (Kitchener, 1986), assumptions (Scriven, 1976), tests of meaning (Hullfish and Smith, 1961), analytical and argumentative capacities (Ennis, 1962), attitudes of thought (D'Angelo, 1971), distinguishing bias from reason (O'Neill, 1985), and the use of thought as progress toward a goal (Halpern, 1984). The definition used in this line of inquiry was advocated by Bloom (1956) who wrote that accomplishing higher order thinking required a knowledge of methods which can be readily utilized, an analysis or understanding of the new situation, and a facility in discerning the appropriate relations between previous experience and the new situation.

Teaching "Thinking"

"Recently, researchers have begun to investigate how the ability and the propensity to think well are acquired and maintained" (Resnick, 1987). For example, Simon (1976) suggested that when cognitive scientists perform information-processing analyses of complex skills, the same kinds of basic problem-solving strategies are used repeatedly in task performance. However, research on critical thought training shows that strategies taught can often be used after just a few lessons, but that people induced to use particular thinking strategies will do so on the immediate occasion but will fail to apply the same strategy on subsequent occasions (Belmont, Butterfield, and Ferretti, 1982).

Meyers (1986), contends that "by modeling reflective thought in lectures and discussions, teachers can do much to encourage this frame of mind in their students" (p. 47). Research has indicated that several characteristics contribute to modeling higher order thinking in college classrooms: clarity, consistency, openness, communicativeness, specificity and accessibility (Brookfield, 1987, p. 86-88).

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Are faculty members in colleges of agriculture modeling these behaviors? Can faculty members, through intervention, develop and incorporate these behaviors into their teaching?

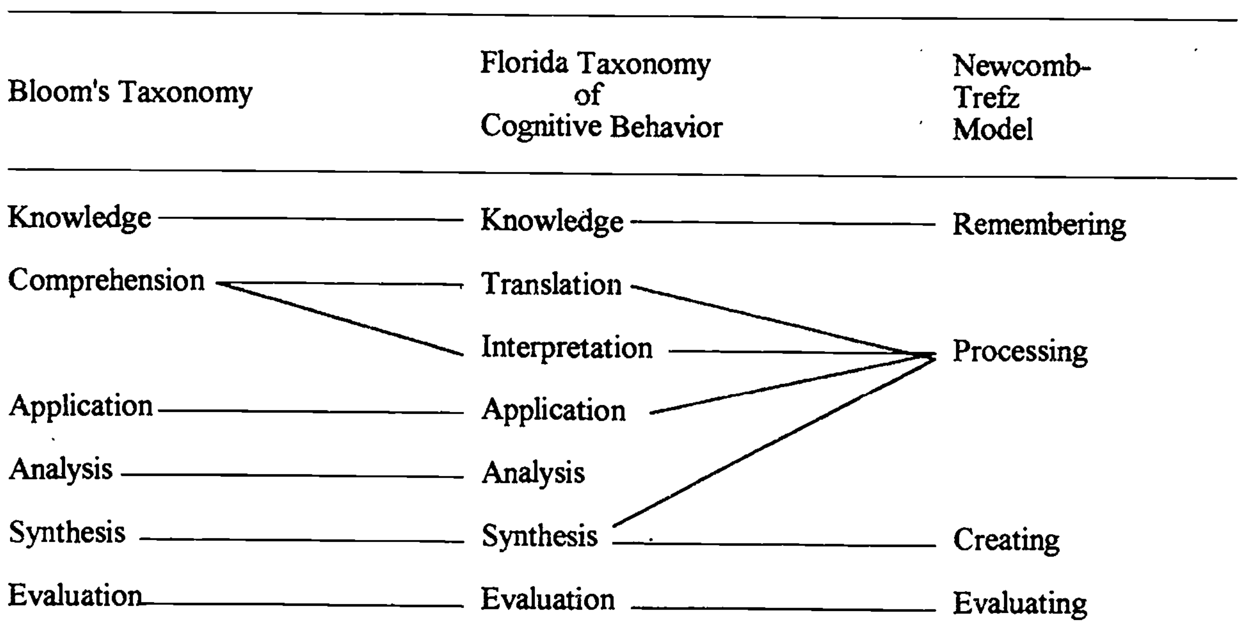
A Theory for Research on Thinking

The Taxonomy of Educational Objectives: Cognitive Domain, developed by Bloom et al. (1956), was built on a theory of varying levels of complexity in which cognitive thought and associated behaviors could be classified into six hierarchical levels. Using Bloom's Taxonomy as a framework for classifying levels of thinking therefore, provides focus and direction for teachers interested in improving the quality of learning in their classrooms (Newcomb and Trefz, 1987).

Bloom's Taxonomy was condensed by Newcomb & Trefz (1987) from six levels into four "user-friendly" levels (see Figure 1). The Newcomb-Trefz Model and Bloom's Taxonomy were used in this study.

Figure 1

A Comparison of Bloom's Taxonomy, The Florida Taxonomy of Cognitive Behavior and the Newcomb-Trefz Model



Purpose and Objectives

The purpose of this project was to describe the aspired cognitive level of instruction, and the assessed cognitive level of instruction, and to determine the attitude toward teaching at higher cognitive levels among faculty members in a College of Agriculture. Furthermore, the researcher sought to develop an intercession at three treatment levels. The specific research questions guiding the study were:

1. At what level of cognition do participant faculty aspire to teach?
2. At what level of cognition are participant faculty actually teaching?
3. Among participant faculty, what is their attitude toward teaching at higher cognitive levels?
4. What treatment can be introduced to influence the cognitive level at which professors teach?

Procedures

The target population for this three-year project was 187 faculty members in the College of Agriculture at the University of Idaho. The accessible population was faculty members on campus in Moscow, who had a teaching appointment on the general funds budget and who were teaching at least one undergraduate course during Fall/Spring Semesters, 1993/1994. Thirty faculty members from each of eight departments/schools in the College of Agriculture were nominated by department chairs to participate.

Instrumentation for Phase I

Three instruments used in this study -- a demographic instrument, an aspired cognitive level of instruction instrument, and an attitude toward teaching at higher cognitive levels instrument -- were developed by the researcher and validated by a panel of experts. Reliability was established using data from a pilot study of 25 College of Agriculture faculty members (68% return rate). On the 50-item, six-point Likert-type attitude instrument, Cronbach's alpha generated a reliability coefficient of $r = .86$. A test/retest procedure was adopted to establish reliability of the aspiration methodology; the coefficient indicated reliability.

Additionally, the cognitive level of classroom discourse (the formal speech or conversation delivered during class) was described by employing the Florida Taxonomy of Cognitive Behavior ("FTCB" by Webb, 1970). The FTCB utilized 55 categories of observable behaviors indicative of the various cognitive levels identified by Bloom's Taxonomy. Validity for this instrument was based upon its direct de[illegible]pment from Bloom's Taxonomy and the support generally given to this hierarchy [illegible] cognitive behaviors. Reliability for this instrument was established by coding audio-tapes of lectures and establishing Spearman Rho reliability coefficients. Intra-rater reliability was approximately $r = .96$. Inter-rater reliability between previous researchers and the two researchers in this study was approximately $r = .98$.

Participants were observed and audio-taped during six randomly selected class sessions, approximately every two weeks, but avoiding the first ten days and the final ten days of the semester. Participants were aware of the days the researchers would be in attendance. The observations were split evenly between two raters.

Collection

Aspired cognitive level of instruction, and attitude toward teaching at higher cognitive levels were measured, and demographics were collected during a participant

meeting held the first week of Fall/Spring Semesters. During the meeting, participants received an introduction to the theory and an explanation of the instrumentation utilized in the study. After which, the preliminary instrumentation was completed.

To determine aspired cognitive level of instruction, participants placed 10 chips, in proportion to their aspired cognitive level of instruction, on each of four quadrants on a posterboard marked remembering, processing, creating, and evaluating (Newcomb and Trefz model, 1987). The proportion of chips placed on each quadrant was recorded as a portion of one hundred, thus, revealing the aspired level, in percentages, at each level of cognition.

Procedures for Phase II

Participants of the study attended a two-hour workshop at the end of Phase I to discuss the findings of the data collection and analysis. Following the workshop, participants were randomly placed into three levels of intervention:

I. Awareness - Bringing together participant faculty at the conclusion of Phase I for a two-hour workshop to share results of the study and to suggest techniques for teaching at higher cognitive levels.

II. Resources - Sending, on a monthly basis for nine months, reading materials and resources targeted at enhancing cognitive level of teaching. Specifically, resources included: Teaching for Critical Thinking (Chaffee), What Happened to Thinking (Parker), Thought and Knowledge (various excerpts, Halpern), Critical Thinking (Paul), Discussion Method Teaching (Welty), Learning as Problem Solving (Newcomb et al.), The Students Are...(Anonymous).

III. Development - Working with faculty intensively, one hour each month for nine months, (September - May) to explore teaching that reaches higher cognitive levels. Workshop titles included: What did we learn?, Writing objectives across the levels, An introduction to learning styles, Learning styles utilized in reaching across the levels, Sharing your best-kept secret, Questioning strategies for reaching higher cognitive levels, An informal collection of thoughts on teaching across the levels, Documenting your teaching effectiveness, and Barriers to teaching at higher cognitive levels.

Results of Phase I

Aspired and Assessed Cognitive Level of Instruction

Participant faculty aspired to have slightly over one-half (52%) of their discourse at the remembering and processing levels. Participants aspired to have just under one fourth (23.9%) of their in-class discourse at the remembering level while aspiring for almost one-third (28.6%) of their discourse to be presented at the processing level. Aspirations for discourse at the creating level ranged from 0% to 50% while aspiration for instruction at the evaluating level ranged from 0% to 60%.

The discourse of participants in this study was assessed to be approximately 98% at the remembering and processing levels (remembering = 47.2%, processing = 50.7%).

Participants' discourse was approximately 1.5% at the creating level with a range of 0% to 6%. Evaluating level discourse was assessed at less than 1%.

Table 1
Aspired and Assessed Cognitive Levels

	Aspired percent			Assessed percent		
Level of cognition	Mode	Mean	Range	Mode	Mean	Range
Remembering	20	23.9	10-50	45.5	47.2	25-60
Processing	30	28.6	20-40	49	50.7	39-68
Creating	20	22.9	0-50	1	1.5	0-6
Evaluating	20	24.6	0-60	0	0.5	0-2

Attitude

The mean score on the attitude instrument (232 on a scale of 50 - 300; range = 181 to 266) indicated that participants in the study had attitudes which favored teaching at higher cognitive levels.

Conclusions from Phase I

1. Participants in this study primarily aspired for their discourse to be balanced across the levels of cognition. The widest ranges between individual aspired percent of discourse at a given level of cognition occurred at the creating and evaluating levels.

2. The faculty members in this study conducted discourse primarily at the remembering and processing levels of cognition.

3. The participants in this study aspired to teach at cognitive levels higher than those at which they were assessed. The gap between aspired and assessed cognitive levels of instruction increased with increasingly higher levels of cognition in the hierarchy.

4. Regardless of the cognitive level to which faculty members in this study aspired to conduct discourse, they actually conducted discourse at about the same level as each other. However, those individuals that aspired to teach more at the evaluating level were assessed as teaching more at that level than those who did not.

5. Participants in this study held favorable attitudes toward teaching at higher cognitive levels.

Results from Phase II

The "Awareness" Level, was introduced to act as a control group. In Treatment Level One, the faculty were made aware of the results of Phase I. Both Levels Two and

Three include the awareness-raising workshop of Level One as well as more proactive measures in educating the faculty regarding specific theories and techniques that affect an increase in the actual cognitive level of teaching and learning in the classroom.

Results for Treatment Level One: Awareness

Participants who were randomly placed into Treatment Level One were given the opportunity to participate in a two-hour workshop during which they reflected on the outcomes of Phase I of the study. In addition to the discussion generated during the workshop, participants were given the opportunity to consider differences between their aspired and assessed cognitive levels of instruction and suggest reasons for any discrepancies between these two measurements.

Responses regarding the reasons for discrepancies provided data on whether differences should exist and how they might be overcome as well as the professors' attitudes toward teaching at higher cognitive levels. Themes gathered in this exercise include: equivalent importance of all levels of cognition in discourse in classrooms, need for analytical skills to deal with future challenges and change, hierarchical importance of levels of cognition in discourse, greater importance of logical thinking among levels of cognition in instruction, greater importance of creativity among levels of cognition in instruction, and importance of remembering level of cognition so that students can reprocess facts that may not be consistent with what they have learned.

Results for Treatment Level Two: Resources

Participants who were randomly placed into Treatment Level Two were asked to respond to monthly reading assignments for eight months during the academic year. Each participant faculty member was requested to express a possible application of the reading material content to their current or future teaching.

Common themes present in the reading responses include transforming students, focusing on the process of solving problems, encouraging students to reason and think independently, encouraging students to apply principles and concepts to their own experience, questioning the effectiveness of teaching or modeling critical thinking at the University level, focusing on the teacher as a model critical thinker, facing difficulties and barriers in teaching critical thinking, and covering subject matter or material versus developing reflection and understanding. As examples of each theme, selected excerpts from these comments are listed below:

Transforming students.

Although I believe in what I am doing and believe it is part of a curriculum based on critical pedagogy, I had no idea I was in such agreement with people in the critical thinking movement. . . . My ultimate goal is to transform students and prepare them to be able to answer the question - - In this particular situation, what should I do?

Focusing on the process of solving problems.

"In Immunology, I present many experimental designs and experimental results to illustrate a particular principle until the students can predict the outcome of an experiment before they see the results."

Encouraging students to reason and think independently.
An application that is currently being done to encourage reasoning is the use of questions on the first exam that may have two or three correct answers depending on the logic they used to reach their conclusion. It is interesting (and frustrating to the student also) to see the reaction of some students when they find out that there may not be only one correct answer. To encourage professor/student interaction this year I am experimenting with using e-mail as a way to get feedback and/or questions on a lecture prior to the next lecture.

"I plan to incorporate more writing into the class to encourage individual thinking and processing of information. I will try to restructure discussions to draw out more student involvement in what is being taught, how it is used and why it is important to students."

Too often we fail to see what we do from the eyes of the students. I will try to be more careful to explain to the students or to help them realize the reason why we are studying a particular concept. Perhaps I should involve them more in setting goals for the courses and various phases of the course.
Encouraging students to apply principles and concepts to their own experience.
"This is a re-emphasis on the idea that evaluating and analyzing is better than memorization and repeating back. [For example,] After giving students some basic data they could be challenged to use these data to find solutions to real or realistic problems."

. . . what comes to mind is the use of thought questions in my genetics course to try to get students to relate what is being taught in class to the 'real' world. These questions usually are in the form of an opinion question. . . . Some students enjoy the assignments, some don't, and some are not used to being asked their opinions. Hopefully it does get them to think how genetics relates to their lives.
Questioning the efficacy of teaching critical thinking at the University level.
Thus far I have not been convinced that any significant improvement in critical thinking is possible at the University level as those processes and potentials in students are developed at much younger ages. If U.S. students come to college unprepared then there is little that can be done due to a variety of reasons, e.g., no resources, no time in 4 years, no funds, inappropriateness for a University to teach basic thinking/studying skills, etc. However, I always have an open mind and always am seeking a good enough argument to convince me that I am wrong.

I had several radical thoughts while reading this latest information. I found much of the content disturbing. . . . Some of my thoughts: 'Maybe 75% of the students shouldn't be at the University if they have not acquired the skills needed for logical and abstract thought!!' and 'I predict that 'thinking' will be the next thing that computers will do for us....so why bother trying to teach those who haven't figured it out?????' . . . Some things that I do in my classroom, and plan to expand after reading this article are: I will show students how to categorize facts and organize information. I will give concrete examples of making lists and making tables to logically sort information.

"I think that it will be determined that the physical act of memorization does "exercise" the brain and enhance our natural ability to define problems, seek information, formulate solutions and evaluate results..... all of the "goals" of learning."

Focusing on the teacher as a model critical thinker.

"I am changing the focus [of the course] . . . so the lecture is more problem oriented in order to increase the students' critical thinking skills. By 'walking' them through the thinking process in class, I hope to improve their thinking abilities."

If as the author contends, some students need to see (by the professor writing on the board) how to think through a problem, then the use of prewritten overheads would not be beneficial to these students. . . . In my genetics class, I do use the board but in the future, I may try to use the board when presenting problems to give a visual description of how to think through a problem. . . . Currently in my course I do ask reasoning questions (especially in the first section). I agree with the author that some students have difficulty when asked for an answer that 'is not in the book'. A possible solution is to use examples of previous test questions [using reasoning] in class to demonstrate (probably on the board) how to use reasoning to come to a possible correct answer. I say possible correct because I have historically asked questions that, with the correct logic, could have more than one answer. I have found that this type of question tests not only the students' understanding but also the student's confidence in his or her understanding. I will continue to use this type of questioning but increase in-class examples to give the students an idea how to 'think out' a problem.

"One specific addition I plan to make in my Immunology lectures is to 'THINK OUT LOUD' so the students can better understand the relationships that I see ....to provide a structured way to approach interpretation of data."

Facing difficulties and barriers in teaching critical thinking.

I feel that my counseling background has given me skills for leading discussions, getting people involved, preventing dominance by one student, etc. . . . However, I still find it very difficult to incorporate discussion in nutrition, a course of 80-150 students. They want to be passive (it seems) and I feel I'm wasting time and not doing my job if I include discussion. What can I do?

It is a constant, draining battle to teach critical thinking. Students, often good students, hate it because they don't do as well as they are used to. Therefore, they go to the powers that be and complain about poor teaching. If an exam requires critical thinking, they complain it is tricky and ambiguous. What can we do so the students will buy into it?

It is ridiculous to think that I am going to try to learn the names of the people who take my classes...I will NEVER. . . . I run a research lab with 5 people in it, I am responsible for 1 million dollars in grants, I am publishing detailed research articles in a highly competitive field, I am involved internationally in my field. The overhead I bring into the University keeps the tuition costs down. The students are lucky to have me in the classroom....I do not need to know each name or consider each persons needs. We are dealing with a huge breakdown in our education system.

My students can hardly READ, and if they can read, they can hardly COMPREHEND.....I need to use my class time to essentially read the text book to them.

"I would like to teach Investigation of Foods strictly from a problem solving orientation. The problem is, try as we may, we cannot get students to invest themselves in the learning process. What can we do?"

Covering subject matter versus developing reflection and understanding.

This was an interesting article - one which may cause some reflection on our present methods of instruction. I will try to slow down in the coverage of some key concepts to allow more student reflection and inquiry in solving problems rather than rush to cover all of the material.

I went to an experimental High School that did this kind of cognitive teaching in the 1960's. For example we studied the concept of "revolution" rather than any historical facts.......sounds good, but in reality it did not help me in college and I continue to have a vast gap in my "general knowledge" . . . [but] I do understand some of the actors that contribute to drastic change in government. Which kind of knowledge is more important????? Lacking the concrete information, I feel as though it [the concrete information] is more important, more practical. . . . I do agree with the concept that often, "less is more". I have found myself covering less and less material with each passing year, as I gain more experience in the classroom and opt for better understanding rather than material covered.

Results for Treatment Level Three: Development

Participants who were randomly placed into Treatment Level Three were afforded the greatest opportunity to interact and discuss theories and techniques for higher cognitive level instruction with their peers. These discussions were focused on specific topics during eight one-hour workshops. Qualitative data were gathered primarily on specific examples of applications that faculty make or plan to make in their teaching in terms of the various concepts presented during the workshop.

During Workshop One, the findings from Phase I of the study were reported to all participants (see the Results for Treatment Level One section).

The focus of Workshop Two was writing instructional objectives across all the levels of cognition. Results included instructional objectives written by faculty members (in Level Three) that described an objective for their course at each of three different levels of cognition.

Workshop Three dealt with the concept of learning styles and the relationship of the learning style theory to teaching style and reaching various cognitive levels in the classroom. Results included professors' definitions of a learning style and their interpretation of how learning styles relate to their own teaching practices.

Workshop Four continued with the theme of learning and teaching styles, including a focus on problem solving teaching as a technique for reaching students with a variety of learning styles at a variety of levels of cognition. Results included faculty members' descriptions of present and future problem solving techniques used in their courses.

Workshop Five centered on an informal discussion among faculty of techniques and principles they have found effective in reaching the higher cognitive levels during

classroom discourse. Results included faculty members' description of their individual techniques and the way in which tha. technique challenged students across the levels of cognition.

The focus of Workshop Six was the discussion-method technique and questioning strategies to be used in discourse for reaching higher cognitive levels. Results included actually involving the faculty members in the experience of participating in a discussion technique used by a colleague and their reflections on the application of that technique to their own classes, with an emphasis on encouraging students to develop their thinking skills at the creating and evaluating levels.

Workshop Seven was a formal presentation by a guest lecturer on techniques for faculty members' to document their teaching effectiveness with a particular emphasis on demonstrating excellence in teaching performance by challenging students beyond the lower levels of cognition. Results included a videotape of the presentation for future use by faculty and direct interaction with the presenter on difficulties and barriers faced to receiving recognition for teaching at higher levels of cognition.

The final workshop, Workshop Eight, dealt with particular barriers that faculty face in reaching higher cognitive levels. Results included excerpts gathered from participants' written comments concerning variables that could be barriers and suggestions for breaking down barriers to reaching higher cognitive levels.

Conclusions from Phase II

All the qualitative data gathered in Phase II of this study revealed more specific information regarding the following questions: Why do certain faculty possess less favorable attitudes toward teaching at higher cognitive levels? Why does a gap exist between the aspired and assessed cognitive levels of instruction? Why do barriers to reaching higher aspired levels of cognition exist? Why do faculty members express a general desire for balance across the levels of cognition in their courses?

In 1987, when Newcomb and Trefz asked professors if they were pleased with their cognitive level of testing, 80% said they desired to change. In agreement with this finding, Phase II provided qualitative information from the Treatment Levels Two and Three regarding the specific changes that faculty members plan to make in their classrooms. Faculty members provided examples of applications that they currently make or plan to make in the future to reach higher cognitive levels of instruction based on the written materials that they read or the workshop concepts to which they were exposed.

At the same time, faculty members also voiced their disagreement with various theories or techniques presented in the reading materials or the workshops. In the end, specific barriers to reaching higher cognitive levels in the classroom may be identified, although specific solutions for overcoming these barriers are not necessarily as clear.

Recommendations Regarding Faculty and Instruction

1. Educating teachers regarding their cognitive level of instruction is necessary if change is to occur. Teachers aspire to teach at higher cognitive levels because they theoretically see the benefits of teaching at higher cognitive levels, but they are not

reaching the aspired levels. The problem, therefore, could be lack of knowledge of techniques and methods used to model higher cognitive levels of instruction. Workshops and seminars need to be developed and offered to those faculty who desire changes in their cognitive level of teaching.

2. Professors should make changes in their current teaching methodology to reach the cognitive levels to which they aspire for their instruction. Many variables may contribute to faculty members' aspirations being higher than their current teaching levels. In addition to providing teaching enhancement opportunities to teachers, administrators need to consider whether promotion and tenure policies as well as teaching evaluations will promote actual teaching at higher cognitive levels.

3. As agricultural educators, important responsibilities accruing to faculty in agricultural education, not only include preparing preservice teachers of secondary agriculture and extension personnel, but also educating colleagues in colleges of agriculture on current teaching issues. The issue of teaching higher order thinking skills must be addressed in today's learning environment. Every reason exists for agricultural educators to lead this trend, considering the diverse directions agriculture has taken.

4. Agricultural educators who possess the capability to prepare persons for teaching at higher cognitive levels will be called upon by university and college-wide teaching committees, curriculum committees, and planning committees to offer valuable input into the enhancement of teaching.

Recommendations for Further Research

1. Explore the barriers to teaching at higher cognitive levels. For example, Phase II of this study revealed certain qualitative information regarding barriers that professors perceive to teaching at higher cognitive levels. Further study will be required to determine possible relationships between these barriers and probable solutions for overcoming these barriers.

2. Examine variables, other than the teacher, which influence cognitive levels reached in the classroom. For example, administrative policies, physical condition and set-up of classroom facilities and equipment, time management skills of faculty and students, students' attitudes and motivation, and previous exposure to teaching at higher cognitive levels may all contribute to cognitive level of discourse in the classroom.

3. Establish a clear positive effect between level of instruction and long-term learning and transfer of learning. For example, by determining the retention rate of information in relation to the cognitive level at which the information was delivered/received, a true relationship between delivery of information and thought processes for retention of the same may be established.

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TOWARD A MODEL FOR INCREASING COGNITIVE LEVEL REACHED BY STUDENTS IN COLLEGE CLASSROOMS: PHASES I & II

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Dr. Whittington's paper is a continuation of her research focus on improving teaching and learning in agriculture. While the procedures and methods used to carry out this study were well done, in my opinion, even more impressive is the fact that such a project was "tackled" in the first place.

The foundation of this project, enhancing the quality of teaching in colleges of agriculture, is an important emerging role for our profession. Historically, we have successfully trained undergraduate students to teach agriculture on the secondary level. Extending this expertise to our peers is a natural, and much needed, way for us to serve the broader group of educators in agriculture.

The theoretical base of this study was well structured and provided the appropriate underpinning necessary to establish the purpose and objectives investigated. The areas of Understanding Higher Order Thinking, Teaching "Thinking", and A Theory for Research on Thinking were each discussed in a concise, yet adequate way. The research questions were "answerable" and gave promise that the study would contribute to our profession.

The important points of the procedures were described appropriately. The reported reliability of the instruments used were certainly acceptable. I consider the method used to collect data for "aspired cognitive level of instruction" to be very interesting. Using a set of chips to indicate how the instructors aspire to teach was creative. Perhaps, in the end, the researcher found that seeing what teachers do when the "chips are down" does NOT give us the truest picture of how they teach.

When looking at the results and conclusions of Phase I, I consider the differences between aspired and assessed cognitive level of instruction to of value. While the results are similar to those found in the literature, the data provide an important basis establishing the need for faculty development at this campus. This information, coupled with the results showing that faculty had attitudes which favored teaching at higher cognitive levels indicates there is a need and desire for the services which Agricultural Educators can provide. No data related to demographic characteristics were reported. I wonder if any particular characteristics impacted aspired and assessed cognitive level of instruction in any way?

Some interesting results were reported related to Phase II of the project. An experimental design was developed to provide information about instruction at various cognitive levels; however, no appraisals were reported concerning what type of intervention might be best. Regardless, the qualitative information gleaned from this part of the study will be valuable in the design of subsequent faculty development workshops.

I applaud the researcher for venturing to conduct such a project. I especially praise the way she carried out the project in such a positive, non-threatening way. This work does indeed move us toward a model for increasing cognitive level of instruction in our classes.

DECISION CASES VERSUS TRADITIONAL LECTURE IN A UNIVERSITY AGRICULTURE COURSE

Marlo G. Allen   Azenegashe O. Abaye
James R. McKenna   William G. Camp *

Instructors teaching agricultural curricula have implemented a wide variety of teaching methods, which fit different niches within the agricultural classroom. Case studies are not a new teaching method in agriculture classrooms at either the high school or university levels. Nolan (1927) published a collection of case studies for use in public school Agricultural Education programs almost three-quarters of a century ago. The traditional form of case study has been referred to as descriptive, or sometimes historical, cases. University agricultural educators have utilized descriptive or historical case studies as a teaching tool for many years (Stanford, Crookston, & Davis, 1992).

A less-known form of case study is the so-called "decision case." The decision case as a teaching metood was introduced to the faculties in a number of colleges of agriculture in a national workshop at the University of Minnesota, in 1991, Proponents of the decision case method claim that the method helps professors transform passive learners into active thinkers, problem solvers, and decision makers. Since the Minnesota workshop, university agricultural educators from other universities have begun to adopt the decision case teaching method, which varies considerably from the traditional case study method. Indeed, the decision case teaching method closely resembles aspects of the problem-solving approach as described by Newcomb, McCracken, and Warmbrod (1994) and by Crunkilton and Krebs (1982).

Introduction and Theoretical Framework

The levels of cognitive operation were delineated and outlined in a document which has come to be known as Bloom's taxonomy (Bloom, Englehart, Furst, Hill, and Krathwohl, 1956). Knowledge, comprehension, application, analysis, synthesis, and evaluation are all levels at which students operate along the cognitive learning continuum. Lecture is best suited to encourage remembering, or knowledge-based learning, instead of a range of cognitive skills. Lecturing results in students assuming a passive, non-thinking, information-receiving role (McKeachie, 1994). Case

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studies, as a teaching method, are praised for their ability to require students to think across all levels of cognition (Newcomb, 1992).

Decision cases present real issues or decisions to be made, while the more traditional, descriptive case studies describe events, practices, conditions, or references (Stanford, 1992). In addition decision cases are brought to the student from the point of view of a decision maker, as opposed to the standpoint of an analyst, expert, or historian. If the instructor aspires to help students build analytical and synthesis skills, apply concepts, learn to solve problems, develop mature judgment, enhance communication skills, and retain information, then the decision case may be an appropriate method (Simmons, 1994).

Decision cases are reported to elevate student confidence, and to activate discussion and participation (Merseth, 1990). Dooley and Skinner (1977) classified decision cases as excellent in developing mature judgment and useful attitudes. Instructors at the University of Minnesota provided evidence that students have a higher perception of learning when taught using decision cases (Stanford et al., 1992).

Decision cases have been advocated by faculty at the Harvard Business School as a mechanism designed to motivate students to think, for the past eighty years (Dooley & Skinner, 1977). A decision case, simply termed "case" at the Harvard Business School, is a documentation of reality (Simmons, Crookston, and Stanford, 1992). It is a written document of an actual situation (Stanford, 1992) which is presented to the class through an unbiased, multidimensional perspective (Merseth, 1990). Decision cases are based on real-life unresolved problems (Simmons, 1992) which place the students in a decision-making role (Simmons, 1993). In this role the student analyzes a situation and identifies the key issues surrounding possible outcomes, objectives, and options (McKeachie, 1994).

Due to the widespread use of the traditional lecture, college students, including those in colleges of agriculture, are most often taught to think at the lower (knowledge) to middle (comprehension, application, and analysis) levels of cognition (Newcomb, 1992). Newcomb (1992) also stated that current instruction activates student cognitive thinking at 37% remembering (knowledge), and 44% processing (comprehension, application, and analysis). Only 19% of student learning is at the higher-order creating and evaluating (synthesis and evaluation) levels.

In today's rapidly changing world, the ability to acquire or use knowledge and skills is more important than compiling a static knowledge base (McKeachie, 1994). Teaching methods must be changed to reflect a modern society mandating the need for functioning, thinking-oriented, decision-making students. Methods, such as the decision case, which transform passive learners into active thinkers, problem solvers, and decision makers (McKeachie, 1994); facilitate higher level learning (Coleman,

1985); and encourage greater breadth of learning (Stanford et al., 1992) must be implemented.

Purpose and Objectives

The purpose of this study was to compare the effects of decision case and traditional lecture teaching methods on student cognitive learning and attitudes toward instruction. The study focused on the utilization of two teaching tools to teach a unit on pesticide management in Virginia. Data were collected for student retention scores, and attitude scores toward method. The objectives of this study were:

1. to determine if there was a difference in cognitive learning between students taught with the decision case, as opposed to the traditional lecture method.

2. To determine if there was a difference in attitude between students taught with the decision case method, as opposed to the traditional lecture method.

3. Related null hypotheses were formulated and tested at the .05 alpha level.

Procedures

Several instruments were prepared. A decision case entitled Ex-Terminators was developed, validated, and field-tested according to guidelines outlined in Decision Cases for Agriculture (Stanford, Crookston, Davis, and Simmons, 1992). Ex-terminators consisted of a written document presenting an unbiased, multidimensional perspective (Merseth, 1990) of the death of an elderly Virginian couple, who died from exposure to high levels of Vikane, Sulfuryl Fluoride. The case containing five study questions and twelve exhibits was accompanied by teaching-notes. The teaching-notes provided a case overview, case goals and objectives, target audience, and author's insights concerning the case study questions. The case was submitted to a validation panel including both subject matter experts and experts in teaching methods.

Lesson plans were developed for each method of instruction. Both the decision case and lecture lesson plans consisted of identical content with the same student performance objectives.

Lessons concluded with an evaluation of student cognitive learning measured with a 40 question multiple-choice exam and attitude scale reviewed by a validation panel. In addition, a semantic differential attitude scale was devised to measure student attitude toward the unit, and its components. Class content, class discussion, teaching style, and reading material were rated by students. The lesson plans, cognitive examination, and attitude scale were all submitted to a validation panel

consisting of 3 agricultural professors, a former agriculture student, and a specialist with the Office of Pesticide Regulation.

A pilot study was conducted on 17 students enrolled an Agronomy course primarily consisting of juniors. After receiving 50 minutes of instruction with the insertion of a decision case, pilot-test students completed the semantic differential scale and the multiple-choice cognitive exam. The test was computer graded, and appropriate statistics were tallied using the Test Scoring and Analysis Program. Based on pilot study results the lesson plan, cognitive exam, and attitude scale were revised and resubmitted to the validation panel. Written comments on the attitude scale indicated that the instruction was too fast, therefore lessons were allocated an additional 20 minutes of instruction.

Although the actual population of students in World Crops participated in the study, the classes were treated as a sample for the sake of this experiment. Technically, the study was a population census; however, the use of existing groups of subjects for educational research is a well-established and widely-used approach.

The experiment utilized a 2 x 2 factorial design. Students from each of two sections of the course, World Crops, were randomly assigned to treatment and control groups, resulting in a total of 4 groups as described in Table 1. Each group was then randomly assigned a teaching method. Groups also received one of two instructors. Two instructors were utilized to control for instructor bias. The first section was randomly assigned an instructor, but the second section was purposefully assigned an instructor - so each instructor taught both methods.

Table 1. Random Group Division and Assignment

Group #	Class Section	Method	Instructor
#1	9:00 am	Case	1
#2	9:00 am	Lecture	2
#3	10:00 am	Lecture	1
#4	10:00 am	Case	2

The students were not informed that an experiment was underway; they were simply told that they would be divided into smaller discussion groups for the next 1-1/2 class sessions. Midway through class on Monday, students were informed of their group locations and instructor. Students then moved to their respective assigned locations (nearby, in the same building) and given 20 minutes of preliminary instruction.

The groups were given instruction according to the applicable lesson plan. Similar reading packets were provided to the students. The only difference in reading material was that the decision case students received the case verbiage explaining

the exhibits. Lecture students received all of the reading material except for the verbiage linking the exhibits and leading to the decision case discussion.

On Wednesday, the divided classes resumed in the assigned separate locations and received the remaining 50 minutes of instruction. The treatment groups received instruction with the insertion of a decision case, and the control groups receiving only the traditional lecture instruction. Friday the groups returned to their original class configurations and location. First, students completed the attitude scale. Once the attitude scale was completed each student exchanged it for an exam. After completion, the exams were collected, coded to indicate the group, and taken to the Test Scoring Center to be analyzed.

Means and standard deviation for scores of students on the cognitive examination were calculated. Analysis of the revised cognitive exam produced a 0.61 coefficient alpha. Attitude scale scores were calculated for each of the unit aspects: class content, class discussion, teaching style, and reading material. All aspect attitude scores were totaled to obtain a cumulative attitude score for the overall lesson. The attitude scale means and standard deviations were reported for each component, and the overall unit.

An analysis of covariance (ANCOVA) procedure was utilized to test both of the null hypotheses.

Findings

Data were analyzed for 57 students enrolled in the college junior level class, World Crops. Twenty-seven students completed decision case instruction and testing, and 30 students completed traditional lecture instruction and testing. All students who were physically present on Monday and Wednesday completed the instruction, cognitive examination, and attitude scale.

The first null hypothesis was that there would be no difference in the mean cognitive scores between students receiving decision case or traditional lecture instruction. No significant difference between the cognitive examination mean scores was found. The analysis yielded an $\underline{F}$ value of 2.08 with a $\underline{p}$ of 0.16 as reported in Table 2. In addition cognitive examination scores of students receiving decision case or lecture instruction were not significantly different for teacher, academic level, gender, or major.

Table 2. Analysis of Covariance for Cognitive Score

Source	df	SS	F	p
Method	1	43.76	2.08	0.16
Teacher	1	36.97	1.76	0.19
Academic Level	1	34.65	1.65	0.21
Gender	1	8.51	0.40	0.53
Major	1	9.55	0.45	0.50
Error	51	1072.69		
Total	56	1204.14		

Table 3 summarizes the test data by groups. The decision case students, groups 1 and 4, had a total cognitive examination mean score of 22.05, with a standard deviation of 4.62. The traditional lecture groups, 2 and 3, had a mean score of 24.70 with a standard deviation of 4.04.

Table 3. Cognitive Examination Statistics for Method by Group

Group #	Mean	SD
	Decision Case	
#1	21.64	5.16
#4	22.46	4.07
Total	22.05	4.62
	Traditional Lecture	
#2	22.9	3.67
#3	26.5	4.41
Total	24.7	4.04

The second null hypothesis that there would be no significant difference between the mean attitude scores toward instruction between students receiving the decision case or traditional lecture was rejected. The analysis of data yielded an F value of 9.70 with a p of 0.0030 as reported in Table 4. In further analysis, attitude scores for class content, class discussion, and teaching style were all significantly different between the two groups, in all cases favoring the treatment (decision case) group. Only reading material attitude scores were not significantly different - a result that would have been expected since the reading material was essentially identical for the two groups, differing only in material linking the exhibits and leading up to the case discussion.

Table 4. Summary of Analysis of Covariance for Attitude Toward Method

Response Variable	df	SS	F	p
Class Content	1	146.05	8.72	0.0047
Class Discussion	1	374.42	15.51	0.0002
Teaching Style	1	267.56	10.7	0.0019
Reading Material	1	14.92	0.45	0.5052
Total		2668.24	9.7	0.003

Table 5 summarizes the attitude scores by method. The mean attitude score for the overall unit was 124.94 with a standard deviation of 23.86 for students receiving decision case instruction. Students receiving traditional lecture instruction had a mean attitude score of 111.15 and a standard deviation of 22.66.

Table 5. Attitude Score Statistics by Method

	Mean	SD	Mean	SD
	Decision Case		Traditional Lecture	
Class Content	31.1	5.91	27.88	5.61
Class Discussion	31.77	7.18	27.40	6.81
Teaching Style	31.67	7.11	26.50	6.73
Reading Material	30.40	8.23	29.37	7.85
Total	124.94	23.86	111.15	22.66

Conclusions Recommendations and Implications

In this study, students who received decision case instruction did not receive significantly different scores on the cognitive examination from students taught the same material, using the traditional lecture approach. These results do not support the claim that cognitive learning is enhanced by decision case instruction (Simmons, 1994). McKeachie's (McKeachie, Pintrich, Lin, Smith, and Sharma, 1990) claim that methods which promote retention of information favor discussion methods over lecture was also not supported by this study.

Meaningful effects on attitude toward the instruction were found between students receiving decision case and lecture instruction. This finding reflects student preferences for active, discussion-oriented, participatory instruction as contended by Dooley and Skinner (1977), McKeachie et al. (1990), and Stanford et al. (1992).

The researchers felt that such a brief period of instruction could not realistically be expected to produce changes in higher-level cognitive operations in college-level students. Therefore, the cognitive examination in this study did not attempt to isolate higher-level cognitive learning. The results of this study lead to a question as to whether use of decision case methods over a longer period of instruction and

measuring higher level cognitive learning instead of just cognitive learning in general, might result in higher examination scores for decision case students.

Offering several decision case lessons, followed by multiple examination experiences may substantiate claims that decision cases promote retention. Students in this study encountered only one decision case so they were unfamiliar with the method and what was expected of them. When students experience decision cases many times, the decision-making process may become less overwhelming and more manageable (Simmons, 1993).

Overall, it is recommended that instructors in colleges of agriculture should utilize decision cases as one teaching tool in their instruction. The fact that students found decision case learning more enjoyable, might produce better class attendance. If students are encouraged to come to class on a more regular basis the potential for learning is increased. In addition, decision cases may arouse student interest within the subject matter, and thus motivate students to seek additional information outside the classroom.

Dooley and Skinner (1977) stated that decision cases are not equally suited for every educational purpose, but they are a powerful part of the educator's "tool box ". Keep in mind that a smorgasbord of teaching methods are in existence. Each of the many methods serve a purpose along the educational spectrum. If an educator aspires to motivate students to learn, and capture student interest and attention, then the decision case is a viable method. Decision cases may be suitable as the primary form of instruction, as they are used at the Harvard Business School or they may be beneficial when complementing other methods, as they were used in this study. The key to selecting and implementing instructional methods, such as the decision case, is to match teacher goals and student needs to the method.

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DECISION CASES VERSUS TRADITIONAL LECTURE IN A UNIVERSITY AGRICULTURE COURSE

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This study sought to compare the effectiveness of two teaching methods on the cognitive learning of students and student attitude related to a unit on pesticide management. The first interesting point about this study I want to recognize is the fact that an interdisciplinary group was assembled to conduct this research. Dr. Camp teamed with two professors from another department on his campus and an official from a commodity group. Such collaboration only serves to benefit our profession and extend the contributions we can make to a broader audience.

The theoretical base established the Decision Case method as an established, acceptable way of teaching on the university level. Studies claiming it to provide students higher perception in learning, greater confidence, and motivation to think were cited. Such claims make it sound like something that should be marketed on a thirty-minute infomercial. Thus, it is important that this study be conducted to see if it lives up to its billing in an agriculture course.

The purpose and research objectives were clear and provides a good framework for the study. The procedures, discussed in great detail, seemed to be appropriate and logical. Despite the length of the Procedures section, a few methodology-related questions remained unanswered for me. First, were the regular teachers used or were new instructors brought in to teach the unit? Second, was the test given for this unit included in the course grades for the students? Third, what scale was used for the attitude score? I would have liked the researchers to explain what the mean attitude scores indicate. Does a score of 125 indicate a positive attitude? Answers to such questions have a great impact upon the significance of the findings of this study.

The results revealed some interesting information in addition to the fact that there was no significant difference in the total cognitive examination mean scores of the two groups. Scores for both groups were very low -- 55% for those taught with the decision case method and 62% for those taught with lecture. Perhaps neither method is appropriate for teaching this material? Maybe there is a problem with the test (the .61 coefficient alpha might have indicated such)? Further, I wonder if there might have been a difference in the scores of the two groups had the test been given, say, a month later?

The significant difference between the two groups in the students' attitude about the topic is important. Even though there was no difference in their knowledge about the topic, we might assume that the students taught with the decision case method would more likely use the information, or at least feel better about the concepts taught.

The recommendations discussed some valuable information for us to explore. Though I believe some of the ideas were speculative (such as decision case method producing better class attendance), we should continually look for ways to most effectively present new material to our students.

LEARNING STRATEGIES USED IN AGRICULTURAL COURSES DELIVERED THROUGH VIDEOTAPE AND THEIR RELATIONSHIP TO COGNITIVE STYLE

Greg Miller *

Introduction/Theoretical Framework

Teaching and learning are complex processes composed of interactions among teachers, students, instructional content, and the environment. Teaching and learning have been researched extensively, but much remains to be learned about the process (Riddle, 1992). This is particularly true for teaching and learning in agriculture (Crunkilton, 1988). The need for research-based knowledge related to learners and learning is especially important in the distance education context, but most of the literature in distance education is anecdotal (Scholsser & Anderson, 1994).

Students approach learning tasks differently. This is true also of adult learners enrolled in distance education programs (Wong, 1992). Learning strategies are the techniques or skills used by an individual in accomplishing a learning task (Fellenz, 1989). Learning strategies influence achievement, but students generally have a limited repertoire of learning strategies, some of which may not be effective (Ehrman, 1990). What learning strategies are commonly used by agricultural distant learners? Researchers (Miller & Honeyman, 1994; Miller, 1995) have explored basic learning strategies used by students enrolled in videotaped courses, but additional research is needed to more comprehensively identify alternative learning strategies successfully used by distant learners in agriculture. Such information would be of value to students and teachers in that instruction in appropriate learning strategies can improve student achievement (Fellenz, 1989).

Learning strategies are intimately related to learning styles (Ehrman, 1990). In fact, learning style may be defined as a propensity to select a learning strategy despite the demands of a given learning task (Dillon & Schmeck, 1983). Even so, learning strategies are to some extent a function of a particular situation and are more amenable to change than are cognitive styles (Henderson, 1984).

Both field-dependent and field-independent learners can be successful in a variety of learning environments. However, it is likely that different problems are better solved with strategies associated with one or the other cognitive style. Are the learning strategies employed by agricultural distant learners associated with cognitive style?

Purpose/Objectives

The purpose of this study was to describe learning strategies used by students enrolled in videotaped courses and to explore associations between selected learning strategies and cognitive style. The following research objectives guided the study:

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1. Describe learning strategies used by students enrolled in videotaped courses.
2. Determine whether agricultural distant learners were consistent in their approach to learning from videotape over time.
3. Describe associations between the use of selected learning strategies and the cognitive style of agricultural distant learners.

Methods and/or Procedures

The population for this descriptive correlational study was students enrolled in an off-campus professional agriculture degree program at Iowa State University. The sample (n=107) consisted of all students who enrolled in one or more of five agricultural courses delivered through videotape during Spring Semester, 1995. Courses in agronomy (2), agricultural systems technology, animal science, and animal ecology were offered.

A learning strategies for videotaped instruction instrument was developed by the researcher. The instrument sought both quantitative and qualitative data about the learning activities of distant learners. Content and face validity were established by a panel of experts in agricultural education, and the instrument was field-tested for suitability with a group of 10 students who had formerly enrolled in videotaped courses through the off-campus program. The instrument required students to record factual data related to their learning activities over a seven-day period.

The Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971) was used to determine the preferred cognitive style of the distant learners. The GEFT is a standardized instrument with a reliability estimate of .82. Also, concurrent validity with the Embedded Figures test was .82 for males and .63 for females. To compare field-dependent and field-independent students' qualitative descriptions of their learning strategies, a median split was used (Spanier & Tate, 1988; Thompson & Knox, 1987). Students who scored below the group median of 13.5 were labeled field-dependent, and those with scores greater than the median were labeled field-independent.

Learning strategies data were collected by mailed questionnaire. Approximately five weeks after the first mailing, a follow-up mailing was sent to all respondents and nonrespondents. Respondents were asked to complete the learning strategies instrument for a second time, and nonrespondents were encouraged to provide data on at least this occasion. A total of 92 (86%) students completed the learning strategies instrument once, while 61 (57%) completed the instrument on two separate occasions.

The GEFT was administered by proctors during a regularly scheduled examination. A letter was sent to all students included in the sample (n=107) approximately one week before the GEFT was administered to explain the purpose of the study and to encourage their participation. Fifty-nine (55%) students completed the GEFT and at least one copy of the learning strategies instrument.

All data were analyzed with the SPSS/PC+ personal computer program. Appropriate statistics for description (frequencies, percentages, means, standard deviations, Pearson correlations, point biserial correlations, phi coefficients, and Cramer's V statistic) were used. The magnitude of all relationships was interpreted using Davis' (1971) descriptors.

Results and/or Findings

How were the videotaped lessons used by students? Most of the students (n=60, 65.2%) indicated that they viewed the videotaped lesson whenever they had time rather than viewing it immediately after it was received (n=7, 7.6%), or putting it aside until a predetermined viewing time (n=25, 27.2%). On average, students viewed the tape for 122.87% of the tape length with a standard deviation of 52.09 (Table 2). A majority of students paused the tape while viewing (n=85, 92.4%) and took notes (n=82, 90.1%). Less than 50% of the students viewed the tapes in segments (n=39, 42.4%), or viewed the tape more than once (n=36, 39.1%) (Table 1).

Table 1
Frequency and Percent of Students Who Utilized Selected Learning Strategies During a Seven-Day Period (n=92)

Strategy	f	%
Viewed the videotape in segments.	39	42.4
Took notes while viewing the videotapes.	82	90.1
Viewed the videotape more than once.	36	39.1
Paused the videotape while viewing.	85	92.4
Read class notes.	61	66.3
Outlined class notes.	18	19.6
Read assigned readings.	68	73.9
Read unassigned related literature.	14	15.2
Viewed videotaped lessons.	88	95.7
Studied with one other person.	9	9.8
Studied with a group of students.	5	5.4
Called the instructor.	18	19.6

Table 2
Means and Standard Deviations for Selected Learning Related Variables (n=92)

Variable	Mean	S.D.
Number of videotape courses taken.	3.21	3.59
Viewing time as a percent of video length.	122.87	52.09
Total amount of time spent studying over the seven-day period.	269.07	153.81
Number of times the student called the instructor.	1.17[a]	.38
Total percentage of time spent studying with other people.	3.28	10.44

[a] n=18

How did students approach the learning task in videotaped courses? Students, on average, spent 269.07 minutes engaged in learning activities during the one week period and spent approximately 3% of their time studying with others. Approximately 20% (18) of the students called the instructor an average of 1.17 times during the seven-day period (Table 2). As for study practices, a majority of students viewed the videotaped lessons (n=88, 95.7%), read assigned readings (n=68, 73.9%), and read class notes (n=61, 66.3%). Fewer than half the students outlined class notes (n=18, 19.6%), read unassigned related literature (n=14, 15.2%), studied with one other person (n=9, 9.8%), or studied with a group of persons (n=5, 5.4%) (Table 1).

Pearson correlations, phi coefficients, and Cramer's V statistic were used to determine whether agricultural distant learners were consistent in their approach to learning from videotape over time. Students' learning activities were measured at an interval of 5 weeks. Relationships between students' first and second responses were calculated for 19 variables. Three of the associations were very strong, four associations were substantial, and eight of the associations were moderate. Four negligible to low associations were found and related to: (1) whether the student called the instructor, (2) whether the student outlined class notes, (3) whether the

Table 3
Relationships Between First and Second Response for Selected Learning Related Variables (n=61)

Variable	Association
Type of viewing schedule followed.	$.62^{a}$
Time of day when students were more likely to view the tape.	$.66^{a}$
Proportion of reading assignments completed.	$.56^{a}$
Viewed the videotape in segments.	$.73^{b}$
Took notes while viewing the videotapes.	$.81^{b}$
Viewed the videotape more than once.	$.48^{b}$
Paused the videotape while viewing.	$.47^{b}$
Read class notes.	$.49^{b}$
Outlined class notes.	$.26^{b}$
Read assigned readings.	$.43^{b}$
Read unassigned related literature.	$-.03^{b}$
Viewed videotaped lessons.	$.38^{b}$
Studied with one other person.	$.48^{b}$
Studied with a group of persons.	$.48^{b}$
Called the instructor.	$.20^{b}$
Viewing time as a percent of video length.	1.00^{c}
Total amount of time spent studying over the seven-day period.	$.48^{b}$
Number of times the student called the instructor.	$.20^{b}$
Total percentage of time spent studying with other people.	$.55^{b}$

Note: ^{a}=Cramer's V; ^{b}=phi; ^{c}=Pearson

student read unassigned related literature, and (4) the number of telephone calls made to the instructor (Table 3).

Pearson correlations, point biserial correlations, and Cramer's V statistic were used to describe associations between the use of selected learning strategies and the cognitive style of the distant learners. Seventeen relationships were examined that ranged in magnitude from negligible to moderate. Eleven associations were negligible, three were low, and three were moderate. Field-dependent learners were more likely to view a videotape immediately after it was received or at a preset viewing time and tended to spend a greater proportion of their study time with others. Field-independent learners were more likely to view a tape whenever they had time, were more likely to list viewing the videotape as a learning strategy, and were more likely to telephone their instructor (Table 4).

Table 4
Relationships Between Learning Style and Selected Learning Related Variables (n=59)

Variable	Association
Type of viewing schedule followed.	.45[a]
Viewed the videotape in segments.	-.10[b]
Took notes while viewing the videotapes.	-.03[b]
Viewed the videotape more than once.	-.03[b]
Paused the videotape while viewing.	.09[b]
Read class notes.	-.08[b]
Outlined class notes.	-.09[b]
Read assigned readings.	-.13[b]
Read unassigned related literature.	.06[b]
Viewed videotaped lessons.	.38[b]
Studied with one other person.	.02[b]
Called the instructor.	-.06[b]
Viewing time as a percent of video length.	-.08[c]
Total amount of time spent studying over the last seven days.	-.01[c]
Number of times the student called the instructor.	.43[c]
Total percentage of time spent studying with other people.	-.21[c]
Number of videotape courses taken.	.01[c]

Note: [a]=Cramer's V; [b]=point biserial; [c]=Pearson

Students were asked to describe specific learning strategies or activities that had worked especially well for them over the specified seven-day period. Both field-dependent and field-independent learners controlled the pace of instruction by rewinding and pausing the tape, found creative ways to work around their family responsibilities, and found ways of applying what they had learned to their occupations. Field-independent learners tended to describe their learning activities more thoroughly. And surprisingly,

field-independent learners were more likely to express a desire to have on-campus laboratory sessions to meet the instructor and to work with other students.

Conclusions/Recommendations/Implications

One of the often cited benefits of videotaped instruction is the convenience that it affords students. Students who participated in this study took advantage of this as they exercised their ability to control when, where, and for how long instruction took place. Furthermore, students exercised control over the pace of lessons. Convenience and student ability to control pace must be fostered by distance education programmers. Acceptability of the videotape medium is related to these variables (Miller & Honeyman, 1994, Miller, 1995).

As a group, the distant learners tended to study independently and concentrated on viewing the videotape, reading assignments, and reading notes to study. They rarely studied with other individuals or groups and rarely called the instructor. This low level of interaction and high level of dependence on the videotape suggests a need for high quality communication. Instructors and video production specialists should be aware of the importance of clear communication and should develop and employ strategies to enhance the quality of communication in videotaped courses. One approach could involve inviting a trusted colleague of the instructor to each taping. The colleague could interact with the instructor, ask questions, and identify potential communication problems. Taping on-campus courses for videotape delivery may be another promising alternative. The on-campus students, through questions and nonverbal cues, may be able to assist the instructor in communicating lessons more effectively to the distant learner.

Students adopted a relatively consistent approach to the task of learning from videotape. Instructors should be made aware of this trend and may wish to recommend different strategies to their students. Additional research is needed to describe relationships between learning strategies and achievement in agricultural courses delivered by videotape. Besides quantitative comparisons, qualitative data is needed to identify unique approaches to learning from this medium. Research should be conducted to determine if students enrolled in videotaped courses rely more on surface or deep approaches to learning (Fenwick & McMillan, 1992; Henderson, 1984) and whether depth is related to achievement of intended learning outcomes for specific videotaped courses. In any case, students should be informed of the relationship between learning strategies and achievement and should be informed of a variety of effective strategies for learning from videotape. Learning strategies workshops would not likely be of interest to students (Bernt & Bugbee, 1990), but embedding learning strategies instruction into the regular curriculum materials and training instructors to incorporate learning strategies into regular classroom presentations (Weinstein & Underwood, 1985) may be useful approaches in the agricultural setting.

Field-dependent and field-independent learners employed very similar strategies for learning from videotaped lessons. However, results of this study suggest that field-dependent learners spent a greater proportion of their study time with others and were more likely to establish a schedule for viewing the videotaped lessons. These findings are consistent with the theoretical preferences of field-dependent learners (Garton, 1993,

Torres, 1993). While the videotape medium may impose certain logistical and pedagogical limitations that favor the field-independent learner, field-dependent learners who participated in this study were able to create, on their own, social interactions and structures that supported their preferred learning style. Surprisingly, field-independent learners were more likely to call the instructor and express interest in attending on-campus sessions. This study should be repeated with additional agricultural distant learners to determine if stable patterns exist regarding the relationships between learning strategies and cognitive style.

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LEARNING STRATEGIES USED IN AGRICULTURAL COURSES DELIVERED THROUGH VIDEOTAPE AND THEIR RELATIONSHIP WITH COGNITIVE STYLE

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In this paper we see Dr. Miller continuing his work in the area of distance education research. The use of communication technologies to extend educational programs off campus has become a major area of interest in agricultural education. The use of high tech telecommunications equipment has made it possible for our educational programs to reach students where they are. Now students have more control of how and when they learn. One of the technologies giving students greatest freedom from the confines of traditional classes is videotape.

This research adds to the knowledge base we in agricultural education will use to enhance distance education methods. The use of videotape to deliver courses or entire degree programs, as is the case at Iowa State, indicates that distance education is not only part of the future, but the present as well. Dr. Miller pointed out in his introduction that learning is composed of interactions among teachers, students, instructional content and the environment. Because of the radical change in the environment caused by the use of videotape based courses, it is important to investigate the what happens to the other components of the learning relationship.

The introduction covered many different building blocks of the theoretical base in a concise manner. A bit more detail on field dependence and its impact upon learning would have been appreciated. The methodology was explained very well. I applaud the researcher for not limiting himself to quantitative research on this study. The qualitative findings may, in the long run, provide more applicable information concerning how students are using the medium.

The 86% response rate of participants who returned at least one questionnaire makes the findings for objectives #1 and #3 valuable. The 55% response rate for participants returning both questionnaires could lessen the value of findings related to objective #2 unless consideration was made for non-response error.

The results and findings reported were very interesting. It is obvious that students using videotape to receive course lectures are taking advantage of this medium is several ways. Many students chose to view the tape in segments, pause the tape, and view the tape more than once. Students on campus, taking traditional classes, don't have such luxuries. This opportunity to learn when you want and have unlimited repetition of material likely enhances student learning. This fact reinforces the idea that distance education course materials must be of the highest quality.

This study shows that distance education students use a different approach than do their counterparts taking traditional courses. We have a lot to learn about best serving their needs. More work should be conducted to better understand how distance education environments have influenced teachers, learners, and instructional content.

INTERACTION IN THE DISTANCE EDUCATION SETTING

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INTRODUCTION / THEORETICAL FRAMEWORK

Distance education has been the subject of study for at least 100 years and many educators agree that distance learning is the fastest growing instructional pattern in the world. In recent years agricultural researchers have become involved in this field of education as distant learning is needed and desired by agriculturists who operate in a rapidly changing industry. Distance education is also commonly used by agricultural educators for adults who are unable to attend school on-site due to work, social, and family commitments (Schoenfelder, 1995).

In the past the most common theme in distance education research has been that which compares two or more media in relation to their effectiveness. However, today educators are realizing that the important issues are not programmatic but pedagogical/andragogical in nature. Recently, interaction has become an area of interest to distance education researchers. Kearsley (1995) stated:

> One of the most important instructional elements of contemporary distance education is interaction. It is widely held that a high level of interaction is desirable and positively affects the effectiveness of any distance education course. However, it is not clear from research or evaluation data that interaction does improve the quality of learning in most distance education programs (p. 366).

Research by Baker (1995) indicated that interaction is important for a variety of types of learning, learner satisfaction, and persistence of distance students. Further strengthening the importance of studying interaction was Jackson (1994) who described interaction as one of the central issues related to distance education today.

In 1993 Acker and McCain made the following statements concerning the importance of interaction. They stated that " interaction is central to the social expectations of education in the broadest sense and is in itself a primary goal of the larger educational process and that feedback between learner and teacher is necessary for education to develop and improve" (Acker & McCain, 1993, p.11).

Interaction is an educational topic which has been studied for several decades. Flanders (1970), as well as others, have published entire books dedicated to the subject of interaction. Although these books offer useful insights into the study, they limit themselves to the study of "classroom" or face-to-face interaction.

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Moore (1989) further defined interaction by dividing it into three categories: learner-content interaction, learner-instructor interaction, and learner-learner interaction. A fourth component of interaction was defined by distance education researchers as learner-interface interaction which takes into account the interaction that occurs when a learner must use intervening technologies to communicate with the content, negotiate meaning, and validate knowledge with the instructor and other learners (Hillman et al, 1994). Research needs to be conducted by agricultural researchers in this area which will enable educators to understand the interaction needs of their students and develop agricultural distance courses that will meet their interaction needs.

PURPOSE(S) / OBJECTIVES(S)

The purpose of this study was to investigate interaction and its relationship to agricultural courses taught via distance education through the Off-Campus Professional Agriculture Program at Iowa State University. The objectives of the study were as follows:

1. Describe selected demographic characteristics of students enrolled in courses offered through the Off-Campus Professional Agriculture Program.
2. Determine student differences in interaction needs based upon delivery method.

RESEARCH METHODS AND PROCEDURES

The research undertaken was descriptive in nature. The population for the study consisted of all students enrolled in distance education courses administered through the Off-Campus Professional Agriculture Program during the Spring Semester of 1995. A census was used to collect data.

Data was collected on 139 students from the following courses: Applied Non-Ruminant Nutrition (AnS 512), Wildlife and Agriculture (A Ecl 130), Advanced Crop Management (Agron 542), Agricultural Safety and Health (AST 436X), and Principles of Crop Production (Agron 114). The courses were offered through traditional classroom format (face-to-face), over the Iowa Communications Network (ICN), and via videotape. Exceptions were Wildlife and Agriculture which was not offered via the ICN and Agricultural Safety and Health which was only offered via videotape.

The ICN (Iowa Communication Network) is an end-to-end fiber optic digital transmission, error-free data transport, and sharp, crisp-voice communications network. The network links Iowa's schools, public universities, community colleges, independent colleges, government offices and libraries. These facilities are available to Iowans through access points in each of the state's 99 counties, thus making everyone within 20 minutes of an ICN user site.

The questionnaire utilized in the study was developed by the researchers and consisted of an interaction statements section and a demographics section. Content and face validity were established by a panel of experts in agricultural education. A pilot test was conducted using past students of distance education courses offered through the Off-Campus Professional Agriculture Program at Iowa State University. Cronbach's alpha was

used to estimate the internal consistency of the instrument. The reliability coefficient for the pilot test was .93. No changes were made to the instrument after the pilot test. The reliability coefficient was recalculated for the study respondents and was .95.

The 68 interaction statements were measured using a Likert-type scale which ranged from 'extremely negative' (1) to 'extremely positive' (8), and included a 'does not apply' (9) response category. The statements were developed from a review of relevant literature and instruments used for similar purposes in other studies. The students were asked to read the statement and circle the number which represented the extent to which they felt the experience to be positive or negative in relationship to their learning.

The questionnaire, along with a cover letter and a stamped return envelope was sent to each student. Ten days after the initial mailing, a follow-up letter was sent to all non-respondents. Approximately one month after the first mailing, a complete mailing was sent to remaining non-respondents. One hundred and fifteen of the 139 students completed and returned the questionnaire for a response rate of 83 percent. All data were analyzed with the SPSS/PC+ personal computer program. Statistics used were frequencies, percents, means, and standard deviations.

RESULTS / FINDINGS

The data collected from the respondents was placed in one of three groups for analysis depending on the delivery method by which the students completed their course work: videotape, ICN, and face-to-face. It should be noted that the students who took classes face-to-face did so in an ICN setting; they were the students at the origination site for the course.

The students who participated in the study ranged in age from 19 to 57 years. The mean age of students was 34.30 with a standard deviation of 8.80. Eighty-three percent (93) of the students in the study were male.

The students indicated that 82% (92) of them were part-time students. The students were asked to report their current martial status. Sixty-two percent (69) were married, 34% (38) were single, and four percent (5) were divorced.

Table 1
Occupation of Students Enrolled in the Off-Campus Professional Agriculture Program

Occupation	f	%	Cum %
Farming	35	31.3	31.3
Agribusiness	35	31.3	62.6
Agricultural Extension	6	5.4	68.0
Agricultural Education	3	2.7	70.7
Other	33	29.3	100.0
Total	112	100.0	100.0

Table 1 shows that sixty-two percent (70) of the students were occupied in either farming or agribusiness. Almost 30% (33) of the students listed "other" as their occupation due to the fact that they had more than one occupation. Generally they indicated that they farmed as well as earned income from some other agricultural occupation.

Table 2
Students Reason for Enrolling in the Off-Campus Professional Agriculture Program

Reason	f	%	Cum %
Pursuing a degree	66	60.0	60.0
To improve my business/ career performance	26	23.6	83.6
For personal interest/hobby	6	5.5	89.1
Other	3	2.7	91.8
More than one reason	9	8.2	100.0
Total	110	100.0	100.0

Table 2 shows that sixty percent of the students indicated that they enrolled in the courses to pursue a degree; however, many were also interested in improving their business or career performance.

Videotape was the delivery method utilized by most students (88.5%), followed by the ICN (8.0%), and face-to-face (3.5%) instruction. The vast majority of students (97%) indicated that they would take another course taught using distance learning.

Table 3
Students Overall Satisfaction With Their Off-Campus Professional Agriculture Program Class

Reason	f	%	Cum %
Very dissatisfied	4	3.7	3.7
Dissatisfied	1	.9	4.6
Somewhat dissatisfied	6	5.5	10.1
Somewhat satisfied	16	14.7	24.8
Satisfied	58	53.2	78.0
Very satisfied	24	22.0	100.0
Total	109	100.0	100.0

Table 3 reveals that seventy-five percent of the students indicated that overall they were satisfied to very satisfied with their class. However, further analysis indicated that the students in the face-to-face group were not as satisfied with their courses as were the videotape or ICN students.

Table 4 demonstrates that the majority of students indicated that they felt that experiences aimed at learner-instructor interaction were moderately to very positively related to their learning. They also indicated that they felt instructor interest, teaching skills, and personal interaction with the students aided the learning process. Opportunities to discuss assignments and/or course work with instructors was viewed positively by all three groups of students.

Table 4
Mean Scores for Selected Statements Related to Interaction by Delivery Method

Statement (in order of appearance on questionnaire)	Delivery Method: Face to Face	ICN	Videotape
Discussing class assignments with instructor during class time.	6.75	6.50	6.44
Talking informally with instructor.	6.75	6.12	6.50
Privately discussing course work with other students.	6.00	6.00	6.25
Instructor makes eye contact with me.	6.50	6.38	6.29
Instructor treats some members of the class differently than others.	1.33	3.00	3.19
Class members talking during class (interrupting teacher).	1.67	2.83	3.08
Instructor shows personal interest in my class work.	6.50	6.43	6.38
Instructor ignores me during class.	1.33	2.83	3.04
Instructor uses a variety of audio-visual aids in class.	6.75	6.25	7.02
Poor instructor use of distance education technology.	1.50	3.83	3.97
Being physically separated from the teacher (such as being in a remote location).	5.00	3.57	5.16
Instructor provides student(s) remarks concerning class.	6.75	6.13	6.77
Self-regulation (control) of learning.	5.50	4.63	6.35
Personal enthusiasm for class.	6.25	6.29	6.78
Instructor visiting off-campus site classes.	6.00	6.57	6.09
Help from remote-site technicians.	7.00	6.00	5.65
Scheduling time to work on class assignments.	6.75	5.29	5.97
Being the only student at a remote site	0.00	3.71	4.85

Note: Based on Scale: 1= Extremely negative; 2 = Very negative; 3 = Moderately negative; 4 = Slightly negative; 5 = Slightly positive; 6 = Moderately positive; 7 = Very positive; 8 = Extremely positive

Table 4 also shows that students taking courses via videotape felt that self-regulation of learning was more important than did the student respondents in the ICN or face-to face groups and; students in the videotape group often felt that the learning experiences statements did not apply to their learning via videotape. However, all three groups indicated that being physically separated from the teacher did not pose a considerable challenge to learning. They also indicated that they felt personal enthusiasm for their classes was moderately to very positively related to their learning.

Scheduling time to work on class assignments was felt to be moderately to very positive to learning by all the students. The videotape students indicated that they did not feel that learning individually was a hindrance to their education but ICN students indicated a dislike for being the only student at a particular learning site or being physically separated from the teacher.

The effect of poor instructor use of distance education technology was felt to be slightly to extremely negative by each of the groups of learners, with the ICN learners believing it to be most negative. The students also felt that talking during class, being ignored by the instructor, and the instructor treating some class members differently than others was also negatively related to their learning.

CONCLUSIONS / RECOMMENDATIONS / IMPLICATIONS

Due to the fact that a small number of students who participated in this study took courses either face-to-face or over the ICN, our conclusions are offered cautiously with regards to these populations. The results of this study indicate that interaction needs of learners, while similar in general, vary based upon the delivery method used for the course.

The data from this study suggests that instructors need personal contact with all students regardless of delivery method. Instructors should use this personal contact to clarify course assignments and expectations. A study by Rodriguez (1995), found that students and professors believed that such interaction enhanced communications, improved teaching and student interest in content matter.

The respondents also indicated a slight desire for student to student interaction regardless of delivery method. Teachers educators should be aware of this desire and plan activities which incorporate interpersonal interaction into their courses. Teacher educators should develop training programs that focus on interaction and how in can be incorporated into courses taught at a distance.

All students in this study desired high quality interaction with the distance education technology. This finding reinforces the often stated belief that the key to success in distance learning is the teacher. "If the teacher on the system is good, the technology itself can become almost transparent. Conversely, no technology can overcome poor teaching; poor teaching is actually exacerbated in distance education applications," (Barker, 1995).

Hillman, et. al. (1994) recommend that all students planning to take a course via distance education be required to first take a for-credit technology-based class. Although this may not be feasible, educators must make efforts to improve their students interaction with distance education technology so it does not overshadow the learning experience.

Increased student performance is another possible outcome of improved student understanding of distance education technology.

It was interesting to note that students taking courses via videotape did not seem to feel that interaction was as important to their learning as did students taking courses face-to-face or via the ICN. The videotape students also indicated that they desired more control over their learning than ICN or traditional students. Does this finding indicate a difference in the learning styles of these student populations or a difference in learning preferences?

Adult distance education students have been described as students possessing strong motivation, study skills, and discipline (Schoenfelder, 1995). Perhaps those students who possess these traits do not require as much interaction as students without these traits. However, the researchers question whether or not these individuals might learn better if interaction was improved. Additionally, might the lack of interaction in many distance education courses be part of the reason behind the high attrition rate commonly found in distance education? Further research needs to be conducted with these populations to determine if there are differences in their interaction needs which should be addressed by distance educators concerned with program retention and/or course completion.

Regardless of delivery method, the students' enrolled in these classes were overall satisfied to very satisfied. Studies such as this one are valuable in documenting the desirability of distance learning. Biner, et. al, (1994) concluded that high student satisfaction could benefit distance education by promoting distance education programs, motivating students, increasing enrollment, improving learning, and decreasing attrition rates.

Interaction is not a phenomena that simply occurs; it needs to be an intentional part of the learning design for the course to be taught. Each element of the learning opportunity (the teacher, content, context and methods) must compliment each other and include flexible opportunities for interaction. Multiple delivery methods used in distributed learning systems increase the complexity of the learning design. Continued study of variables such as interaction can only increase the chance of a successful outcome for consumers of distance learning.

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INTERACTION IN THE DISTANCE EDUCATION SETTING

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While, as the researchers pointed out, distance education research has been taking place for at least 100 years, it has only recently become an important area of emphasis in agricultural education. As a profession, we are uniquely suited to investigate instructional technologies and teaching methodologies. Further, we are in a position to disseminate such information and use it for faculty development activities for our peers.

Ms. King and Dr. Doerfert did an excellent job of constructing the theoretical framework for this research. The appropriate elements of historical distance education research and the significance of interaction in educational settings lead the reader to understand why this study was undertaken and how it will contribute to the body of research.

I found the information about the Iowa Communication Network to be especially interesting. Because of the technological system and distance education programs in place, research such as this study place agricultural educators at Iowa State University in the forefront of this area.

The purpose was logical, but I found the objectives to lack specificity needed to describe the undertaking. It seems an objective stating the desire to identify types of interactions taking place in distance education settings would have been appropriate. The study certainly produced results and conclusions relative to that issue.

The methods used were described adequately and were appropriate for this research. The reliability coefficient for the instrument was quite impressive. The demographic data collected provide important information that will be useful to the administrators of the Off-Campus Professional Agriculture Program at Iowa State University. Such information will help identify the type of people to target in promoting this program. It also closely reflects other profiles of distance learners found in the literature.

The results provided, among other things, validation that the institution is on track with its distance education course offerings. The fact that three-fourths of the students expressed satisfaction with their class and nearly all of the students indicated they would take another course using distance education is a very good sign. It is also interesting that separation from the teacher did not cause considerable stress among students, regardless of course format. This finding goes against findings in other research.

Distance education provides agricultural educators with a "new frontier" to explore alternative instructional methods and designs. With the high level of satisfaction and eagerness found among students taking part in the Iowa State distance education program, perhaps instructors should try to employ greater variety of teacher-student and student-student interaction and evaluate the results.

RELATIONSHIPS BETWEEN EXTENSION AGENTS' USE OF INFORMATION SOURCES AND DEMOGRAPHIC CHARACTERISTICS: A NATIONAL PERSPECTIVE

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INTRODUCTION

Extension agents are non-formal educators who aid in the diffusion of useful and practical information on subjects relating to agriculture and natural resources, youth development, family, nutrition and health, and community development. Such agents guide and develop educational programs, based on problems and opportunities, and then create educational programs to meet local community needs.

According to Bay (1980), extension workers rely heavily on two organizational sources for information: internal and external. Internal information sources include summarized research findings, fact sheets, pamphlets, and other materials published by the extension service. Internal information sources are their first choice because they are easy to access and use, familiar to them, reliable and authoritative. But more importantly these information sources are prepared for them to use and to disseminate in their areas of responsibility. External information sources are secondary alternatives because they are usually not readily available and sometimes require additional cost to access. When the information wanted is not readily available through the extension system, agents have to resort to external sources.

Several studies have been conducted regarding information use by extension agents (Burns & Anderson, 1973; and Shih & Evans, 1991). Findings from these studies suggest that extension agents rely mostly on internal information sources such as extension specialists, agricultural experiment station bulletins, fact sheets, and extension publications. Farm and trade magazines were the external information source most frequently consulted by extension agents. Shih and Evans found no relationships between Illinois extension agents use of information sources and their work experience and age.

In a study conducted by Agnew (1991), state extension directors perceived that program delivery approaches will change in the next five years. These changes include increased use of electronic communications and instructional devices. The electronic changes most often mentioned were increased use of telecommunication as a mode of delivery, access to electronic data sources, interactive instructional video, and increased use of computer technology.

Other researchers have examined the strengths and weaknesses of the extension delivery system depending upon the audience, educational goals, and available resources. Sattar and Lancaster (1984) identified three problems in extension agents' information use.

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These include: 1) diversity of information; 2) fugitive literature; and 3) diversity of treatment and presentation. Fedele (1985) suggested three areas where the present extension delivery system fails: 1) extension information is very labor intensive; 2) is inconsistent in quality and content; and 3) is not accessible.

What, when and how information is searched and used by extension agents is of critical importance in meeting the information needs of extension agents and the clientele they serve. Identification and understanding of the search for and use of information sources will go a long way in improving delivery methods for extension. As extension educators consider alternative delivery methods, inquiries must be made concerning the usefulness and appropriateness of delivery methods, depending on type of audience, educational level of learners, skills of extension agents, and their educational objectives. These inquiries become even more critical in the context of budget cuts, reduced staff and, professional development goals, each requiring the efficient use of resources. This study examined the nature and extent of information use by extension agents in the United States.

PURPOSE AND OBJECTIVES

The purpose of this study was to examine information use by extension agents in the United States. The first objective was to determine agents' search for and use of information. The second objective was to identify information sources that extension agents most frequently use. The third objective was to determine differences, if any, among frequency of use of information sources and agents' demographic characteristics (age, gender, highest education level, and primary area of program responsibility).

METHODS AND PROCEDURES

A stratified random sample was drawn from the target population of all extension agents in the United States. Eight states, two from each extension region were randomly selected for the study. States selected were: Iowa, Missouri, Maryland, West Virginia, Georgia, Texas, Colorado and Oregon. The frame was obtained from extension director's office in each state. A sample of 305 out of 1515 extension agents in the eight states were randomly selected. This sample size reflects a 5% margin of error with a 5% risk of drawing a bad sample (Krejcie and Morgan, 1970).

The questionnaire, developed by the researchers, had three sections: 1) agents' information search and use; 2) frequency of use of information sources measured on a five-point, Likert scale which ranged from 1(none) to 5 (once a day); and 3) demographic information (age, gender, highest education level, major for the highest degree, and primary area of program responsibility). The questionnaire was assessed for content and face validity by a panel of experts in agricultural communications and research methodology. Items which were measured on the Likert scale were assessed for reliability using Cronbachs alpha. Results of reliability analysis indicated that the questionnaire had acceptable reliability (alpha=.81). After the initial mailing and two follow-ups, a total of 191 (63%) agents responded. Early and late respondents were compared on key variables, based on procedures suggested by Miller and Smith (1983). No significant differences

were found between the two groups and the data were generalized to the population. Descriptive statistics and inferential statistics (t-test and ANOVA) were used to organize and summarize the data.

FINDINGS

Demographic Profile of Extension Agents

The demographic profile of agents is shown in Table 1. As shown in Table 1, the 91 female and 100 male agents averaged 43 years of age. A majority of agents (74%) reported a master's degree as their highest level of education. Agents averaged 13 years of work experience. Agriculture was the primary area of program responsibility for 73 agents (38%), family living/home economics for 53 agents (28%), and 4-H/youth development for 41 agents (22%). Twenty-three agents (12%) were in the "other" category (forestry, community development, and natural resources).

Table 1. Demographic Profile of Extension Agents (n=191)

Characteristics	f	%	Mean/SD
Age			42.69/10.19
Gender			
Male	100	52.4	
Female	91	47.6	
Highest Level of Education			
Bachelor's degree	32	16.8	
Master's degree	142	74.3	
Doctoral degree	15	7.9	
Other	2	1.0	
Experience			13.13/9.11
Primary area of Program Responsibility			
4-H/Youth Development	41	21.6	
Family Living/Home Economics	53	27.9	
Agriculture	73	38.4	
Other	23	12.1	

Objective 1--Search for and Use of Information

Tables 2 through 4 report results relative to the search and use of information by extension agents. More than three-fourths of the agents (77%) indicated that they needed an item for information the same day, followed by yesterday (10%), this week (9%), and this month (4%), (Table 2). Agents were asked to identify: 1) causes for an information search and 2) frequently searched subject-matter areas. To answer a clients' inquiry was the most frequent reason to search for information (94%), followed by preparing for a training program (63%), report preparation (56%), collecting research-based information (36%), preparing for a presentation (35%), and preparing a radio program (33%), (Table 3). The most frequently searched subject area was county information (48%), followed by 4-H (46%), pesticide application (38%), crop production (38%), and farm management (36%), (Table 4).

Table 2. Last Time Extension Agent Needed an Item for Information (n=191)

Time	f	%
Today	146	76.8
Yesterday	19	10.0
This week	18	9.5
This month	7	3.7

Table 3. Causes for Information Search (n=191)

Cause	f	%	Rank
Answer a clients inquiry	179	94.2	1
Prepare a training program	119	62.6	2
Prepare a report	106	55.8	3
Search for research information	68	35.8	4
Prepare a presentation for a professional meeting	66	34.7	5
Prepare a radio program	62	32.6	6
Write a grant proposal	51	26.8	7
Prepare for a business meeting	40	21.1	8
Prepare a research report	25	13.2	9
Fix the price of a farm product	20	10.5	10

Table 4. Subject Matter Areas Frequently Searched by Agents (n=191)

Subject Area	f	%	Rank
County information	92	48.4	1
4-H	88	46.3	2
Meeting	78	41.1	3
Pesticide application	73	38.4	4
Crop production	72	37.9	5
Farm management	66	34.7	6
Livestock feeding	58	30.5	7
Writing proposals	50	26.3	8
Food processing	45	23.7	9
Leasing	42	22.1	10
Tax information	40	21.1	11
Nursery production	40	21.1	12
Personnel recruitment	15	7.9	13

Objective 2--Frequency of Use of Information Sources

Agents were asked to indicate on a scale, 1 (none) to 5 (once a day), the extent to which they communicated with 21 information sources. Results are shown in Table 5. Extension agents frequently (once a day) communicated with clients (4.85), followed by another agent in the office (4.62), another agent in another county (3.95), extension specialists (3.72), their immediate supervisor (3.66), local news agencies (3.66), local business organizations (3.20), state and federal agencies (3.04), and local school teachers and administrators (3.00). Agents communicated at least once a year with extension workers in another state and non-extension university faculty.

Objective 3--Demographic Differences

T-tests and ANOVA results indicate significant differences among frequency of use of information sources and agents' age, gender, highest education level, and primary area of program responsibility. Older agents (over 44 years) more frequently than younger agents communicated with extension program advisory committees (Table 6). Younger agents (less than 44 years) were more likely than older agents to communicate with local school teachers and administrators, (Table 6).

Table 5. Frequency of Use of Information Sources (n=191)

Information Sources	Mean*	SD	Rank
Client(s)	4.85	0.51	1
Another agent in my office	4.62	1.01	2
Another agent in another county	3.95	0.69	3
Extension specialists	3.72	0.79	4
My immediate supervisor	3.66	0.89	5
Local news agencies	3.66	0.71	5
Local business organizations	3.20	0.97	7
Local service organizations	3.19	0.83	8
Other community organizations	3.12	0.87	9
State and federal agencies	3.04	0.86	10
Local school teachers and administrators	3.00	0.92	11
Youth organizations	2.91	0.97	12
County Commissioners	2.85	0.90	13
Extension Program Advisory Committee	2.80	0.82	14
My regional director	2.75	0.88	15
Other local government officials	2.74	0.83	16
County Extension Executive Committee	2.68	0.86	17
Professional extension associations	2.61	0.80	18
Non-extension university faculty	2.32	0.90	19
An extension worker in another state	2.09	0.80	20
Assistant to regional director	1.96	1.09	21

* Mean computed on a scale that ranged from 1=none; 2=once a year; 3 =once a month; 4=once a week; and 5=once a day.

Table 6. T-test Results for Age and Frequency of Use of Information Sources

	AGE					
	< 43 yrs.		> 44 yrs.			
Information Source	Mean[a]	SD	Mean[a]	SD	Mean Difference	t-value
Extension program advisory committee	2.67	.84	2.92	.78	0.25	-2.09*
Local school teachers and administrators	3.14	.79	2.86	1.0	0.28	2.15*

[a] mean computed on a scale: 1 = none; 2 = once per year; 3 = once per month; 4 = once per week; 5 = once a day * significant at .05 level

Table 7 shows the results of t-test relative to frequency of use of information sources and gender. Male agents differed from female agents by more frequently communicating with extension specialists, extension workers in another state, non-extension university faculty, and state and federal agencies, while female agents more frequently than their male counterparts communicated with other community organizations.

Table 7. T-test Results for **Gender** and Frequency of Use of Information Sources

	GENDER					
	Male		**Female**		Mean	t-
Information Source	Mean[a]	SD	Mean[a]	SD	Difference	value
Extension specialist	3.99	.62	3.43	.86	0.56	5.05**
An extension worker in another state	2.21	.82	1.95	.76	0.26	2.21*
My regional director	2.90	.80	2.56	.94	0.34	2.48*
Assistant to regional director	2.12	1.1	1.76	1.0	0.36	2.01*
No-extension university faculty	2.60	.85	2.02	.87	0.58	4.54**
State and federal agencies	3.23	.77	2.82	.91	0.41	3.37**
Other community organizations	2.97	.84	3.28	.89	0.31	-2.44*

[a]mean computed on a scale: 1 = none; 2 = once per year; 3 = once per month; 4 = once per week; 5 = once a day * significant at .05 level; ** significant at .001 level

Agents with BS degrees more frequently than agents with MS and Ph.D. degrees communicated with their immediate supervisors, county commissioners, and local school teachers and administrators (Table 8). Agents with Ph.D. degrees more frequently than agents with BS and MS degrees communicated with agents in another county and in another state.

ANOVA results for agent's primary area of program responsibility and frequency of use of information sources are shown in Table 9. Agricultural agents and other agents differed from family living and 4-H agents by more frequently communicating with extension specialists, extension workers in another state, and non-extension university faculty. 4-H and family living agents more frequently than agricultural and other agents communicated with local school teachers and administrators, and youth organizations. Regardless of primary area of program responsibility and highest educational level, agents communicated frequently with their immediate supervisors, other community organizations, and local news agencies. Given that a majority of agents in this study were agricultural agents followed by family living and 4-H agents, the possibility exists that an interaction is occurring among gender, program areas of responsibility, and frequency of use of information sources.

Table 8. ANOVA Results for **Highest Education Level** and Frequency of Use of Information Sources

Information Source	BS Mean[a]	MS Mean[a]	PHD Mean[a]	F Ratio
Extension specialist	3.41A	3.78A	4.00A	3.96*
My immediate supervisor	3.97A	3.63AB	3.27B	3.60*
Another agent in another county	3.81A	3.92A	4.43B	4.28*
Extension worker in another state	1.69A	2.15B	2.40B	5.76*
County commissioners	3.09A	2.85A	2.28AB	4.08*
Local school teachers & administrators	3.37A	2.96A	2.71B	3.55*

[a] The mean can range from 1(none) to 5 (once per day).
Means followed by the same alphabet are not significantly different from each other at .05 (*) and .001(**) levels as computed by Scheffe post-hoc test.

Table 9. ANOVA Results for **Primary Area of Program Responsibility** and Frequency of Use of Information Sources

Information Source	4-H/YD Mean[a]	FL/HE Mean[a]	AG Mean[a]	Others Mean[a]	F Ratio
Extension specialist	3.61A	3.35A	3.93B	4.13B	8.76**
My immediate supervisor	4.00A	3.58A	3.60A	3.43A	..83*
Extension worker in another state	1.89A	1.86A	2.30B	2.30B	4.80**
Non extension university faculty	2.31A	1.86A	2.49B	2.74B	7.93**
Local school teachers & administrators	3.49A	3.06A	2.72B	2.87A	6.85*
Youth organizations	3.36A	2.66B	2.93B	2.53B	5.50**
State and federal agencies	2.66A	2.96A	3.19B	3.35B	4.89*
Other community organizations	3.17A	3.36A	2.87A	3.17A	3.46*
Local news agencies	3.56A	3.83A	3.68A	3.35A	2.87*

4-H/YD = 4-H and Youth Development; FL/HE = Family Living and Home Economics; AG = Agriculture; Others = Forestry, Community Development and Administration
[a] The mean can range from 1(none) to 5 (once per day).
Means followed by the same alphabet are not significantly different from each other at .05 (*) and .001(**) levels as computed by Scheffe post-hoc test.

CONCLUSIONS AND RECOMMENDATIONS

Extension agents regularly seek information to carry out their day-to-day work. Agents searched a variety of information sources not only for their own knowledge, but also to meet the information needs of their clients. These findings suggest that agents should not only be fairly knowledgeable in subject-matter areas, but also they should be aware of where, from whom, and how to find information in order to answer a client's inquiry.

Extension agents frequently communicate with a variety of information sources. Prominent among these were: clients, another agent in the office, another agent in another county, extension specialists, agent's immediate supervisor, local news agencies, local business organizations, state and federal agencies, and local school teachers and administrators. It appears that, to some extent, agents use electronic information.

Several reasons could account for the differences in demographic characteristics and frequency of use of information sources. Younger agents are more likely to be 4-H and youth development agents. Moreover, the program emphasis of these agents is to work with children and youth. Therefore, it is possible that they more frequently communicate with local school teachers and administrators. On the other hand, older agents, who have been in the system for a longer time, are more comfortable working with extension program advisory committees. Furthermore, the job responsibilities of these agents may require working frequently with program advisory committees.

Male agents predominantly are agricultural agents and are most likely to communicate with extension specialists in subject-matter areas of agronomy, pathology, soil science, and entomology. In addition, state and federal agencies are a major source of information on issues such as IPM, soil conservation etc. Female agents, on the other hand, frequently communicate with community organizations, mainly because these organizations are more concerned with issues related to communities--food, health, nutrition, clothing etc.

Extension agents work in communities. Their job is to help people in the community make informed decisions based on the resources they possess. The extension agents' role is to guide them and help them use resources efficiently Therefore agents, regardless of their primary area of responsibility and education level, frequently communicate with community organizations and local news agencies. Agents have to be in constant contact with local news agencies in order to publicize extension programs and events, and as such, agents frequently communicate with local media personnel.

Significant differences among demographic characteristics and the frequency of use of information sources suggests that specialists who develop educational materials should look into demographic characteristics of agents and the type of information delivery methods they use when designing and developing extension program materials.

The findings of this study should be shared with staff development personnel and extension information services so that informed decisions are made in the development. publication, and delivery of educational materials.

If electronic information is to lead the way for the future as predicted (Agnew, 1991), extension agents must continually be provided opportunities to use such electronic information. A need exists for training in how to access and use electronic information. Further research and education are needed to enhance agents' use of electronic information.

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RELATIONSHIPS BETWEEN EXTENSION AGENTS' USE OF INFORMATION SOURCES AND DEMOGRAPHIC CHARACTERISTICS: A NATIONAL PERSPECTIVE

John P. Mundt, University of Idaho, Discussant

This national study to examine information use by extension agents in the United States was straight forward and well done. The researchers are commended for their effort in conducting a study of this nature which was national in scope. A sound introduction provided theoretical base for the study and lead specifically to the purpose of the research. Specific objectives were developed and appropriate research methods and procedures were used and concisely explained. Data reported provided information specifically supporting conclusions and recommendations and were relative to the findings and conclusions. The authors are commended for a well done study and a well written paper.

The following questions are presented for discussion:

What explanation do the authors offer regarding the findings of Shih and Evans (1991) who found no relationship between Illinois extension agents use of information sources and their work experience and age; and the findings of this study?

What are the reasons agents with Ph.D. degrees would more frequently communicate with agents in other counties and other states?

What explanation/discussion would the researchers offer as to the possibility of interaction occurring among gender, program areas of responsibility, and frequency of use of information sources?

Why is the statement made that the job responsibilities of older agents may require working more frequently with program advisory committees?

The researchers indicated that to some extent, agents used electronic information. Please elaborate and explain what this means in the long and the short run for the extension profession?

What strategies would the researchers suggest be implemented in developing educational materials and the delivery methods with regard to demographic characteristics of agents?

A DESCRIPTION OF GREENHOUSE TOMATO GROWERS AND THEIR USE OF AN EXTENSION-RECOMMENDED INTEGRATED PEST MANAGEMENT PROGRAM

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Introduction and Theoretical Framework

The production of greenhouse tomatoes in Mississippi is one of the most rapidly growing industries in the state. In the past five years, the number of growers has increased from about 15 to over 90. Mississippi currently ranks eighth in the U.S. in production of this crop in terms of acreage under plastic (Snyder, 1993a).

Although market demand for greenhouse tomatoes is expected to continue, the ability to supply the amount of high-quality fruit required by expanding markets is dependent on the ability of growers to avoid pest problems. Diseases and insects are constant threats to production of the crop in Mississippi as well as other areas (Killebrew, 1994). Growers who successfully combat greenhouse tomato pests commonly rely on integrated pest management (IPM). IPM uses a combination of biological, cultural, and chemical techniques, with a two-pronged focus: adoption of preventive measures to avoid diseases that are likely to attack the crop, and monitoring to allow early detection of insects and diseases. This early detection allows avoidance of strict reliance on pesticides (Harris, Killebrew, & Willcutt, 1994).

The Cooperative Extension service is an educational agency designed to work cooperatively among the federal, state, and local governments toward the effective achievement of its mission. The mission of the Cooperative Extension Service, as stated by the Joint USDA-NASULGC Committee on the Future Cooperative Extension Service (1983), is to create better agriculture, better homes, and better communities by disseminating and encouraging the application of research-oriented knowledge to individuals, families, and community.

Information about greenhouse tomato growers in Mississippi is not readily available. This study was designed to develop three profiles about these growers: a demographic profile (gender, ethnic group, age, marital status, educational level, area of specialization in college, employment status, and contact with Extension agents, Extension specialists, and university research personnel), enterprise profile (type of business, type of business structure, association with large company, year when started using IPM, and yearly gross income within last three years), and program profile (sources of IPM information provided by Extension and IPM approaches used).

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History of IPM

The earliest record of IPM as a formal agricultural practice dates from the 1920's and 1930's. Isley initiated modern IPM by using principles of scouting, economic thresholds, and trap crops, along with insecticides, to control the boll weevil in cotton. Isley also studied the biology and ecology of the boll weevil and used this information in a IPM system (Blair, 1982). IPM did not gain prominence until the late 1960's in spite of Isley's innovative program. There are several reasons for this lack of progress. Previous to this time, there was little problem with pest resistance to pesticides when environmental quality was not a major concern. They were inexpensive, easily stored, readily available, and extremely effective against their targets when synthetic pesticides were introduced in the 1940's. They often were looked upon as complete cures for pest problems. Heavy dependence on chemicals, however, resulted in numerous problems, including the development of resistant pests; the death of non-target organisms, including natural enemies of the pests, the resurgence of pest populations; the emergence of secondary pests; crop and environmental contamination; and detrimental effects on human health. This led to serious negative impacts on farm profits (Croft & McGroarty, 1978; Lange & Kishiyama, 1978). Though initially little recognizable need for IPM programs existed, the situation soon changed. IPM programs are now prevalent in many areas of the country and in the production of many commodities (USEPA, 1980).

Developing the IPM Program

An operational concept of IPM was developed for the Science and Education Administration of the USDA to facilitate the organization of state IPM programs (Allen & Bath, 1980). Pest management programs were described as a series of 7 components:

1. Basic Research - Basic Research investigates the biology, ecology, and taxonomy of pests; life cycles, population dynamics, and epidemiology are examples.
2. Control Components Research - Control Components Research develops as many pest control techniques as possible.
3. IPM Systems Research Level I - IPM Systems Research Level I develops management systems that integrate two or more control techniques to manage one or more species of the same type, such as insects.
4. IPM Systems Research Level II - IPM Systems Research Level II integrates research from two or more pest groupings, such as plant pathogens and insects.
5. Extension Level I - Extension Level I delivers information for managing pests of one type, such as insects or weeds, in one or more commodities.
6. Extension Level II - Extension Level II delivers information for managing pests belonging to two or more groupings, such as diseases and insects, in one or more commodities.
7. Higher Education - Higher Education develops curricula and courses to provide interdisciplinary training. Knowledge and information form the base of an IPM program as these seven components illustrate.

Operational Underpinnings of an IPM Program

There are two operational underpinnings in most IPM programs: the use of thresholds and field monitoring systems.

Thresholds. An idea which is crucial to many IPM decisions is the concept of using thresholds for decision making. One type of threshold is economic injury level. Economic injury levels are first established and then used as a basis for determining when a management component, such as a pesticide, is needed. Headley (1972) defined the economic injury level as the result of a pest population that produces an incremental damage equal to the cost of preventing the damage.

Monitoring. Another essential part of an IPM program is the development of reliable monitoring techniques. Monitoring activities result in the collection of information on pest and beneficial species population density, weather conditions, plant phenology, relevant management practices, soil type, etc. Monitoring involves taking samples at the correct time, as well as using the correct sampling method. Successful monitoring depends on a clear knowledge of the ecology and biology of the pest (Headley, 1972).

Management Practices of IPM

The many practices available for managing pests in agricultural situations have generally been classified as chemical or non-chemical practices. Chemical practices involve the use of pesticides. Non-chemical practices involve pheromone techniques, biological controls, cultural controls, mechanical controls, host plant resistance, and pathogen genetic manipulation (Lyons & Ferris, 1985; Rajotte, B. G., Kasmierczak, F., Norton, G. W., Lambur, M. D., & Allen, W. A., 1987; Harris et al, 1994).

Delivery of IPM Information

IPM delivery is an information-intense system requiring both background information to generate an understanding of the system and recent information that announces pending events.

Extension educational information has traditionally been delivered to the grower or homeowner through various oral and written reports. Farm visits, telephone calls, newsletters, bulletins, and feature articles in newspapers have all been means of reaching growers. Many states have developed scouting manuals that include color photos of pests, weeds, and the manifestations of diseases of a given crop, along with descriptions of the correct scouting procedures and possible control practices for each. IPM, however, in contrast to the calendar spray approach, needs timely field level data about population levels of pests, predators, and parasites, and information regarding environmental conditions. If an economically and environmentally optimum decision is to be made, information on alternative pest control strategies is also necessary (Croft, Howes, & Welch, 1976; Harris et al, 1994). There must be a rapid transfer of information to the farmer or other decision maker when an analysis is completed. In the past, Extension has responded to these needs and constraints by using computer delivery systems, such as

SCAMP at Cornell University, PMEX at Michigan State University, and IMPACT at the University of California, to ensure rapid information transfer (Zalom, 1983; Sarette, Tette, & Barnard, 1981; Croft, Howes, & Welch, 1976).

Both the characteristics of users and their informational needs were considered in the development of these computer delivery systems. For example, it is possible to get information on fruit without going through reports for other commodities. These systems are flexible enough to fit different types of users, such as Extension personnel, research specialists, field technicians, and growers. The systems require little technical knowledge so that users with only a minimal amount of computer experience can access the information (Sarette, Tette, & Barnard, 1981).

The role of agricultural and Extension education in conducting this study has been supported by several authors. Brown (1992) recommended that agricultural educators not shyly approach their agricultural teaching, research, and Extension counterparts and try to become accepted as part of the family, but that they exert active leadership on behalf of the entire agricultural research and education system. Fuller (1990) said that

> "... our emerging market niche in higher education is as behavioral scientists who focus on the educational issues related to economic development of the food, fiber, agriculture, and natural resources systems within our nation, as behavioral scientists, we have a capacity to expand beyond the roles traditionally assigned by our institutions" (p.3).

Brown (1992) further encouraged agricultural educators to take the initiative in forming alliances with our peers in other disciplines and with the private sector in agricultural and natural resources. Additionally, this study is supported by the recommendation of Buriak and Shinn (1991) that one major area of agricultural education research be teaching/program evaluation, specifically program impacts, program change, communication methods, and program evaluation and accreditation.

Purpose and Objectives

In Mississippi, Extension personnel must know the status of greenhouse tomato growers in order to provide effective programming. The purpose of this study, therefore, was to determine the level of implementation of the Extension-recommended IPM approach by greenhouse tomato growers in Mississippi. To accomplish this purpose, the researchers developed the following objectives:

1. To provide a demographic profile of greenhouse tomato growers in Mississippi;
2. To determine the success with which greenhouse tomato growers are implementing IPM programs; and
3. To determine where growers obtain information about IPM.

Methods and Procedures

This study combined quantitative and qualitative methods with on-site observation and mail survey methods. Quantitative mail survey methods were used to describe the growers on selected demographic and production variables and to determine how they used the cooperative Extension service in their implementation of IPM practices.

Qualitative and quantitative methods were used to determine the effectiveness of IPM approaches by selected growers.

Population/Sampling

The population for the study consisted of all greenhouse tomato growers in Mississippi. The accessible population was identified as those for whom an address was available (N = 87). A simple random sample of 45 growers was drawn from the accessible population for the survey phase of the study. Four greenhouses were selected for the on-site, qualitative part of the study.

Instrumentation

A questionnaire was developed based on the national evaluation of Extension's IPM programs conducted in 1987 (Rajotte, Kazmierczak, Norton, Lambur, & Allen, 1987). Content validity was established by a panel of experts from agricultural education, plant pathology, horticulture, entomology, and the cooperative Extension Service.

Data Collection

For the survey phase, a letter stating the objectives of the study, along with a stamped, return-addressed envelope, and the questionnaire was mailed to 45 growers on April 12, 1994. Follow-up phone calls were made beginning 14 days after the initial mailing. Nine people were eliminated from the sample because they indicated they were no longer in business. Of the remaining 36 people in the sample, 27 responded for a response rate of 75%.

The on-site phase included a combination of qualitative and quantitative techniques: direct observation of the growing condition of tomatoes in the greenhouse (documented with photographs), face to face interviews of growers, and collecting of tissue samples from the plants to determine the presence or absence of important nutrients via tissue analysis.

Findings

The majority of growers were male (85.19%) and all were white. Around 63% of the growers were over 40 years old. Most growers were married (88.89%) and had graduated from high school (62.96%), but not college. Only 29.6% of the growers had a college degree. Over half of the growers indicated that growing tomatoes was their full time occupation (55.56%). The majority of growers (74%) communicated with Extension personnel once a month or less frequently (see Table 1).

Twenty-six (96.3%) growers indicated that they ran a completely independent private type of business. Most (81.5%) growers had a sole proprietorship type of business structure. Two respondents (7.4%) had a partnership type of business structure; while one (3.7%) respondent had a corporation. Only one (3.7%) respondent indicated some

Table 1. Distribution of Respondents by Demographics (N =27).

Variable	Category	Frequency	Percent
Gender	Male	23	85.19
	Female	4	14.81
Ethnic Group	Asian	0	0.00
	Black	0	0.00
	White	27	100.00
	Hispanic	0	0.00
Age	Under 20	0	0.00
	20 - 30	2	7.41
	31 - 40	8	29.63
	41 - 50	4	14.81
	Above 50	13	48.15
Marital Status	Single	3	11.11
	Married	24	88.89
	Divorced	0	0.00
Educational Level	High school	17	62.96
	Bachelor's degree	7	25.93
	Master's degree	1	3.70
	Other	2	7.41
Area of Specialization in College (n = 10)	Pest management	0	0.00
	Liberal arts	0	0.00
	General science	2	20.00
	General agriculture	3	30.00
	Pest related area	0	0.00
	Other	5	50.00
Employment Status (n=26)	Full-time	15	55.56
	Part-time	11	40.74
Contact with Extension Agents, Extension Specialists, and University Research Personnel	Once a day	0	0.00
	Once a week	5	18.52
	Once every two weeks	2	7.41
	Once a month	11	40.74
	Less than once a month	9	33.33

other type of business structure than those designated. Only one grower indicated a relationship with a large company.

The 27 growers who responded indicated that they owned a total of 58 greenhouses, an average of 2.2 greenhouses per respondent. The highest number of

greenhouses owned was 8 (one respondent), and the most frequently reported number of greenhouses owned was one (twelve respondents).

Most (77.8%) of the respondents indicated that they began using IPM approaches after 1989. Three (11.1%) of the respondents started using IPM practices between 1980 and 1989, and only one (3.7%) respondent started using IPM practices before 1980.

Fourteen (51.9%) respondents had less than \$20,000 yearly gross income, including seven full-time growers and seven part time growers. Seven respondents (25.9%) indicated a gross income between \$20,000 to \$49,999; while only one (3.7%) of the respondents reported a gross income over \$49,999. Five (20.8%) of the growers did not respond to this question. During telephone interviews, growers indicated a frustration because of the lack of profits generated by their operations. The primary perceived problem was marketing and market limitations. Table 2 contains a summary of yearly gross income responses.

Table 2. Yearly Gross Income (Three-Year Average) (N=26).

	Full-Time Growers		Part-Time Growers	
Income	Frequency	Percent	Frequency	Percent
Less than \$20,000	7	63.64	7	46.67
\$20,000 to \$49,999	2	18.18	5	33.33
More than \$49,000	0	0.00	1	6.67
No Response	2	18.18	2	13.33

The most commonly used sources of IPM information were growers' own research and experience (Mean = 3.6), Extension printouts (bulletins, manuals, and handbooks) (Mean = 3.6), and telephone visits with an Extension agent or Extension specialist (Mean = 3.5). Table 3 contains a summary of reported sources of IPM information.

Growers were also asked to identify statements which described their approach to using IPM. The most commonly reported use of IPM was "a combination of biological and genetic (primarily disease-resistant) varieties, and chemical control methods that are not as likely to adversely affect the environment and humans)" (Mean = 3.8). The responses to this question are summarized in Table 4.

On-site visual observations revealed that *Botrytis* gray mold and whiteflies were common pests. Of the four locations studied on-site, three locations had both *Botrytis* gray mold and whiteflies. Tissue analysis revealed a zinc deficiency and a slight potassium deficiency in plants in one location. In another location, tissue analysis revealed slight nitrogen and phosphate deficiencies. Both of these locations were also in the group of three that had both *Botrytis* gray mold and whiteflies.

Table 3. Sources of IPM Information Used by Greenhouse Tomato Growers (N=27).

Source	Mean	S.D.
Your own research and own experience	3.58	1.35
Extension bulletins, manuals, and handbooks	3.56	1.29
Telephone visits with Extension agent, specialist, other	3.52	1.48
Information obtained from other growers	2.88	1.13
Greenhouse visits with Extension agent, specialist, other	2.80	1.53
Extension specialist	2.72	1.57
Newsletters, newspaper and trade magazines	2.56	1.50
Extension sponsored workshops	2.48	1.29
Extension sponsored production meetings	2.44	1.36
Professional and general farm journals	1.84	0.99
Consultants	1.68	1.18
Commodity and agricultural industry meetings	1.64	0.91
Agribusiness dealers	1.64	1.22
Extension radio program	1.48	1.12
Chemical or farm/horticultural supply sponsored meetings	1.28	0.61
Extension television/ videotapes	1.24	0.44
Extension computer networks	1.08	0.28

Note. Scale: 1 = seldom used, 2 = infrequently used, 3 = sometimes used, 4 = frequently used, 5 = very frequently used.

Conclusions and Recommendations

Growers responding to this study relied on traditional sources of information such as Extension bulletins, manuals and handbooks, and direct contact with individuals and groups in meetings and workshops. If Extension wants to maintain and improve information delivery to this group, it would be best to maintain traditional delivery methods while introducing computer networks and other electronic systems for this audience (Rajotte, Kazmierczak, Norton, Lambur & Allen, 1987).

Growers should take full advantage of publications already available through their county agents and specialists. In Mississippi, these include guides on pest management (Harris, et al., 1994), production of greenhouse tomatoes (Snyder, 1992), environmental control of greenhouses (Snyder, 1993b), and fertilization management (Snyder, 1993c).

Table 4. IPM Approaches Used by Greenhouse Tomato Growers (N=27).

Approach	Mean	S.D.
Use of a combination of biological, genetic (primarily disease-resistant varieties), and chemical control methods that are not as likely to adversely affect the environment and humans	3.78	1.53
Use of chemical treatments after scouting has indicated that enough insects or diseases are present to cause economic damage to the crop; primary reliance on chemical treatments	3.35	1.29
Use chemical treatments routinely on timed schedule regardless of insect/ disease pressure in the greenhouse	1.93	1.36

Note. Scale: 1 = seldom used, 2 = infrequently used, 3 = sometimes used, 4 = frequently used, 5 = very frequently used.

Some growers were using improper IPM approaches. An ideal IPM program should include a combination of biological controls, genetically-enhanced varieties, and chemical controls instead of a primary reliance on chemical treatments (Killebrew, 1994). Proper use of IPM both controls the pests and diseases and protects the environment and humans. Extension personnel should immediately deliver correct and efficient information to growers so they can implement IPM approaches correctly.

Growers need to develop marketing skills so they can make their operations more profitable. They must be able to secure stable, ongoing markets to provide a consistent income so long range plans can be made. Extension personnel could meet this need through workshops and informal classes on market analysis and marketing techniques.

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A DESCRIPTION OF GREENHOUSE TOMATO GROWERS AND THEIR USE OF AN EXTENSION-RECOMMENDED INTEGRATED PEST MANAGEMENT PROGRAM

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This study dealt with the production of greenhouse tomatoes in the state of Mississippi and the perceived use of an integrated pest management program (IPM). A lengthy theoretical framework introduced the study. The information provided appeared to be more than needed and could have been more concise in order to lead the reader specifically to the purpose and objectives of the study. The introduction provided support for undertaking a study of this nature. For this effort the researchers are commended.

The purpose of the study was designed to determine the level of implementation of the extension-recommended IPM approach by greenhouse tomato growers in Mississippi. Specific objectives were developed to guide the study. The researchers used both quantitative (survey) and qualitative (on-site) methods in gathering the data. While a random process was used to determine the sample for the mail survey, a question arises as to how the four growers where selected for the on-site qualitative part of the study. The questionnaire was developed based on a previous study. No procedure was discussed regarding establishing instrument reliability and the paper did not discuss how the data were analyzed. The findings reported demographic data, income categories, sources of IPM information and use, and IPM approaches used by growers. The data reported did not provide information specifically for objective two which was to determine the success with which greenhouse tomato growers were implementing IPM programs. Perhaps objective two should have been stated "to determine the sources and use of IPM information." The findings reported data gathered by telephone interviews. No mention of telephone-gathered data was discussed in the procedures.

The following questions are presented for discussion:

A conclusion was that some growers were using improper IPM approaches. What specific data were reported which supported this statement?

A recommendation was that growers need to develop marketing skills. What is the relationship of this recommendation to the purpose of the study?

An implied recommendation from other authors was that it would be best to maintain traditional delivery methods while introducing computer networks and other electronic systems. What does this mean for the profession?

What recommendations would the authors suggest to others in the profession who might conduct this type of research?

COMPUTER USE, EXPERIENCE, KNOWLEDGE, AND ATTITUDES OF EXTENSION PERSONNEL: IMPLICATIONS FOR DESIGNING EDUCATIONAL PROGRAMS

Sung-Youl Park and Julia Gamon*

Introduction

Educators of today are living in the transition between the information age and the computer or communication age. Extension educators are particularly affected by this transition; Ezell (1989) contended that Extension's future depends on its ability to use technology to deliver programs. The teaching methods and communication approaches Extension adopted in the past need to be updated for today's diverse and quickly changing society (FACT Committee, 1991). Taylor, Hoag and Owen (1991) stated that Extension needs to put more effort toward computerizing its system and toward increasing the computer literacy of its personnel.

Systems theory, a new theory for education that has evolved from industrial management and organizational sociology (Saettler, 1990), would support the training of personnel in new technology. Systems theory states that an organization consists of several mutually dependent subunits. Input in one subunit affects output in another. In the case of computer use by Extension personnel, input comes from organizational support such as educational training programs, and output is the competency of personnel.

There is evidence that Extension recognizes the need for computer training for its personnel. In a study of Extension area specialists, state specialists, and administrators, all three groups reported a high need for training in using computers (Gibson & Hillison, 1993). In a nationwide study of what was important and what was actually included in inservice training, use of computers were reported as "very important." Ninety percent of the states included computer training in their inservice education activities (White, Taylor, & Butler, 1994).

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Researchers have studied constraints to the use of computers (Loyd & Gressard, 1986; Smith & Kotrlik, 1990; Fletcher & Deeds, 1994). Anxiety, lack of confidence, and lack of enjoyment have been related to low computer use. Limited computer experience has been found to be a factor influencing anxiety (Loyd & Gressard, 1986). The relationships between computer literacy and age, gender, and educational level have been studied, and findings have been contradictory (Paula & Martin, 1988). However, there has been little information related to job position. Information on the relationship between the job position of Extension personnel and variables related to computer technology would help in the design and implementation of computer training and support programs.

Purpose and Objectives

The purpose of the study was to analyze the responses of Iowa Extension personnel to questions about their use of computers and to identify differences related to all the various kinds of job positions. The results would have implications for computer training and support. Specific objectives were to identify differences among Extension personnel with different job positions as to: (1) computer attitudes, (2) computer experience, (3) computer knowledge, and (4) computer use.

Procedures

This was a descriptive study with a population that consisted of all Extension personnel listed in the 1992 Iowa State University Extension Directory. All positions were included, field, state, professional, paraprofessional, clerical, support, administrative, and university Extension as well as Cooperative Extension appointments. The total population number was 974. Because of constraints on staff time, a simple random sample of 200 employees was selected to receive the mailed questionnaire in the fall of 1993. Two follow-up mailings were made, and the final response rate was 95%. T- tests were used to compare early and late respondents, and no significant differences (.05 level) were found. Because of the high return rate and lack of differences between early and late responders, no further effort was made to contact nonrespondents.

The five-part questionnaire measured computer attitudes (24 items), computer experience (2 items), computer knowledge (7 items), computer use (3 items), and demographic information (6 items). Content validity of the instrument was established by three Extension computer specialists and faculty members in the Department of Agricultural Education and Studies.

The questions in the computer attitude part were adapted from the computer attitude scales originally developed by Loyd and Gressard (1986), which contained four subscales: computer anxiety, confidence, enjoyment, and usefulness. A Likert-type scale was used ranging from strongly disagree (1) to strongly agree (5). A Cronbach's alpha reliability coefficient was calculated on the responses of a pilot-test with 25 people not in the sample, and coefficients on the subscales ranged from .69 to .81. The total scale's reliability was .92 in the pilot test and .94 in the final survey.

To measure computer experience, two items were employed: participation in computer training courses and years of computer use. Computer knowledge was measured by self-reported ability to use specific computer systems and programs. The five-point scale ranged from 1=very poor to 5=excellent and had an alpha coefficient of reliability of .86. Computer usage was measured by three items: frequency, length of time, and use of e-mail and the Iowa State University Extension computer network (EXNET).

Data analyses consisted of calculating means and standard deviations and of determining statistical differences through the use of t-tests and analyses of variance. Wilks' lambda was used to measure overall effects. The higher the lambda value, the less of the variance that could be explained by the factor.

Results

The total number of usable responses was 184. This included responses from 25 county Extension education directors (14%), 38 field specialists (21%), 23 state specialists (13%), 10 administrators (4%), 47 office workers (26%), 12 program assistants (7%), 11 support staff (6%), and 15 others (8%). The most numerous group was office workers, 37 (20%), followed by agriculture with 33 (18%). Approximately 40% of respondents had served Extension more than 10 years.

Iowa Extension personnel were experienced with computers and well-trained. The average years of use was eight, and 64% had used computers for more than six years. Ninety-five percent of the respondents had participated in at least one computer training workshop or course. The average number of workshops participated in was five, and more than 25% had participated in six or more.

Iowa State University Extension personnel had very positive attitudes toward computers. The most positive sub-attitude was that of computer usefulness and the least positive was computer enjoyment. A multi-variate analysis of variance (MANOVA) was used to assess differences in computer attitudes by job position. The Wilks' lambda was used to test the overall effect of job position on attitudes. The Wilks' lambda for the overall effect of job position on computer attitudes was 0.19,$F(168,12) = 1.67$ and $p = .0001$. Therefore, an overall significance difference was found in computer attitudes when respondents were grouped by job position. According to the univariate analysis of variance (Table 1), nine items were significant at alpha = .05. The program assistants ranked significantly lower than other groups on two of the items.

Table 1
Analysis of variance of means of computer attitude items by job position

No	Item	1[a]	2[b]	3[c]	4[d]	5[e]	6[f]	7[g]	8[h]	F Value
	Computer anxiety (lack of)									
1	Make me feel uncomfortable[r]	4.32	4.32	4.48	4.60	4.13	4.27	3.83	3.73	1.87
2	Do not feel threatened	3.68	3.84	4.17	4.30	4.83	3.93	3.33	4.00	1.39
3	Get a sinking feeling[r]	4.36	4.50	4.61	4.50	4.40	4.33	4.17	4.09	0.98
4	Computer makes me nervous[r]	4.16	4.29	4.52	4.70	4.13	4.33	3.75	3.82	2.00
5	Does not bother me at all	3.88	4.18	4.17	4.30	4.21	4.27	4.25	3.82	0.47
6	Feel aggressive and hostile[r]	4.52	4.32	4.61	4.60	4.43	4.27	4.42	4.55	0.51
	Computer confidence									
7	Confident about trying new	3.72	3.76	4.13	4.30	3.96	4.00	3.42	3.91	1.08
8	Computer is very hard for me[r]	4.08	4.18	4.17	4.50	4.32	4.40	3.67	4.09	1.27
9	Not the type to do well[r]	4.04	4.39	4.57	4.50	4.34	4.33	4.08	4.18	1.07
10	I can work with computers	4.40	4.39	4.70	4.60	4.32	4.47	4.08	2.82	1.89
11	Not good with computers[r]	3.80	4.16	4.22	4.60	4.34	4.00	3.92	4.55	1.32
12	Perform well in workshops	3.56	3.97	4.13	4.40	3.83	3.67	3.42	3.64	2.09*
	Computer enjoyment									
13	I find it hard to stop	3.20	3.68	3.57	4.20	3.81	3.93	3.42	3.00	2.41*
14	Is enjoyable and stimulating	3.64	3.97	3.67	4.40	4.28	4.13	3.75	3.36	3.15**
15	I stick with it	3.08	3.50	3.61	3.90	3.83	3.33	3.25	3.18	2.09*
16	Does not appeal to me[r]	2.88	3.47	3.96	4.10	3.66	3.33	3.25	4.36	3.30*
17	Work as little as possible with computers[r]	4.24	4.61	4.43	4.50	4.40	4.27	4.00	4.27	1.11
18	Continue to think about it	3.48	3.71	4.31	3.70	4.02	3.67	3.50	4.00	2.48*
	Computer usefulness									
19	Computer is worth while	4.44	4.50	4.61	4.60	4.49	4.67	4.67	4.64	0.36
20	Need a firm mastery	4.28	4.24	4.04	4.50	4.06	4.27	2.92	3.82	4.25**
21	Expect me to be literate	3.64	3.68	4.22	4.10	3.74	3.47	2.83	3.91	2.58*
22	Use computers in my career	4.64	4.63	4.61	4.40	4.53	4.73	4.50	4.18	0.31
23	Increases job possibilities	4.44	4.53	4.35	4.40	4.64	4.60	4.33	4.27	0.79
24	Supervisor expects me to be	4.56	4.34	4.35	4.00	4.32	3.80	3.08	3.73	4.91**

Note. Scale: 1 = Very poor; 2 = Poor; 3 = Average; 4 = Good; and 5 = Excellent

[a]County Extension Education Director
[b]Field Specialist
[c]State Specialist
[d]Administrator
[e]Office Worker
[f]Other
[g]Program Assistant
[h]Support Staff
[r]Recoded negative item

*$p <= .05$ **$p <= .01$ 3. c, d > g 6. b, c, e, h > g 7. e > b

A multi-variate analysis of variance (MANOVA) was used to assess differences in computer experience by job position. The Wilks' lambda statistical procedure was used to test the overall job position effect on computer experience. The Wilks' lambda of computer experience items from MANOVA was 0.71,$F(42,137) = 4.25$ and $p = .0001$. Therefore, an overall significant difference was found in computer experience according to job position. Results from the univariate analysis of variance are shown in Table 2. According to a Sheffe' test, the administrators had significantly more years of computer use than did the county directors, field specialists, office workers, program assistants, and others.

Table 2
Analysis of variance of means of computer experience items by job position

No.	Item	1[a]	2[b]	3[c]	4[d]	5[e]	6[f]	7[g]	8[h]	F Value
1	Number of workshops and courses participated in	3.96	3.61	5.64	7.60	6.47	3.20	2.17	4.48	3.57**
2	Number of years of use	7.27	6.42	10.00	17.3	7.56	7.79	3.83	9.63	6.28**

[a]County Extension Education Director
[b]Field Specialist
[c]State Specialist
[d]Administrator
[e]Office Worker
[f]Other
[g]Program Assistant
[h]Support Staff

Note **$p <= .01$.   2. d>a,b,e,f,g

The Wilks' lambda for the overall effect of job position on computer knowledge was 0.55, $F(49,129) = 2.17$ and $p = .0001$. Therefore, an overall significant difference was found in computer knowledge according to job position. In the univariate analysis of variance (Table 3), all items were significant at the .05 level except for statistical programs. Word processing knowledge was consistently higher than knowledge of other computer items and was above the midpoint for all positions. State specialists and administrators had significantly more knowledge of spreadsheets than program assistants. In computer communications, program assistants had less knowledge than field specialists, state specialists, office workers, and support staff. In knowledge of computer languages, office workers had more than field specialists.

Table 3
Analysis of variance of means of computer knowledge items by job position

No.	Item	1[a]	2[b]	3[c]	4[d]	5[e]	6[f]	7[g]	8[h]	F Value
1	Computer systems	3.16	3.21	3.61	3.90	3.65	3.33	2.67	3.45	2.44*
2	Word processing	3.56	3.87	4.17	4.20	4.19	4.00	3.25	3.82	3.21**
3	Spreadsheet	2.76	2.76	3.48	3.70	2.83	3.13	2.00	3.36	3.90**
4	Graphic	2.12	2.47	3.13	3.20	2.45	2.60	1.75	3.36	3.47**
5	Statistical	2.20	2.16	2.91	2.70	2.33	2.33	1.67	2.64	2.05
6	Communication	3.08	3.11	3.61	3.20	3.47	2.73	1.73	3.45	5.07**
7	Language	2.32	1.87	2.61	2.90	2.79	1.87	2.08	2.18	3.71**

Note. Scale: 1= Very poor; 2 = Poor; 3 = Average; 4 = Good; and 5 = Excellent

[a]County Extension Education Director
[b]Field Specialist
[c]State Specialist
[d]Administrator
[e]Office Worker
[f]Other
[g]Program Assistant
[h]Support Staff

*$p <= .05$ **$p <= .01$ 3. c, d > g 6. b, c, e, h > g 7. e > b

To test the overall effect of job position on computer use, Wilks' lambda was again used. The results from MANOVA were 0.71,F(21,158) = 2.96 and p = .0001. Therefore an overall significant difference among job positions was found in computer use items. According to the results from the univariate analysis (Table 4), all items were significant at alpha = .05. Just as with computer communication and attitudes, the program assistants ranked significantly lower than other groups in computer use.

Table 4

Analysis of variance of means of computer use items by job position

No.	Item	1[a]	2[b]	3[c]	4[d]	5[e]	6[f]	7[g]	8[h]	F Value
1	Frequency	4.20	4.39	4.80	4.87	4.66	3.93	3.50	4.36	3.76**
2	Length	3.64	4.00	4.35	4.40	4.30	3.26	3.42	4.40	2.83**
3	e-mail and EXNET	3.20	3.71	4.17	4.20	3.87	2.80	1.25	3.09	6.33**

Note: Frequency scale: 1= Never; 2 = 1-3 Months; 3 = 1/Week; 4 = 2/4 Week; 5 = Daily
Length scale: 1 = Never; 2 = <30 min.; 3 = 30-60 min; 4 = 1-2 hrs.; 5 = >2 hrs.

[a]County Extension Education Director
[b]Field Specialist
[c]State Specialist
[d]Administrator
[e]Office Worker
[f]Other
[g]Program Assistant
[h]Support Staff

**$p <= .01$ 1. c>g 3. c>g;d>g;e>g;b>g

Personalized training and support was preferred by staff in all positions. Off-campus staff had less preference for on-campus workshops, compared to on-campus staff. There was an overall significant difference toward preference to receive education training and support when grouped by job position. Wilks' lambda of preference items calculated from MANOVA was 0.49, $F(77,101)=1.61$ and $p = .0009$.

Table 5
Analysis of variance of means of preference to receive training and support items by job position

No.	Item	1[a]	2[b]	3[c]	4[d]	5[e]	6[f]	7[g]	8[h]	F Value
1	Personalized	4.16	4.47	4.26	4.30	4.57	4.40	4.25	4.27	1.30
2	Telephone	3.20	3.39	3.17	3.00	3.33	3.07	3.25	3.73	.059
3	On-campus	2.72	2.87	4.09	3.90	3.63	4.07	3.17	3.18	5.61
4	Periodical	2.92	3.11	3.48	3.30	3.52	3.40	3.08	3.27	1.10
5	Computer disks	3.16	3.34	3.22	3.30	3.30	3.67	3.42	3.27	0.43
6	Video tapes	3.08	3.13	2.91	2.90	3.04	3.00	3.42	3.36	0.54
7	Via EXNET	2.56	2.61	2.96	2.60	3.20	2.47	2.92	2.54	1.68
8	Documentation	3.00	2.87	3.48	3.60	3.30	3.33	3.42	3.18	1.37
9	Satellite	2.72	2.97	2.39	2.90	2.91	2.87	3.33	2.55	1.60
10	Manual	3.60	3.71	4.30	3.70	3.81	3.93	3.83	4.00	1.26
11	Combination	3.56	3.58	3.83	3.40	3.80	3.60	3.92	3.36	0.79

Note: Scale: 1 = Strongly disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly agree

[a]County Extension Education Director
[b]Field Specialist
[c]State Specialist
[d]Administrator
[e]Office Worker
[f]Other
[g]Program Assistant
[h]Support Staff

$^{**}p <= .01$ 3. c>a,b;f>a

There was a significant difference among positions as to types of needed assistance with computers. The Wilks' lambda from the MANOVA was 0.59, $F(42,137) = 2.26$ and $p = .0001$. From the univariate analyses of variance (Table 6), two items, communication via EXNET and purchasing new equipment, were significantly different by job position.

Table 6
Analysis of variance of means of needed assistance items by job position

No.	Item	1[a]	2[b]	3[c]	4[d]	5[e]	6[f]	7[g]	8[h]	F Value
1	Introduction	1.81	1.76	1.61	2.10	1.94	1.80	2.75	1.91	1.40
2	Software	3.88	3.87	4.04	3.60	3.81	3.93	4.17	3.27	1.25
3	Programming	2.64	2.95	3.13	3.20	3.30	2.93	3.50	3.64	1.33
4	Information	3.28	3.18	3.17	3.60	2.35	2.40	3.25	2.36	3.58**
5	Purchasing	3.56	2.29	2.61	3.00	2.91	3.40	4.42	2.36	3.65**
6	Upgrading	3.60	3.32	3.48	3.30	3.22	3.40	3.33	2.64	0.93

Note:
[a]County Extension Education Director
[b]Field Specialist
[c]State Specialist
[d]Administrator
[e]Office Worker
[f]Other
[g]Program Assistant
[h]Support Staff

**$p <= .01$ 1. c>g   5. g>b

Conclusions

1. Extension personnel in Iowa were trained and experienced with computers.

2. Extension personnel had very positive attitudes toward the use of computers.

3. Extension personnel with different job positions differed significantly in their attitudes, experience, knowledge, and use of computers.

4. Program assistants ranked significantly lower than other job positions on all four measures: attitudes, experience, knowledge, and use.

5. Word processing was the topic about which respondents in all positions were most knowledgeable.

6. Respondents preferred individual training and support on computers.

7. Off-campus professionals (county directors and field specialists) were least likely to want on-campus computer training.

Recommendations

1. Educational training workshops should be targeted to specific job positions, for example, program assistants would require a more basic level of training on communication via computer than would office workers or professional staff.

2. Training and support should focus on computer aspects other than word processing. Iowa Extension personnel are knowledgeable in this area.

3. Training should be designed specifically for program assistants in the areas most needed. A further study is needed to determine in what areas they need to be competent.

4. Support should be personalized, perhaps through an 800 telephone number.

5. Training for Extension personnel should be provided both on-campus and off-campus.

6. Computer specialists should develop some easy-to-read manuals or instruction sheets.

7. Computer specialists should recommend user-friendly commercial manuals to Extension personnel.

Educational Importance

Based on the results of this study, the job positions of Iowa Extension personnel have significant relationships with the variables: computer attitudes, experience, knowledge, and use. Thus, the identification of job position is an important factor to consider in the design and implementation of computer training programs.

Personnel with different attitudes, experience, knowledge, and use levels may need different teaching methods and content of inservice programs. Individuals whose levels are high may not be interested in basic introductions to computer systems and programs. Therefore, they should be grouped together and educated differently. An effective way to group potential participants in training program should be by job position.

Results of this study are generalizable only to Iowa Extension personnel, but other states may be interested in conducting similar studies to determine the effect of job position for other inservice topics, especially as Extension attempts to be in the forefront in its use of new technology.

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COMPUTER USE, EXPERIENCE, KNOWLEDGE, AND ATTITUDES OF EXTENSION PERSONNEL: IMPLICATIONS FOR DESIGNING EDUCATIONAL PROGRAMS

John P. Mundt, University of Idaho, Discussant

The authors are commended for conducting a study which provides information that can be applied in delivering computer training and support for extension personnel in the state of Iowa.

The purpose as stated was more a statement of the process the researchers planned to use rather than a purpose for the research. Another way to state the purpose of the study might have been, "The purpose of the study was to investigate computer attitudes, experience, knowledge, and use by Iowa extension personnel relative to job position." Specific objectives were identified to guide the study. However, in the findings information was reported regarding types of needed computer assistance and the type of personalized training and support preferred by the respondents. It would appear that if these data were going to be reported in the findings, the purpose and objectives for that part of the study should have been addressed and clarified.

The instrument used was adapted from a previous study for the questions in the computer attitude part of the study. No mention was made regarding the design of the remaining portion of the instrument. It was assumed that the remaining portion of the instrument was researcher designed. In table 1 participants were asked to respond to 24 statements (questions) on a Likert-type scale 1 = very poor, through, 5 = excellent. It appeared that statements were not very discriminating in relation to the defined scale. As examples, it appears that it could have been confusing to respond to the statements; "work as little as possible with computers," "continue to think about it," "I stick with it" on the scale provided. Perhaps the scale should have been defined with different descriptors. The conclusions were supported by the data.

The following questions are presented for discussion:

Program assistants ranked significantly lower than other job positions on all four measures. Might that have been an expected outcome?

Overall extension personnel in Iowa were trained and experienced with computers. Have the researchers found any similar studies which might be compared to a similar population in another state?

What do the results of this research mean for the state extension system in Iowa? What will or has been done with the results of this effort?

Are there implications for the profession of agricultural and extension education?

DISTANCE EDUCATION NEEDS OF COOPERATIVE EXTENSION AGENTS

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Introduction

New information technologies have changed the face of distance education. The definition for distance education as a result has been transformed to reflect these advances. According to Barker, Frisbie, and Patrick (1989), distance education refers to "the simultaneous telecommunicated delivery of instruction from a host site or classroom to distant sites, coupled with live audio and/or video interaction between teacher and student(s)--not to correspondence study" (p. 21). These advancements not only impacted the way distance education is defined, but also have effected the providers and receivers of educational programs offered via these technologies.

The transformation of the definition and the realization of distance education's potential have caused educational institutions to offer distance education through telecommunication-based technologies. The British Open University, which was established in 1971, started a new era of distance education by extensively using television as an educational broadcast medium and merging all of its correspondence print material with the electronic media (Holmburg, 1986). This era signaled to educational institutions that emerging technologies could help distance education become stronger and be of higher quality by combining instruction via telecommunications with correspondence study (printed materials).

Distance education has evolved into a method of providing universities with the power to provide education beyond the resident classroom setting to new as well as traditional learners. These new technologies can help facilitate teacher/learner interaction. However, Larsen (1985) indicated that educators must develop a strong understanding of communication interactions to stay current with advancing technologies or they will not be prepared to efficiently use the technology in their instruction.

According to Kelly (1990), the transition from resident classroom teaching to distance education requires some educators to develop new skills in course planning and delivery. Delivery skills include methods of instruction, teaching techniques, timing, teacher/student interaction, feedback, printed supplement materials, and evaluation (Kelly, 1990). However, careful planning is crucial in order for delivery of the distance education course or program to be effective. The needs of the learner are paramount to the planning of a distance education course or program.

Distance education has become an emerging force because of the growing demand for educational opportunities targeted to specific groups, a societal shift from mass production to individualized instruction, and recent advancements in communications technology (Lauzon & Moore, 1989). Distance education is being viewed as a major educational activity that is required for competitive individuals in a highly technological and global society. Many educational administrators have indicated that distance education will

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become more important because of declining enrollments, increasing graduation and/or certification requirements, teacher and professor shortages, budgetary reductions, and an aging student population. Colleges of agricultural sciences and organizations such as the Extension Service of the U. S. Department of Agriculture (ES/USDA) are attempting to find various avenues for delivering courses and programs to their clientele.

According to Hamilton (1989), the Iowa Cooperative Extension Service installed distance education equipment in 1986 to link extension audiences in all Iowa counties. He indicated that the system has been effective in delivering educational programs to the citizens of Iowa. Hamilton found that favorable indicators for distance education included the effective use of small groups, travel savings (for staff), and the use of visual subject matter.

Different groups of learners have distinct needs. Cooperative Extension agents, due to the nature of their job, are place-bound, have erratic work schedules, and require a variety of educational programs. This unique situation results in special needs in terms of distance learning. The Mississippi Cooperative Extension Service (MCES) wants to increase the use of distance education in the in-service education of their agents. However, the distance learning needs of county agents in Mississippi have never been identified.

Purpose and Objectives

The purpose of this study was to determine the distance learning needs of MCES agents. The objectives developed to fulfill the purpose of this study were to:

1. Identify important demographic characteristics of MCES agents.
2. Determine the MCES agents knowledge of and interest level in distance learning.
3. Determine the specific course credit and in-service subject matter areas needed by MCES agents to be provided via distance learning.
4. Determine the distance learning delivery method(s) (satellite, videotape, written correspondence, fiber optic cable, etc.) most preferred by MCES agents in their local setting.
5. Identify the most preferred time(s) of delivery and types of interaction and flexibility needed for distance learning courses and programs to MCES agents.

Methods and Procedures

The population for the study consisted of MCES agents who serve 82 counties in the state. The population frame was provided and verified by the Director and Associate Director of the MCES. A census was used because the total population (N=190) was accessible and the researchers wanted to obtain input from all agents in the field.

A questionnaire was developed to collect the appropriate data by a panel of experts that included three Mississippi State University (MSU) College of Agriculture and Home Economics faculty, three MCES specialists, three graduate students in the Department of Agricultural Education and Experimental Statistics at MSU. The panel developed the questionnaire that contained five sections to collect data related to the Extension agents' 1) demographics, 2) knowledge of and interest in receiving distance learning courses and programs, 3) specific credit course and/or in-service needs, 4) preferred distance learning delivery methods, and 5) preferred times of delivery and types of interaction. Agents were asked to identify and select items they preferred in relation to receiving courses and programs via distance learning within each section on the questionnaire.

The questionnaire was pilot tested using 10 graduate students in the Department of Agricultural Education and Experimental Statistics at MSU. These students were former Cooperative Extension agents or currently serve as a Cooperative Extension agent in Alabama. The pilot test established the questionnaire's content validity, clarity, appropriateness, design and layout.

The questionnaire was mailed to the agents with an appropriate cover letter and return envelope. After two weeks, follow-up telephone calls were made to the non-respondents encouraging them to complete the questionnaire and return it in the self-addressed envelope. After four weeks, data contained on the returned questionnaires were summarized using frequencies, means, and percentages.

Results

One hundred forty-three agents returned the questionnaire yielding a 75% response rate. Demographics of the respondents were compared to known demographics of the population and no significant differences were found. Forty-seven percent of the respondents identified 'production agriculture' as a program area of responsibility, which includes working with clientele, such as cotton, soybean, rice, cattle, and poultry producers in Mississippi. Thirty-nine percent identified responsibilities in the 'home economics' program area which includes nutrition, family well-being, and child development. Fourteen percent indicated having responsibilities in '4-H and youth development' while 14% indicated 'community development.' Many MCES agents have responsibilities in two or more program areas.

The respondents also identified the number of years that they have served as a MCES agent. Twenty-eight percent of the agents indicated that they have worked between 16 to 25 years for the MCES. Twenty-six percent indicated having 11 to 15 years while 14% had 6 to 10 years service. Fifteen percent of the agents had worked one to five years while seven percent had worked less than one year. Sixty-nine percent of the respondents had a master's degree while 23% had a bachelor's. Four percent indicated having a doctorate. Fifty percent of the respondents were female while 45% were male (5% did not indicate their gender). The average age of the respondents was 40 years.

MCES agents have a strong knowledge of and interest level in distance learning. Ninety-seven percent of the respondents indicated that they understood the concept of distance learning, meaning the telecommunicated delivery of instruction by two-way audio/video interaction between an instructor and students who are separated by distance. They also indicated that they understand the concept of receiving credit and non-credit courses and programs through distance learning, which included understanding the various methods of delivery. Only 3% indicated that they did not understand. Ninety-eight percent of the respondents indicated that Colleges of Agriculture should offer credit courses through distance learning so agents can continue their education without leaving their responsibilities in the local area. However, only 88% indicated that in-service training should be provided through distance learning. Eighty-eight percent of the respondents also indicated that complete degree programs (graduate and undergraduate) should be offered through distance learning while 10.6% said it would not be possible. Eighty-three percent indicated that they would enroll in a distance learning credit course if it is offered in their local area at convenient times, which will not interfere with their primary duties and responsibilities at the county level.

MCES agents indicated that they were interested in enrolling in a number of agricultural and home economics related credit courses through distance learning. The

identified subject matter includes many technical agricultural areas such as weed science, floriculture, ornamental horticulture, as well as social science areas related to agricultural and extension education and home economics, such as teaching methods and rural community development. Table 1 identifies those subject matter areas where 20% or more of the respondents indicated a need.

Table 1

Preferred Subject Area for Credit Courses

Subject Area	Frequency	Percent
Entomology	31	21.7
Food Science & Technology	31	21.7
Floriculture/Ornamental Horticulture	31	21.7
Fruited Vegetable	33	23.1
Teaching Methods	33	23.1
Rural Community Development	40	28.0
Agricultural Pest Management	38	26.6
Agronomy	34	23.8
Turfgrass Management	29	20.3

Note: Agents could mark more than one subject area

MCES agents identified a variety of delivery methods for receiving distance learning courses and programs (agents were able to respond to more than one delivery method). Some respondents indicated that they preferred receiving distance learning materials in more traditional methods. Fifty percent of the respondents preferred receiving videotapes and study materials while 19% prefer the traditional correspondence study (written materials only) (Table 2). Respondents also preferred newer technologies. Over a quarter (28%) of the respondents identified satellite delivery as one preferred method of receiving courses and programs. Seventeen percent preferred compressed video where the instructor and student can interact through two-way audio/video in real time.

Table 2

Preferred Distance Learning Methods

Method	Frequency	Percent
Satellite Delivery	35	24.5
Videotape	70	49.0
Correspondence	26	18.2
Compressed Video	25	17.5

Note: Agents could mark more than one method

MCES agents prefer that distance learning courses and programs be delivered in one to three hour time periods. Fifty-seven percent of the respondents prefer a two-hour time block while 50% also indicated preferring a one hour segment. Thirty percent of the

agents prefer a three-hour time period. Fifty-two percent prefer semester courses while 43% prefer courses in modules.

MCES agents also prefer many different types of interaction for distance learning communication between teacher and student or students, such as class discussion, assignments and tests. The agents were asked to select those items that they preferred using when communicating with the instructor at a distance. Seventy-nine percent of the respondents prefer using e-mail to correspond with the instructor and/or other students at a distance. Eighty-six percent of the respondents also prefer using the telephone and 53% like using a fax machine. Only 46% indicated needing an occasional face-to-face contact with the instructor during the course/program delivery period (Table 3).

Table 3

Preferred Types of Interaction for Effective Distance Learning

Interaction Type	Frequency	Percent
Computer E-mail	113	79.0
Phone	124	86.7
Fax Machine	77	53.8
Compressed Video	57	39.9
Face-to-Face	66	46.2

Note: Agents could mark more than one interaction type

Conclusions, Recommendations and Implications

MCES agents have a strong knowledge of and interest level in distance learning. Nearly all of the respondents understand the concept of distance learning. They also understand the concept of receiving credit and non-credit courses and programs through distance learning. Most importantly MCES agents indicated they want to participate in credit courses and in-service training through distance learning so they can continue their education without leaving their local area of responsibility. Consequently, the MCES should offer credit courses and in-service training via distance education to county agents. Additionally, MCES should work with appropriate academic departments at MSU to develop complete degree programs that could be offered via distance education.

Despite Mississippi having access to newer technologies like satellite delivery and compressed video, a greater percentage of MCES agents preferred self-paced videotapes, a more traditional method of distance education. Two major barriers to MCES agents being able to participate in an educational program are time and place. Satellite delivery and compressed video remove the barrier of location; however, time is still a factor. This is evident in the finding that a large majority of MCES agents would enroll in credit course if it was offered in their area at a convenient time. Self-paced tapes remove the barriers of time and location. Additionally, the expense of self-pace videotapes is less than satellite delivery and compress video. Therefore, self-paced videotapes should be a primary form of delivery of distance education programs to MCES agents. E-mail, fax machine, telephone, tests, and assignments can be used to provide interaction between instructors and learners However, compressed video should also be considered for educational programs that require immediate teacher/learner interaction as well as to provide opportunities for face-to-face contact with the instructor.

County agents in Mississippi have a clear understanding of distance education and what it can do for them. The Mississippi Cooperative Extension Service should capitalize on the agents' knowledge and provide a greater amount of their educational programs via distance education.

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DISTANCE EDUCATION NEEDS OF COOPERATIVE EXTENSION AGENTS

John P. Mundt, University of Idaho, Discussant

This census study of Mississippi Cooperative Extension Service county agents to determine their needs with regard to distance education was straight forward and well done. The researchers are commended for completing research which should have immediate value in addressing strategies for delivering distance education to extension agents in Mississippi.

The study was guided by a clear purpose and specific objectives. Appropriate research procedures were used and the data collected supported the defined objectives. It was interesting to note that nearly all of the respondents indicated that they a strong knowledge of and interest in distance education. Regarding this finding a question arises. How did the researchers differentiate participant responses between knowledge of and interest in distance education?

The following questions are presented for discussion:

> What responses do the researchers offer as to why nearly all respondents indicated a need for credit courses?
>
> Respondents indicated that complete degree programs should be offered, both undergraduate and graduate. Who were the perceived clientele for these programs and why?
>
> Major barriers of time and place were identified. In addition to self-paced video courses what are other solutions to these barriers?
>
> What are the disadvantages of self-paced videos compared to other current technologies?
>
> What do the results of this study mean for distance education providers in Mississippi?
>
> What do the results of this study mean for the profession nationally and what advice would the researchers offer for those in the profession who are involved in delivering distance education?

EFFECTS OF TEACHING APPROACH ON PROBLEM SOLVING ABILITY OF AGRICULTURAL EDUCATION STUDENTS WITH VARYING LEARNING STYLES

James E. Dyer Edward W. Osborne[1]

Introduction

Over the past decade a new commitment to quality instruction and student learning has emerged in the educational community. As a part of that community, agricultural educators are reassessing past educational practices in an effort to determine the effectiveness and validity of methods which have for years been practiced and proclaimed with almost religious fervor (Dyer, 1995). One of those methods is the problem solving approach to teaching agricultural education.

The problem solving approach has been widely accepted and recommended by agricultural educators as the best method of teaching agriculture (Phipps & Osborne, 1988). Today, that approach remains the primary method of teaching offered to preservice agriculture teachers in many teacher education programs. However, its actual use throughout the agricultural education profession is limited, with some educators questioning its validity as a superior approach to instruction. Many teachers view the problem solving approach as archaic--tied to the farm backgrounds and supervised agricultural experience programs of the learners (Moore & Moore, 1984). Critics of the problem solving approach also accuse that while the approach has a sound theoretical base, it has been accepted with little empirical evidence to either defend or reject its usefulness in the classroom. Reviews of literature from prior studies have produced little evidence to refute this claim.

According to Joyce and Harootunian (1967), the approach used by teachers is very important to the success of the teaching process. They stated that teachers should learn how to use several teaching strategies. Likewise, Bartz and Miller (1991) noted that no one method of instruction will work all of the time and under every circumstance. Joyce and Weil (1986) contended that the selection of a teaching method is critical to the learning style of those being served by the instruction.

Ronning, McCurdy, and Ballinger (1984) reported that some students may possess a style of learning which is not complimentary to the use of problem solving. Their inability to solve problems interacts with their inability to use past knowledge and experiences to help in the solution to the problem. Canfield and Canfield (1976) noted that research on learning and teaching styles can serve as a basis for selecting teaching approaches.

The theoretical framework for this study was founded in Mitzel's conceptual model for the study of classroom teaching (Dunkin & Biddle, 1974). Adapted to this study, the Mitzel model suggests that the effectiveness of a teaching approach (process variable) on

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the problem solving ability of students (product variable) is moderated by the learning styles of the students (context variable), even though teacher effects (presage variables) are held constant. Therefore, consideration of student learning styles is a necessity in determining the effectiveness of a teaching approach on the problem solving ability of students.

Of the few studies which have attempted to address these variables in measuring the effects of teaching approach on problem solving ability, mixed results have been reported. Whereas Dawson (1956) reported an increase in problem solving ability, Thompson and Tom (1957) found no differences. Chuatong (1987) reported that, generally, students did not demonstrate a very high level of problem solving ability. No study could be found which determined the effects of the problem solving approach on the problem solving ability of secondary agricultural education students with varying learning styles.

Research on the learning styles of students enrolled in agriculture generally portray them as field-independent, or concrete learners (Cano & Garton, 1994; Cox, Sproles, & Sproles, 1988; Howard & Yoder, 1987; Raven, Wright, & Shelmamer, 1994; Rollins, 1990; Witkin, Moore, Goodenough, & Cox, 1977). However, these same studies also revealed that students with other learning styles are found in agricultural education classes.

Witkin, Oltman, Raskin, and Karp (1971) depicted learning styles in a linear dimension. Whereas extreme scores are common, Witkin et al. noted that the world is not peopled by two distinctly different types of individuals, but rather that learning styles are distributed on a intermittent plane somewhere between and inclusive of abstract and concrete. Their Group Embedded Figures Test (GEFT) enumerates the degree of abstractness/concreteness on a scale of 0-18 (Figure 1). Witkin et al. respectively classified these learners as field-dependent and field-independent. However, according to Dyer (1995) and Garton and Raven (1994), a third category of learners also exists. These individuals score somewhere in the middle of the bipolar scale. For high school learners this category appears to be just below the GEFT national norm score of 11.3 as established by Witkin et al.

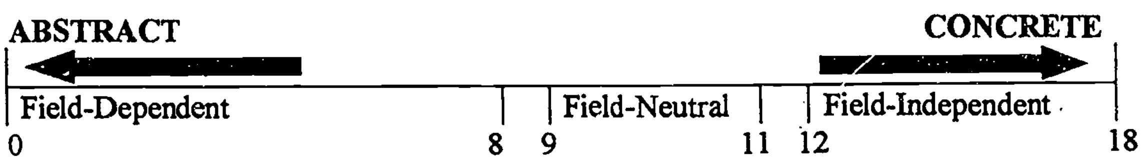

Figure 1. Interpreting GEFT learning style scores for high school age students.

Purpose

The primary purpose of this study was to compare the effectiveness of the problem solving approach to the subject matter approach in teaching given agricultural education problem areas to students with varying learning styles. The specific objectives of the study, stated as research questions, were as follows:

1. What were the effects of the problem solving and subject matter approaches on the problem solving ability of high school agricultural education students in Illinois?

2. What were the effects of students' individual learning styles on the problem solving ability of students taught using the two approaches?

For the purpose of statistical analysis, the research questions were posed as the following null hypotheses. Each hypothesis was tested at the .05 level of significance.

HO_1: There is no difference in the problem solving ability of students taught by the problem solving approach and the problem solving ability of students taught by the subject matter approach.

HO_2: There is no difference in the problem solving ability of students with varying learning styles taught by the problem solving approach and the problem solving ability of students taught by the subject matter approach.

Methods and Procedures

The population of this study consisted of all Illinois secondary agricultural education students. Sixteen classes and 258 students taught by six teachers were selected. Cluster sampling based upon Hays' (1973) formula for determining sample size was used in an attempt to ensure that instructors were capable of using each of the two teaching approaches properly.

The study was conducted using a quasi-experimental design. Since random assignment of subjects to treatment groups was not possible, intact groups were used with random assignment of treatment to the groups. The study followed a variation of the nonequivalent control group design described by Campbell and Stanley (1963), but differed in that the subject matter approach to instruction was used as the control.

Students were administered a pretest designed to measure pre-treatment problem solving ability. Normal curve equivalent (NCE) scores were also obtained to statistically control for existing ability levels. One treatment group received instruction in classes taught by the problem solving approach, the other group received instruction in classes taught by the subject matter approach. Two units of instruction were taught to each group. At the conclusion of all instruction, a problem solving ability posttest and the GEFT instrument were administered to all participants. Each problem solving ability test was scored using an analysis form constructed by the researcher. Inter-rater reliability was established at $\underline{r} = .97$.

Face, content, and construct validity of the researcher-constructed instruments were determined by an expert panel from the University of Illinois College of Agriculture and high school agricultural education teachers prior to administration. All instruments were pilot tested and appropriately adjusted. The GEFT instrument is considered to be a standardized instrument. Its validity has been established and reported by Witkin et al. (1971) based on its parent test, the Embedded Figures Test. Witkin et al. reported a Spearman-Brown reliability coefficient of .82.

Instructional units were prepared using the problem solving approach model presented in Newcomb, McCracken, and Warmbrod (1993) and the subject matter approach model as described by Rosenshine and Stevens (1986). To ensure that the proper teaching approach was used, instructors were provided inservice workshops of 2-6 hours in length concerning the proper use of both teaching approaches and all class sessions were audio recorded and analyzed using a researcher-developed analysis instrument. The instrument was evaluated for content validity by University of Illinois Agricultural Education staff members and inter-rater reliability established at $\underline{r} = .95$.

As part of a larger study which determined the effects of teaching approach on achievement, problem solving ability, and retention, hypotheses were tested using multivariate analysis of covariance (MANCOVA) followed by univariate analysis of covariance (ANCOVA) procedures. In addition, other measures of variance and central tendency were used in analyzing data. Post hoc multiple comparisons were made using Tukey's HSD procedure. Data were analyzed using the SPSS® for Windows™ statistical package. Hotelling's $\underline{T}^2$ was calculated for the effects of the treatment, effects of student learning style, and interaction effects of the treatment and student learning styles on the dependent variable.

Findings

Four teachers and 133 students in 12 classes correctly completed all aspects of the study. Seventy-two students were in classes using the problem solving approach whereas 61 students were in the subject matter approach treatment groups. The mean instructional time needed to complete the units was 18.2 class periods for the problem solving approach (range = 16-22) and 17.8 classes for the subject matter approach (range = 15-21). The majority of students who completed the study were male (69.2%) and Caucasian (97.7%). The majority of learners were field-independent (Table 1). Forty students possessed field-dependent learning styles. Twenty students were field-neutral learners. Male students were predominately field-independent learners whereas slightly less than half of the female students were classified as field-independent.

Table 1
Numbers and Percentages of Students With Varying Learning Styles by Gender and Teaching Approach

		Gender		Teaching Approach	
		Male	Female	PSA	SMA
Learning Style	n	n = 92	n = 41	n = 72	n = 61
Field-Dependent	40 (30.1)	28 (30.4)	12 (29.3)	20 (27.8)	20 (32.8)
Field-Neutral	20 (15.0)	11 (12.0)	9 (22.0)	11 (15.3)	9 (14.8)
Field-Independent	73 (54.9)	53 (56.6)	20 (48.8)	41 (56.9)	32 (52.5)

Note. Percentages are in parentheses. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

Exploration of learning styles by grade level revealed that ninth grade students differed in learning style from other agricultural education students (Table 2). Whereas a majority of freshmen students exhibited a field-dependent style of learning, most sophomores, juniors, and seniors exhibited field-independent learning styles. All teachers who completed the study were field-independent learners (GEFT scores of 12, 13, 17, 17).

Table 2
Numbers and Percentages of Students With Varying Learning Styles by Grade Level

Learning Style	Grade Level 9 $n = 32$	10 $n = 25$	11 $n = 42$	12 $n = 34$
Field-Dependent	18 (56.2)	5 (20.0)	10 (23.8)	7 (20.6)
Field-Neutral	3 (9.4)	4 (16.0)	6 (14.3)	7 (20.6)
Field-Independent	11 (34.4)	16 (64.0)	26 (61.9)	20 (58.8)

Note. Percentages are in parentheses.

Multivariate analysis of covariance produced a Hotelling's T^2 statistic for the effects of teaching approach on the dependent variable of .105, $F_{(1, 123)} = 2.49$, $p = .035$. Follow-up univariate ANCOVA procedures were used to test the null hypotheses pertaining to the effects of teaching approach on problem solving ability.

Hypothesis One

There is no difference in the problem solving ability of students taught by the problem solving approach and the problem solving ability of students taught by the subject matter approach.

The problem solving ability of students was measured by the numerical score obtained from an analysis of the problem solving ability posttest completed by each student. All tests were scored according to the Problem Solving Ability Analysis Form developed by the researcher. Scores on the problem solving ability pretest were used as a covariate measure to adjust for pre-existing group differences.

A moderate correlation was observed between pre-treatment problem solving ability and grade level ($r = .390$). A one-way analysis of variance revealed significant differences ($p = .000$) across grade levels (Table 3). By contrast, a low correlation was observed between post-treatment problem solving ability scores and student grade level ($r = .147$). No significant differences were detected across grade levels for posttest scores.

Table 3
One-Way Analysis of Variance for Problem Solving Ability by Grade Level

Source	df	MS	F
Pretest			
Between Groups	3	(17.10)	7.94**
Within Groups	129	(2.15)	
Posttest			
Between Groups	3	(13.59)	1.97
Within Groups	129	(6.90)	

**$p < .01$.

Tukey's HSD multiple comparison procedure revealed that students in grades 11 and 12 scored significantly higher on the problem solving ability pretest than did ninth-graders.

Seniors also scored significantly higher than did sophomores. However, on posttest problem solving ability scores, sop' omores, juniors, and seniors scored similarly (Table 4).

Table 4
Mean Scores of Student Problem Solving Ability Across Grade Levels

		Problem Solving Ability Pretest		Problem Solving Ability Posttest	
Grade	n	M	SD	M	SD
9	32	3.05	1.17	4.19	2.36
10	25	3.68	1.59	5.64	2.96
11	42	4.01[a]	1.38	5.02	2.73
12	34	4.78[b]	1.71	5.54	2.48

Note. [a]Significantly different from freshmen. [b]Significantly different from freshmen and sophomores.

Results of the univariate analysis of covariance testing the effects of the treatment on the problem solving ability of students indicated that the scores of students in classes taught by the problem solving approach were significantly higher ($p = .046$) on the posttest than were scores of students assigned to classes using the subject matter approach. As a result, the null hypothesis of no difference between treatment groups was rejected in favor of the problem solving approach. Figure 2 graphically displays summary statistics of student performance on the problem solving ability pretest and posttest.

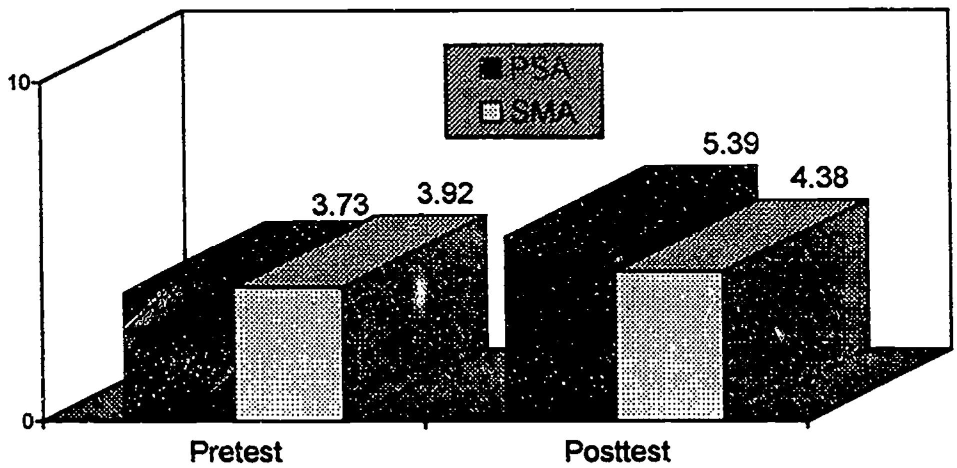

Figure 2. Mean problem solving ability scores by treatment.

Hypothesis Two

There is no difference in the problem solving ability of students with varying learning styles taught by the problem solving approach and the problem solving ability of students taught by the subject matter approach..

When the effects of learning style were measured on the dependent variable, the MANCOVA procedure yielded a Hotelling's T^2 statistic of .036, $F_{(2, 123)}$ =.421, p = .936, indicating no significant differences existed between pretest and posttest problem solving ability scores of students of the same learning style across treatment groups. Therefore, the null hypothesis of no difference between learning styles across treatment groups was retained. Student performance on the problem solving ability pretest and posttest by teaching approach and learning style is depicted in Table 5.

Table 5
Mean Problem Solving Ability Scores Across Learning Styles by Treatment

	PSA		SMA	
Instrument	M	SD	M	SD
Problem Solving Ability Pretest				
Field-dependent	3.72	1.52	3.02	1.31
Field-neutral	3.50	1.34	4.11	2.13
Field-independent	3.95	1.39	4.62	1.67
Problem Solving Ability Test				
Field-dependent	5.42	2.60	3.45	1.90
Field-neutral	4.91	2.49	4.67	1.87
Field-independent	5.94	3.00	4.92	2.51

Exploratory analysis indicated differences in problem solving ability within learning style categories in the treatment group assigned to the problem solving approach. As shown in Figure 3, field-independent learners in the problem solving approach treatment group exhibited significantly higher (p = .003) posttest scores than those received on pretests. No significant differences were detected for either field-neutral (p = .930) or field-dependent (p = .488) learners. Also, no significant differences were identified within learning style categories for students in groups taught by the subject matter approach (Figure 4).

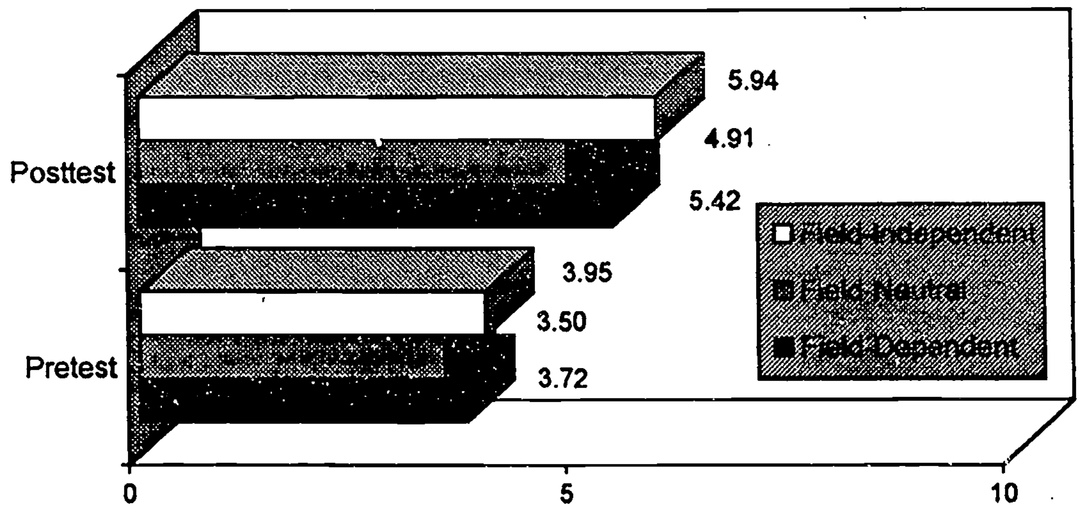

Figure 3. Mean problem solving ability pretest and posttest scores by learning style for students in problem solving approach treatment groups.

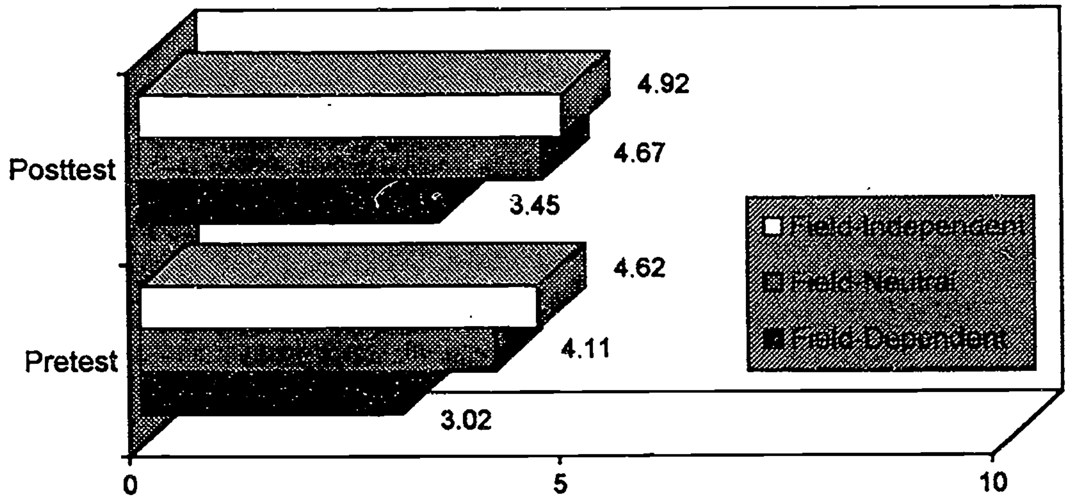

Figure 4. Mean problem solving ability pretest and posttest scores by learning style for students in subject matter approach treatment groups.

In addition, field-independent learners entered the study with greater problem solving ability than did field-dependent or field-neutral learners (Table 6). A one-way analysis of variance confirmed significant differences ($p = .017$) between learning style groups. Tukey's HSD multiple comparison procedure indicated those differences to be between mean scores of field-independent learners and those of field-dependent learners.

Table 6
Mean Problem Solving Ability Scores by Learning Style

	F-D		F-N		F-I	
Instrument	M	SD	M	SD	M	SD
Problem Solving Ability Pretest	3.37	1.44	3.77	1.72	4.25	1.54
Problem Solving Ability Posttest	4.66	2.46	4.89	2.18	5.12	2.82

Conclusions, Recommendations, and Implications

For all clinical studies, care should be taken in generalizing findings to the target population. With this limitation in mind, and based upon the findings of this study, several conclusions, recommendations, and/or implications were noted.

The problem solving approach is more effective than the subject matter approach in increasing the problem solving ability of students. This finding agreed with earlier studies reported by Dawson (1956) and Chuatong (1987). A new finding, however, was that this

increase transcends learning styles. Also new was the finding that use of the problem solving approach is significantly more beneficial to field-independent learners in developing problem solving ability. Since most students in Agricultural Education classes are field-independent learners (Cano & Garton, 1994; Cox et al., 1988; Howard & Yoder, 1987; Raven et al, 1994; Rollins, 1990; Witkin et al., 1977), the problem solving approach to teaching should be used whenever improved problem solving ability is a desired outcome of instruction.

Field-independent learners possess greater problem solving ability than do field-dependent learners. However, each type of learning style benefits from instruction using the problem solving approach. Field-dependent students in classes taught by the problem solving approach increased mean test scores in problem solving ability by 1.70 points, field-neutral students increased 1.41 points, and field-independent learners increased 1.99 points. Therefore, teachers should use the problem solving approach whenever possible to either enhance or develop the problem solving ability of their students.

The ability to solve problems can be acquired if students are taught by the problem solving approach. In addition, problem solving ability can be developed in field-dependent learners to a level of effectiveness nearly equal to that possessed by field-independent learners by use of the problem solving approach. According to Witkin et al. (1977), students scoring less than 11.3 on the GEFT instrument possess little inherent ability to solve problems. They must acquire this skill. Based upon the results of this study, the problem solving approach proved to be an effective tool in this acquisition and should therefore be used as an instructional approach to enhance problem solving ability.

In secondary schools, the ability to solve problems increases by grade level. However, that ability can be accelerated with instructional approaches, such as the problem solving approach, which focus on the solution of problems.

As a clinical study, this research is severely limited in its ability to be generalized to other populations. The study should be replicated to increase the level of generalizability. Likewise, the study should be expanded to include a larger number of minority students.

As indicated in Table 6, standard deviations varied from 1.44 on the pretest to 2.82 on the posttest. Why was deviation so large on the posttest? Since the learning style variable was controlled, obviously other factors are responsible for the deviation in learned problem solving ability. Additional studies should seek to identify those sources of variance.

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EFFECTS OF TEACHING APPROACH ON PROBLEM SOLVING ABILITY OF AGRICULTURAL EDUCATION STUDENTS WITH VARYING LEARNING STYLES

Blannie E. Bowen, The Pennsylvania State University--Discussant

This paper explores a topic most in agricultural education agree is crucial. In this session, the authors present two papers based on a single study. Thus, most comments apply to both papers. The reader must question why the major analysis procedure (MANCOVA) was used when each paper focuses on **one** major dependent variable. It appears that the authors included a statistical procedure used in the study without determining if it was appropriate for individual papers. Overall, the authors tended to use sound procedures. In this paper, the reader might question whether the authors are measuring problem solving ability (potential) or the skills needed to solve problems. It would be useful to see how other researchers dealt with validity issues regarding abilities vs. skills.

Given the emphasis in agricultural education on problem solving, how might familiarity account for any observed differences? For example, the authors report a mean pretest of 3.92 for the subject matter approach vs. 4.38 on the posttest (a difference of .46). For the problem solving approach, the scores were 3.73 on the pretest vs. 5.39 for the posttest (a gain of 1.66). By not reporting the range for the problem solving ability scale, you cannot judge the practical significance of a .46 vs. a 1.66 gain in favor of problem solving. However, if teachers were taught to use the subject matter approach as much as they are the problem solving method, how much of a gain might result?

Regardless of questions about the analysis procedure, the authors did not reject hypothesis 2 about the effect of problem solving vs. the subject matter approach on problem solving ability as it relates to learning style. However, they proceeded to look for group differences and found that problem solving **was effective** only for the 73 students labeled as field independent. No such effectiveness was noted for the 40 field dependent students or the 20 field neutral students. Why were additional analyses performed when the quenstionable MANCOVA indicated no differences for method in relation to learning style?

The reader is cautioned to examine to what extent the findings match the conclusions and recommendations. Given the findings, are researcher bias and expectations inherent in statements such: "The problem solving approach is more effective than the subject matter approach in increasing the problem solving ability of students." Their questionable post hoc analyses said that the problem solving approach is effective for field independent students but not for those labeled as field neutral or field dependent (60 students or almost half of those included in the study). Also, given the findings, one must question the statement: "In secondary schools, the ability to solve problems increases by grade level." This statement contradicts their finding of no problem solving difference across grade levels. In this study, the relationship between pretest problem solving ability and grade level was .39. On the posttest, the relationship was only .15. Not surprising, the authors found no differences across grade level for posttest problem solving ability. Seniors did score higher than sophomores on the pretest, but 9-12 graders scored similarly on the posttest. Intuitively, a researcher might assume that maturation can explain minute differences on the pretest. However, the authors' findings do not support such beliefs.

From an implications perspective, the authors might explore how teachers' learning styles impact their teaching styles. For example, all four teachers in this study had field-independent learning styles <u>and</u> problem solving was effective only for the 73 students with the same style. Overall, this study adds to our limited knowledge base but raises interesting questions.

EFFECTS OF TEACHING APPROACH ON ACHIEVEMENT OF AGRICULTURAL EDUCATION STUDENTS WITH VARYING LEARNING STYLES

James E. Dyer   Edward W. Osborne[1]

Introduction

The selection of an appropriate teaching approach is important to the success of the teaching process. To be successful, teachers must learn how to use a wide variety of teaching strategies (Joyce & Harootunian, 1967). According to Canfield & Canfield (1976), research on learning and teaching styles can serve as a basis for selecting teaching approaches.

Joyce and Weil (1986) proposed that students react differently to different teaching methods, and that the selection of the proper method is critical to the learning style of those being served by the instruction. They further contended that some students may possess a style of learning which promotes the effectiveness of the problem solving approach. On the other hand, some students possess a learning style which is not complimentary to the solution of problems (Witkin, Moore, Goodenough, & Cox, 1977). For these students the problem solving approach to teaching agriculture would have little impact on improvement in learning.

Gage (1972) proposed that theoretical models may provide a framework which leads to a comprehensive theory of teaching. An adaptation of the Mitzel model presented by Dunkin and Biddle (1974) provided the theoretical framework for this study. Adapted to this study, the Mitzel model suggests that the effectiveness of a teaching approach (process variable) on the achievement of students (product variable) is moderated by the learning styles of the students (context variable), even though teacher effects (presage variables) are held constant. It is therefore necessary to determine and address differing learning styles in evaluating the effectiveness of a teaching approach.

Research on the learning styles of students enrolled in agriculture generally portray them as concrete learners (Cano & Garton, 1994; Cox, Sproles, & Sproles, 1988; Howard & Yoder, 1987; Raven, Wright, & Shelmamer, 1994; Rollins, 1990; Witkin et al., 1977). As such, these students usually prefer more action-oriented, practical classes (Cox et al.). However, other learning styles do exist (Gregorc, 1982).

Witkin, Oltman, Raskin, and Karp (1971) depicted learning styles in a linear dimension. Whereas extreme scores are common, Witkin et al. noted that the world is not peopled by two distinctly different types of individuals, but rather that learning styles are distributed on a intermittent plane somewhere between and inclusive of abstract and concrete. Their Group Embedded Figures Test (GEFT) enumerates the degree of

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abstractness/concreteness on a scale of 0-18 (Figure 1). Witkin et al. respectively classified these learners as field-dependent and field-independent.

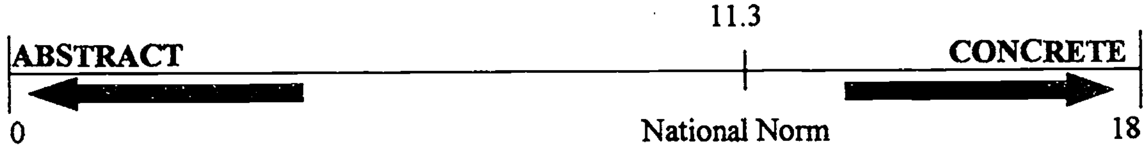

Figure 1. GEFT learning style scores.

According to Garton and Raven (1994) and Dyer (1995), a third category of learners also exists. These individuals score somewhere in the middle of the bipolar scale (Figure 2). For high school learners this category appears to be just below the GEFT national norm score of 11.3 as established by Witkin et al. (1971).

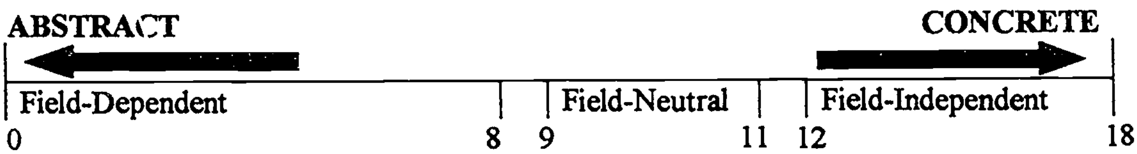

Figure 2. Interpreting GEFT scores for high school age students.

Research on the use of the problem solving approach can best be described as limited in scope with inconclusive results as to its effectiveness. A review of literature in research pertaining to the use of the problem solving approach produced few studies which proclaim its methodological superiority. However, no studies have shown the problem solving approach to be inferior to other approaches.

Of those studies which measured the effects of teaching approach on student achievement, mixed results have been reported. Dawson (1956) and Flowers (1986) reported no significant differences in achievement. Thompson and Tom (1957), however, reported increased achievement scores of students using the problem solving approach. Boone (1988) found that teachers blended approaches and reaffirmed the need for proper training in the use of problem solving approach. Dormody (1990) observed more student-teacher interaction as a result of the use of group teaching using the problem solving approach. Selassie (1990) and Garton and Cano (1993) reported that teachers are less likely to use varying teaching techniques when using the problem solving approach. A void in the literature exists, however, when learning styles are considered in relation to teaching approaches used. Specifically, no study was found which empirically measured the effects of the problem solving approach on the performance of secondary agricultural education students with varying learning styles.

Purpose

The primary purpose of this study was to compare the effectiveness of the problem solving approach to the subject matter approach in teaching given agricultural education

problem areas to students with varying learning styles. The specific objectives of the study, stated as research questions, were as follows:

1. What were the effects of the problem solving and subject matter approaches on the achievement of high school agricultural education students in Illinois?

2. What were the effects of individual learning styles of students on achievement utilizing the problem solving and subject matter approaches to instruction?

For the purpose of statistical analysis, the research questions were posed as null hypotheses. Each hypothesis was tested at the alpha .05 level of significance.

HO_1: There is no difference in the achievement scores of students taught using the problem solving approach and the achievement scores of students taught by the subject matter approach

HO_2: There is no difference in the achievement scores of students of varying learning styles taught using the problem solving approach and the achievement scores of students of varying learning styles taught using the subject matter approach.

Methods and Procedures

The population of this study consisted of all Illinois secondary agricultural education students. Sixteen classes and 258 students, taught by six teachers, were selected. Cluster sampling based upon Hays' (1973) formula for determining sample size was used in an attempt to ensure that instructors were capable of using each of the two teaching approaches properly.

The study was conducted using a quasi-experimental design. Since random assignment of subjects to treatment groups was not possible, intact groups were used with random assignment of treatment to the groups. The study followed a variation of the nonequivalent control group design described by Campbell and Stanley (1963), but differed in that the subject matter approach to instruction was used as the control.

To measure pretreatment achievement, students were administered a pretest in each unit of instruction prior to treatment. Normal curve equivalent (NCE) scores were obtained from guidance counselors to statistically control for existing ability levels of students.

Two units of instruction were taught to each group. One unit consisted of factually based subject matter which did not lend itself well to the identification of problems (Unit I: Applying Principles of Plant Science). The other unit possessed content which could readily be divided into logical and solvable problems (Unit II: Germinating Seeds). One treatment group received instruction in classes taught by the problem solving approach, whereas the other group received instruction in classes taught by the subject matter approach. At the conclusion of each unit of instruction, a multiple choice test was administered to measure differences in achievement levels. At the conclusion of all instruction, the Group Embedded Figures Test was administered to all participants. The validity of the GEFT instrument was established and reported by Witkin et al. (1971) based on its parent test, the Embedded Figures Test. Witkin et al. reported a Spearman-Brown reliability coefficient of .82.

Instructional units were prepared using the problem solving approach model presented in Newcomb, McCracken, and Warmbrod (1993) and the subject matter approach model

as described by Rosenshine and Stevens (1986). To ensure that the proper teaching approach was used, instructors were provided inservice workshops of 2-6 hours in length concerning the proper use of both teaching approaches and all class sessions were audio recorded and analyzed using a researcher-developed analysis instrument. The instrument was evaluated for content validity by University of Illinois Agricultural Education staff members and inter-rater reliability established at $\underline{r} = .95$.

All instruments were pilot tested and appropriately adjusted. The face, content, and construct validity of all researcher-constructed tests were determined prior to administration. Kuder-Richardson 20 reliability coefficients ranged from .77 to .92.

As part of a larger study which determined the effects of teaching approach on achievement, problem solving ability, and retention, hypotheses were tested using multivariate analysis of covariance (MANCOVA) followed by univariate analysis of covariance (ANCOVA) procedures. In addition, other measures of variance and central tendency were used in analyzing data. Post hoc multiple comparisons were made using Tukey's HSD procedure. Data were analyzed using the SPSS© for Windows™ statistical package. Hotelling's $\underline{T}^2$ was calculated for the effects of the treatment, effects of student learning style, and interaction effects of the treatment and student learning styles on the dependent variable.

Findings

Four teachers and 133 students in 12 classes correctly completed all aspects of the study. Seventy-two students were in classes using the problem solving approach whereas 61 students were in the subject matter approach treatment groups. The mean instructional time needed to complete the units was 18.2 class periods for the problem solving approach (range = 16-22) and 17.8 classes for the subject matter approach (range = 15-21). The majority of students who completed the study were male (69.2%) and Caucasian (97.7%). The majority of learners were field-independent (54.9%). Forty students possessed field-dependent learning styles. Twenty students were field-neutral learners (Table 1).

Table 1
Numbers and Percentages of Students With Varying Learning Styles by Teaching Approach

		Teaching Approach	
		PSA	SMA
Learning Style	n	n = 72	n = 61
Field-Dependent	40 (30.1)	20 (27.8)	20 (32.8)
Field-Neutral	20 (15.0)	11 (15.3)	9 (14.8)
Field-Independent	73 (54.9)	41 (56.9)	32 (52.5)

Note. Percentages are in parentheses. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

Exploration of learning styles by grade level revealed that ninth grade students differed in learning style from other agricultural education students (Table 2). Whereas a majority of freshmen students exhibited a field-dependent style of learning, most sophomores,

juniors, and seniors exhibited field-independent learning styles. All teachers who completed the study were field-independent learners (GEFT scores of 12, 13, 17, 17).

Table 2
Numbers and Percentages of Students With Varying Learning Styles by Grade Level

Learning Style	Grade Level 9 n = 32	10 n = 25	11 n = 42	12 n = 34
Field-Dependent	18 (56.2)	5 (20.0)	10 (23.8)	7 (20.6)
Field-Neutral	3 (9.4)	4 (16.0)	6 (14.3)	7 (20.6)
Field-Independent	11 (34.4)	16 (64.0)	26 (61.9)	20 (58.8)

Note. Percentages are in parentheses.

A majority of the male students were field-independent learners. However, less than half of the female students were classified as field-independent learners (Table 3).

Table 3
Numbers and Percentages of Students With Varying Learning Styles by Gender

Learning Style	Gender Male n = 92	Female n = 41
Field-Dependent	28 (30.4)	12 (29.3)
Field-Neutral	11 (12.0)	9 (22.0)
Field-Independent	53 (56.6)	20 (48.8)

Note. Percentages are in parentheses.

As indicated in Table 4, students in classes assigned to the problem solving approach entered the study with higher ability (NCE) scores and greater prior knowledge, as exhibited by higher pretest scores. Covariate adjustments were made in group mean scores to control for these initial between-group differences.

Table 4
Mean Covariate Scores by Teaching Approach

	PSA (n = 72)		SMA (n = 61)	
Covariate	M	SD	M	SD
NCE	62.1	16.6	57.5	19.1
Achievement Pretest I	59.2	13.2	54.2	14.7
Achievement Pretest II	58.4	15.0	54.6	14.5

Note. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

Multivariate analysis of covariance produced a Hotelling's T^2 statistic for the effects of teaching approach on the dependent variable of .105, $F_{(1, 123)} = 2.49$, $p = .035$. Follow-up univariate ANCOVA procedures were used to test hypotheses pertaining to the effects of teaching approach on achievement.

Hypothesis One

There is no difference in the achievement scores of students taught using the problem solving approach and the achievement scores of students taught by the subject matter approach

Students in classes taught using the problem solving approach exhibited higher mean scores on achievement tests for both units of instruction than did students in classes taught using the subject matter approach (Table 5). However, follow-up univariate analysis of covariance indicated no significant differences in achievement as measured by either Achievement Test I ($p = .187$) or Achievement Test II ($p = .053$). Therefore, the null hypothesis of no differences in achievement between treatment groups was retained. Table 6 contains data derived from the univariate analysis of the effects of the treatment.

Table 5
Mean Achievement Scores by Treatment

	PSA		SMA	
Instrument	Observed Mean	Adjusted Mean	Observed Mean	Adjusted Mean
Achievement Test I	77.35	76.15	72.18	73.38
Achievement Test II	74.34	72.89	66.86	68.30

Note. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

Table 6
Univariate Analysis of Treatment Effects

Variable	MS	MSE	F	p
Achievement Test I	185.98	105.74	1.76	.187
Achievement Test II	511.81	133.94	3.82	.053

Note. df = 1, 123.

Hypothesis Two

There is no difference in the achievement scores of students of varying learning styles taught using the problem solving approach and the achievement scores of students of varying learning styles taught using the subject matter approach.

When the effects of learning style were measured on the dependent variable, the MANCOVA procedure yielded a Hotelling's $\underline{T}^2$ statistic of .036, $\underline{F}_{(2, 123)}$ =.421, $\underline{p}$ = .936, indicating no significant differences in achievement existed based upon the learning style of the student.

When student achievement was measured across learning styles, however, differences in both observed and adjusted means were noted in students' scores on both problem area achievement tests. For both tests, students taught by the problem solving approach displayed higher mean scores across learning styles than did their respective counterparts. Summary statistics of achievement across learning styles are presented in Table 7.

Table 7
Mean Achievement Score by Treatment and Learning Style for Achievement Tests

	F-D		F-N		F-I	
Teaching Approach	Obs. Mean	Adj. Mean	Obs. Mean	Adj. Mean	Obs. Mean	Adj. Mean
Achievement Test I						
Problem Solving	74.45	75.81	79.00	80.55	78.58	75.68
Subject Matter	71.70	72.79	68.22	69.60	76.62	74.15
Achievement Test II						
Problem Solving	69.30	71.21	78.84	78.80	75.44	73.04
Subject Matter	65.50	66.51	60.22	62.88	74.84	71.17

Note. F-D = field-dependent, F-N = field-neutral, F-I = field-independent learning styles.

As indicated by these data, interaction effects between the treatment and student learning styles occurred in both sets of achievement test scores. Figures 3 and 4 present graphic displays of the interaction effects based upon adjusted group means for each respective achievement test.

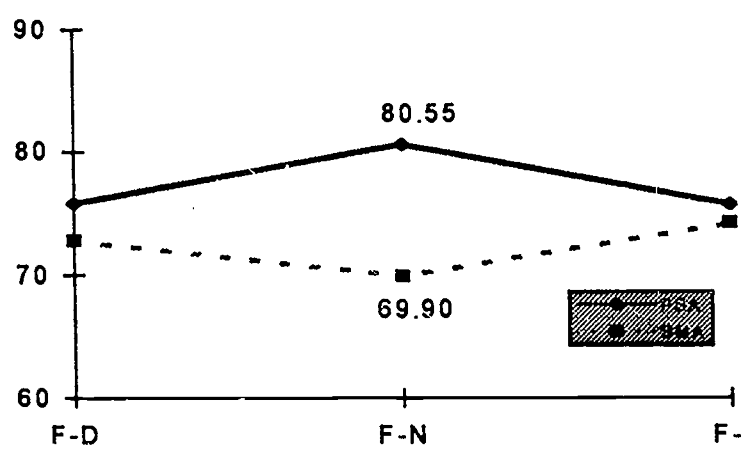

Figure 3. Interaction effects of treatment and learning style for Achievement Test I ($\underline{p}$ = .186).

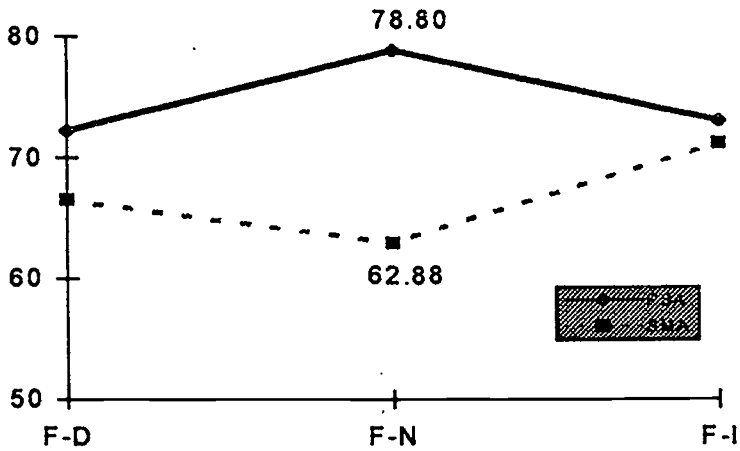

Figure 4. Interaction effects of treatment and learning style for Achievement Test II (p = .028).

Hotelling's T^2 statistic for the effects of the interaction on the dependent variables of student learning style and the teaching approach used was .166, $F_{(2, 123)} = 1.96$, $p = .038$. Follow-up univariate analysis of covariance (Table 8) indicated significant differences ($p = .028$) in student achievement for Achievement Test II, the unit of instruction most readily suited for use with problem solving instruction. Field-neutral learners in classes using the problem solving approach scored significantly higher than did field-neutral learners taught in classes using the subject matter approach. Based upon these results, the null hypothesis of no differences in achievement across student learning styles was rejected.

Table 8
Univariate Analysis of Interaction Effects Between Learning Style and Treatment

Variable	MS	MSE	F	p
Achievement Test I	180.19	105.74	1.70	.186
Achievement Test II	493.13	133.94	3.68	.028

Note. df = 2, 123.

Conclusions

Prior research in the use of the problem solving approach has produced conflicting results. Whereas some studies have reported the problem solving approach to be effective in producing increased achievement, others have not. None of the prior studies, however, have found the problem solving approach to be less effective than the subject matter approach in producing gains in achievement. Results of this study continue in this tradition. In none of the variables under study was the subject matter approach superior to the problem solving approach. By contrast, this study found the problem solving approach to be the more effective approach in producing higher achievement scores for field-neutral learners. In addition, the study was successful in suggesting certain

parameters in which the problem solving approach can be most effectively used, and in identifying the role of learning styles in explaining discrepancies in its successful utilization. Based upon the findings of this study, the following conclusions were formed:

1. For field-neutral learners, the problem solving approach is more effective than the subject matter approach in increasing achievement in problem areas which beget identifiable and relative problems. While the problem solving approach produced increases in achievement test scores across learning styles, field-neutral learners benefited most when the problem solving approach was used.
2. On units of instruction in which relevant and meaningful problems are not identified, the problem solving approach is neither more nor less effective than the subject matter approach in producing significantly increased achievement scores.
3. Freshmen students posses a more abstract style of learning than do sophomores, juniors, or seniors. Likewise, male students possess learning styles which are more concrete than their female counterparts.
4. Both student learning style and teaching approach are important variables which should be addressed for maximum achievement to be attained.

Recommendations and Implications

1. Since the problem solving approach proved to be effective in increasing achievement scores on problem-based topics for field-neutral learners, teachers should use this approach whenever field-neutral learners are among those being taught. To identify these individuals, all students and teachers should be evaluated for learning style upon entrance to an agricultural education program.
2. Teachers of agriculture should accept that students and teachers differ in learning styles and use that knowledge to better facilitate learning. Whereas concrete (field-independent) learners readily divide subject matter into problems to be solved and abstract (field-dependent) learners do not envision subject matter as problems, field-neutral learners are capable of improving achievement scores if the instructor provides the structure (i. e., breaks the subject matter down into solvable problems for the students).
3. Teachers of agriculture should accept that students and teachers differ in learning styles and use that knowledge to better facilitate learning. Instructional strategies using various teaching techniques and materials should be used which would provide for more inclusive and effective instruction utilizing the characteristics of each student's learning style, and the teaching style of the instructor. Also, teachers may use these results to not only address those learning styles, but to expand the students' style limitations by introducing teaching techniques which aid students in enhancing their learning capabilities.
4. As a clinical study, this research is severely limited in its ability to be generalized to other populations. The study should be replicated to increase the level of generalizability and to validate the findings.
5. This study concentrated on the cognitive effects of the problem solving and subject matter approaches on students with varying learning styles. Future studies should also seek to determine the effects of the two approaches on psychomotor skill development in students with varying learning styles.

6. Findings of this study contain scores from only three minority students. Similar studies should be conducted using students from varied ethnic and geographical backgrounds.

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EFFECTS OF TEACHING APPROACH ON ACHIEVEMENT OF AGRICULTURAL EDUCATION STUDENTS WITH VARYING LEARNING STYLES

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The authors begin this paper with a good literature review of achievement as a function of instructional method. They note that limited research has been done with learning styles in the equation. Because the authors present two papers from a single study, most comments apply to both papers. Given the way the study was conducted, again the reader must wonder why the authors did not present one paper. They do not include strong theoretical or logical arguments for investigating variables such as grade level and gender. Had they limited their papers to their hypotheses, one paper could have handled the key variables.

As with their other paper, clarity is needed about the sampling, procedures, and population. Which teachers were in what groups and how many students were in each class? The authors indicate that they used a variation of Campbell and Stanley's nonequivalent control group design. The study started with six teachers, 16 classes, and 258 students. Yet, data are reported for only four teachers, 12 classes, and 133 students who "correctly completed all aspects of the study." Details are needed on the **missing** teachers and students. The reader might assume that the study started with three teachers in the treatment group and three in the control. However, because only four teachers completed the study, it is not clear if two teachers were in each group or a single teacher in one group. Quick math says that mortality involved two teachers and four classes, but almost half of the students. Thus, one must assume that the **missing** classes had large enrollments. If large section classes were not included, are the results skewed positively or negatively?

As the reader studies the findings, one must note statements about less than half of the female students being field independent learners (Table 3). This is correct mathematically, but a cursory reading of Table 3 might lead to a less strong statement. In Table 3, 57% of males were field independent vs. 49% for females. Also, when hypothesis 1 was tested, the method did not influence achievement. For hypothesis 2, the questionable MANCOVA indicated no difference in achievement based on method. However, in Table 7 and the text, the authors state that the problem solving method was effective for one learning style (field neutral). Given the significant interaction they also report, should there be statements about problem solving being effective for any style? Also, because the large section classes were not studied, might the findings be biased? Given the mortality, might the positive findings for problem solving be a function of how many students the teachers had in each class?

As one reads the conclusions, caution is urged about many statements, especially those involving gender and grade level. The findings tend to not support statements that male students tend to be more concrete learners. Also, in their other paper on problem solving ability, freshmen tended to have abstract learning styles and lower problem solving abilities. Yet, in Table 4, sophomores had higher posttest problem solving scores than either juniors or seniors. But, in the text, seniors had higher problem solving scores (5.64 for sophomores, 5.02 for juniors, and 5.54 for seniors). Either the text or the table might be incorrect. Regardless, the reader must be intrigued that sophomores, juniors, and seniors would score similarly even though maturation might suggest otherwise. Further, without ranges, the reader cannot accurately interpret the findings.

As with their other paper, the authors appropriately caution the reader not to generalize the findings. Their recommendations for replications are in order. When such replications occur, efforts should address issues of gender, class size, and the learning styles of teachers. Also, more teachers should be studied to enhance internal and external validity.

LEARNING STYLE: A FACTOR TO CRITICAL THINKING?

Robert M. Torres Jamie Cano*

Introduction

Critical thinking is considered the hallmark to success in life. The educational literature overwhelmingly conveys the value of developing critical thinking abilities in students. Most rationales convey arguments for the importance of thinking abilities: They lead to getting a better job, to the nation being able to compete better economically, to people being able to fit better within a changing and complex environment, to improve the quality of life (Thomas, 1992).

Addressing the postsecondary faculty, Weiss (1993) indicated that teaching faculty in all disciplines and at all levels of education shared a common goal: to develop in students the complex mental operations that will allow them to be successful in the classroom as well as their future careers. How do we develop complex mental operations in student?

Theoretical/Literature Base

In a comprehensive literature review, Torres (1993) developed a conceptual framework that grouped variables identified into five major factors that contribute to developing complex mental operations, or cognitive abilities in students: 1) teacher-related, 2) student-related, 3) personal characteristics, 4) learning styles, and 5) other factors (Figure 1).

Teacher-related factors included such variables as philosophical beliefs (Bane, 1969), preparation (Young, 1982; Gall, 1970), cognitive expectation (Pickford, 1988), tests and assignments (Miller, 1989), and instructional delivery (Pascarella, 1975; McMillan, 1987). While teacher-related factors hold to be important influential factors in cognitive development, student-related factors may be more profound.

Student-related factors included such variables as involvement (McKeachie, 1980; Flander, 1970), motivation (Miller, 1989; Pickford, 1988), and student interest in and value of the course enrolled (Pickford, 1988). Similarly, McKeachie (1980) maintained that students' personal characteristics also played an important role in cognitive development. Pascarella (1985) suggested that student attributes such as gender, age, ethnicity, social economic status, intelligence, and educational or occupational aspiration were worth considering in terms of influence in cognitive development.

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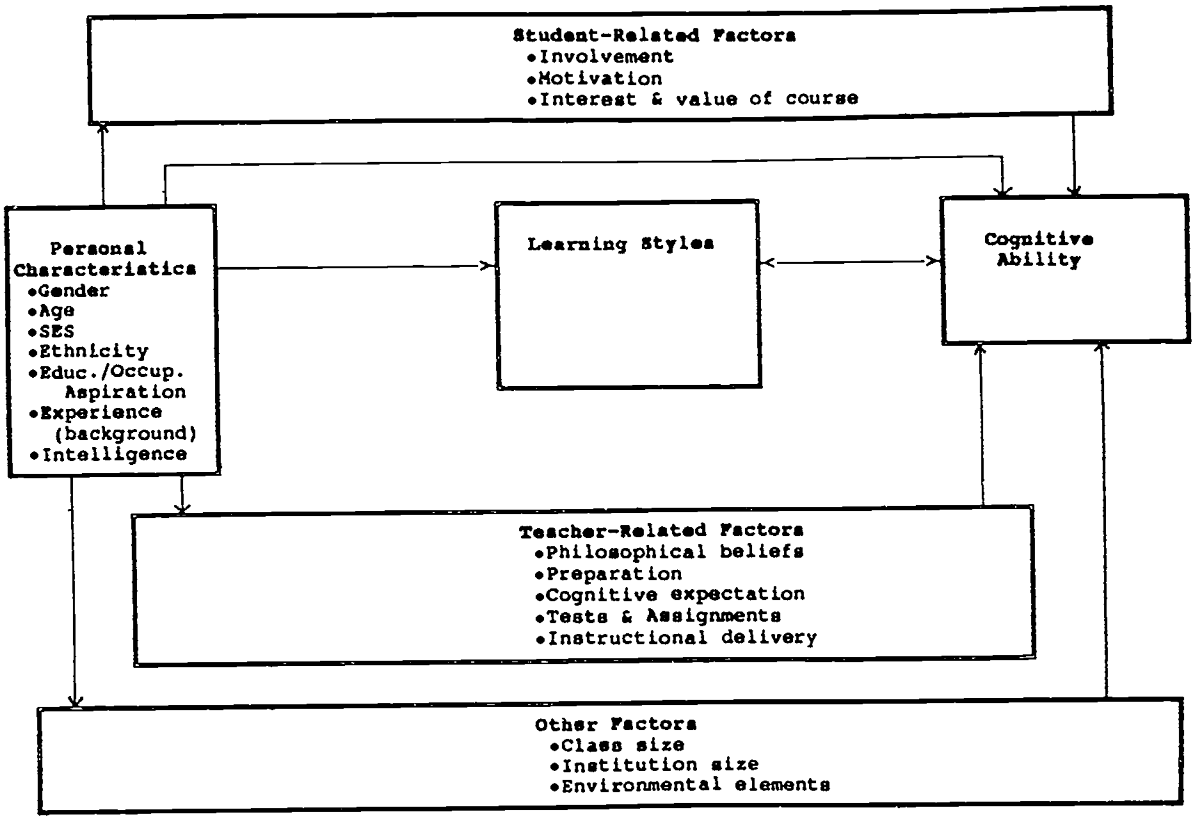

Figure 1 Conceptual Framework

Other factors have also been identified through the literature. Among them were class size, institutional size, reasons for studying, work patterns, the role of the teacher, and environmental elements such as mental activities in class and while studying for courses, (Fisher & Grant, 1983; Chickering, 1972).

While a number of factors have emerged from literature on student cognitive development, an additional factor identified was student learning style. Learning style is one factor researchers claim influenced student educational performance (Dunn & Dunn, 1979; Claxton & Murrell, 1987). Gregorc (1979) described learning style as "consisting of distinctive behaviors which serve as indicators of how a person learns from and adapts to his/her environment. It also give clues as to how a person's mind operates." (p. 234) Learning style research has been applied at an ever-increasing rate to the problems of education (Doebler & Eicke, 1979). Claxton and Murrell (1987) suggested that learning style could be an extremely important element in the move to improve curricula and the teaching process in higher education.

Field-dependent and field-independent learning styles have been widely and extensively studied and have the broadest application to educational concerns (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). Witkin, Moore, Goodenough, and Cox (1977) suggested that students who preferred a field-dependent learning style tended to perceive the world globally, found it more difficult to solve problems, were highly sensitive and attuned to the social environment, tended to favor the "spectator approach"

to learning, and would adopt the organization of information to be learned. Additionally, students who preferred a field-dependent learning style were more extrinsically motivated and responsive to social reinforcement.

Conversely, students who preferred a field-independent learning style tended to view the world more analytically, found it easier to solve problems, and were more likely to favor "inquiry" and independent study. In addition, field-independent students tended to provide their own structure to facilitate learning, were more intrinsically motivated, and were generally unresponsive to social reinforcement (Witkin et al., 1977).

The conceptual framework (Figure 1) serves as a benchmark for beginning to address the developmental cognitive abilities of students enrolled in colleges of agriculture. This study sought to investigate the influence learning style had on the cognitive development of students enrolled in a college of agriculture. Additionally, the study sought to control statistically for variance accounted for by personal characteristics.

Purpose and Objectives

The purpose of the study was to examine and explain the variance in the critical thinking abilities of students enrolled in the College of Agriculture at The Ohio State University. The study was guided by the following research objectives and hypothesis:

1. Describe selected personal characteristics (age, gender, GPA, ethnicity) of students.
2. Describe the performance measure on critical thinking abilities of students.
3. Explain the variance in critical thinking abilities accounted for by learning style beyond that contributed by gender, age, GPA, and ethnicity.

H_1: Learning style will be positively related to critical thinking ability.

Methods/Procedures

The accessible population for the descriptive-correlational study was senior students enrolled in the College of Agriculture at The Ohio State University during the Autumn Quarter, 1992 (N=388). An up-to-date list of seniors was obtained from the College Office and served as the frame for the study. A sample of 196 students was drawn randomly from the population of senior students. The sample size (n=196) was determined using Krejcie and Morgan's (1970) table of sample sizes, specifying a 5 percent margin of error.

Instrumentation

Two instruments were used to gather the data: the Group Embedded Figures Test (GEFT; Witkin, Oltman, Raskin, & Karp, 1971) and the Developing Cognitive Abilities Test (DCAT; Beggs & Mouw, 1989). The GEFT was used to assess the learning style of

students as either field-dependent or field-independent. Individuals scoring greater than the national mean (11.4) were considered to be leaning toward the field-independent learning style, while individuals scoring less than the national mean were considered to be leaning toward the field-dependent learning style (Witkin et al., 1971). The total possible raw score on the GEFT was 18.

The validity of the GEFT has been established by determining its relationship with its "parent" test, Embedded Figures Test (Witkin et al., 1971). Because the GEFT was a speed test, internal consistency was measured by treating each scored section (sections two and three) as split-halves. Witkin et al. (1971) reported a corrected Spearman-Brown reliability coefficient of .82 on the GEFT.

The DCAT was used to assess Critical Thinking Abilities of the students using items on three content areas (verbal, quantitative, spatial). The Critical Thinking Abilities are consistent with the Analysis and Synthesis levels of Bloom's taxonomy (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). The evaluation level of Bloom's taxonomy was deleted from the general intent of the DCAT.

The DCAT was considered a standardized instrument and has been assessed for content validity and reliability (Wick, 1990). The reliability estimate, expressed as Kuder-Richardson-20 as a measure of internal consistency, was established by the developers of the instrument. A reliability estimate of .75 was reported for Critical Thinking Abilities (Wick, 1990). Personological data was gathered from College records.

Data Collection

Data collection began by mailing students a letter of invitation strongly encouraging participation in the study. The letter was structured according to Dillman (1978) and specified four dates and times with two data collection sessions on each date. Students were invited to attend one of the eight sessions offered. Students were able to indicate their willingness to participate on a self-addressed, stamped postcard. Ten days after the initial mailing, follow-up efforts were conducted via telephone to determine students' willingness to participate in the study. A make-up data collection session was offered to students unable to attend their scheduled session. All data collection sessions were located in the same room.

A total of 47 percent (n=92) of the students in the sample participated in one of the eight scheduled or one make-up data collection session. Students who did not participate in the study were treated as non-respondents and considered to be non-response error.

Non-response error was controlled by sampling the non-respondents and comparing them with the respondents. A sample of 10 percent of the non-respondents (n=11) was randomly drawn and statistically compared to the sample of respondents (n=92) on variables of interest as suggested by Miller and Smith (1983). No significant

differences (p>.05) were found between the sample of non-respondents and respondents. Thus, the non-response data were pooled with the respondent data, yielding a sample size of 103 (53.0%) and allowing generalization to the sample/population (Miller & Smith, 1983).

Analysis of Data

The data were analyzed using SPSS/PC+. Descriptive statistics such as frequencies, central tendencies, variance, and ranges were used to simplify and characterize the data. Hierarchical multiple linear regression was used to explain the variance in students' critical thinking abilities. The independent variables of the study included age, gender, GPA, ethnicity, and learning style. The dependent variable was students critical thinking abilities score. An alpha level of .05 was set a priori.

Results

Table 1 presents the summarized data on students' background characteristics (age, gender, learning style, cumulative GPA, and critical thinking abilities). Ethnicity was dropped from consideration as a variable due to the lack of variance (94.2% white; 4.8% African-American; 1.0% Hispanic).

Table 1.
Summary Data: Regression of Critical Thinking Abilities on Selected Variables (n=103)

	Intercorrelations						
Variable	X_1	X_2	X_3	X_4	Y	Mean	SD
Age (X_1)	1.00	-.19	-.05	.07	-.08	23.65	4.13
Gender* (X_2)		1.00	.26	.09	-.02	.57	.50
GEFT (X_3)			1.00	.27	.36	12.42	4.27
GPA (X_4)				1.00	.33	2.74	.57
Critical Thinking Abilities (Y)					1.00	17.04	3.78

*0=female; 1=male

According to the data, the mean age (X_1) of senior students was 23.65. The students' mean gender (X_2) indicated 43 percent were female and 57 percent were male. The learning style - GEFT (X_3) mean score was 12.42 out of a total possible score of 18. Using the national norm as the midpoint (Witkin, Otlman, Raskin, & Karp, 1971), students can be dichotomized as either field dependent or field independent. As such, further data analysis reveals that 38.8 percent of the students tended to lean toward a field-dependent learning style, while 61.2 percent of the students tended to lean toward a field-independent learning style. Academically, the data records a cumulative Grade Point Average (X_4) mean score of 2.74 for students. As the dependent variable of the

study, the Critical Thinking Abilities mean score for senior students was 17.04 out of a possible score of 27. Variance for each variable is located on Table 1.

A correlation matrix (Table 1) was generated containing the dependent variable, the variable of interest, and the control variables (Table 1). Variables used as control variables in examining the relationship between learning style and critical thinking were age ($r=-.08$), gender ($r_{pb}=-.02$), and GPA ($r=.33$). The variable of interest, learning style, was correlated with critical thinking ($r=.36$).

The correlation matrix also served to reveal the presence of multicollinearity -- a potential violation of the assumptions in using multiple linear regression. Using the rules of thumb offered by Lewis-Beck (1980), none of the bivariate correlations exceeded the stated .80 coefficient, nor did the range of R^2 (.04 - .13) reveal a potential threat to the assumptions after each independent variable was regressed on all other independent variables.

Using hierarchical multiple linear regression analysis (Table 2), 22 percent ($R^2=.216$) of the variance in senior students critical thinking abilities was accounted for by the optimal linear combination of GPA, age, gender, and GEFT score ($F=6.76$, $p<.05$). In the analysis, the control variables were entered into the equation first followed by the variable of interest. The three control variables (GPA, age, and gender) contributed 13 percent of the variance in senior students' critical thinking abilities score. Isolating the variance contributed by the control variables, the variable of interest -- learning style (GEFT), uniquely accounted for an additional 9.1 percent of the variance in senior students' critical thinking ability score ($t=3.38$, $p<.05$).

Table 2.
<u>Hierarchical Regression of Critical Thinking Abilities on Control Variables and Variables of Interest</u> (n=103)

Variable	R^2	R^2 Change	*b*	*t*	*p*
Control Variables	.130	.130			
GPA			1.81	2.81	.005*
Age			-.10	-1.16	.248
Gender[a]			-1.15	-1.54	.128
Variable of Interest					
GEFT	.216	.091	.30	3.38	.001*
(Constant)			11.17		

*$p<.05$ for individual variables; Standard Error=3.58; Adjusted $R^2=.18$; For Model: $F=6.76$, $p<.05$. a: 0=female; 1=male.

Conclusions and Recommendations

Using Davis' (1971) conventions for describing the magnitude of relationships, a moderately positive bivariate relationship ($r=.36$) existed between learning style and critical thinking of students. However, this relationship does not control the multicollinearity of extraneous variables. In his address to the agricultural education profession, McCracken (1991) argued for a need to control for variance in a dependent variable that is presumably "caused" by one or more independent variables extraneous to the relationship under investigation. Hence, by nullifying variance of the control variables (age, gender, and GPA), the current study indicates approximately 9 percent of the variance in critical thinking abilities in students enrolled in the College of Agriculture is uniquely accounted for by learning style. The study also suggested a substantial proportion (91%) of the variance in student critical thinking abilities remains unaccounted.

Yet, by most standards, the ability of one variable to contribute uniquely 9 percent of the variance in a dependent variable suggests learning style is indeed a significant variable that educators need to become familiar with to use in promoting and developing students' critical thinking abilities. So, what can be recommended about an attribute variable that is said to remain static across one's life?

One must first keep cognizant that learning style should be conceived as referring to *actions*, rather than *abilities* of students. As such, instructors should develop an educational environment conducive to promoting actions that contribute to critical thinking. This is not to say that instructors change students' preference for learning (learning style); rather, instructors need to use the students' learning style in planning and the delivery instruction. In the delivery, instructors should incorporate a variety of teaching methods, curriculum materials, and evaluation techniques into classroom discourse to reach students with differing learning styles. Rosenshine and Furst (1971) identified *variability* as one of five teacher behaviors that were found to provide the greatest influence on student learning. The remaining four were clarity, enthusiasm, task-oriented, and student opportunity to learn the criterion material.

Additionally, instructors need in-service training on learning styles. With leadership from a college teaching committee, learning style workshops should be designed and implemented by teacher educators in agricultural education with expertise in learning theories. At the styles workshops, faculty can gain knowledge about learning styles by having their own learning style assessed. Pat Guild, a leading expert on learning style indicated it is important for instructors, when working with students, to understand both their own and the students' learning perspectives (Brandt, 1990), because as Dunn and Dunn (1979) suggested, instructors teach the way they learn.

Furthermore, research needs to continue along this line of inquiry. Identifying factors that contribute to the development of critical thinking in students of all ages

persists as a pressing issue for educators and researchers. As a cognitive process function, critical thinking has continued to elude the development of any "recipe" formula in developing these essential skills. Nonetheless, effort should be exerted to forage factors that make unique contributions to the development of critical thinking abilities. With 91 percent of the variance unaccounted for by this study, teacher-related and student-related factors identified in the conceptual framework, as well as others, might be worth investigating.

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LEARNING STYLE: A FACTOR TO CRITICAL THINKING

Blannie E. Bowen, The Pennsylvania State University--Discussant

The authors are to be commended for continuing a line of inquiry that was initiated several years ago. At a recent NAERM conference, one of the authors presented a paper with similar subjects and constructs. This degree of commitment to serious inquiry is reflected throughout this paper that is clearly written.

The authors used over 30 references to establish a thorough and comprehensive synthesis of related research. Also, they synthesized this research into a conceptual framework that is presented graphically in Figure 1. Even a reader who is remotely familiar with the learning style and critical thinking literature can easily grasp the essence of their study. Further, given recent NAERM keynote lectures that have focused on approaches to elevate the level of scholarship in agricultural education research, it is refreshing to see authors heed that wisdom. One example of the authors' attempt to follow that advice can be found through their use of related research to formulate and test hypotheses. In this study, they use the wealth of related research to hypothesize that learning style is positively related to critical thinking ability.

Seniors enrolled in Ohio State's College of Agriculture in Autumn 1992 constituted their target population. The authors used a random sample of those students as subject for their investigation. Most of the procedures are consistent with those recommended for this type of investigation.

Not surprising, the authors were able to support their hypothesis that was derived from a thorough synthesis of related research literature. Given the complex nature of the constructs being investigated, their regression models produced the types of less than positive findings that should be expected. However, they resisted the temptation to let their conclusions and recommendations extend beyond their findings and related research and theory. Their implications for practice are well-founded given that learning styles and critical thinking cannot be manipulated to an appreciable extent. In total, the study was well designed and conducted. The reader can feel comfortable in knowing that the authors' findings are perhaps the best answers currently available regarding questions involving these complex constructs.

THE LEADERSHIP ATTITUDES OF INDIVIDUALS ENROLLED IN LEADERSHIP DEVELOPMENT LABS

Dr. Richard Lane Cummins, Dr. Christine D. Townsend,
Dr. Gary E. Briers, Dr. Glen C. Shinn*

Theoretical Framework for the Study

One of the relationships among individuals in a group is leader and follower. In order to facilitate action by the group, leadership must be accomplished; but, just what is leadership? Generally, the <u>results</u> of leadership can be easily identified as a product, an event, a task, or a procedure accomplished by the group. Determining <u>how</u> the result was accomplished can be more difficult. Why do some people lead, some follow, and some watch from the sidelines?

Early leadership studies focused on one of three universal approaches: qualities of a leader, behaviors of a leader, or a leader's decision-making style. This traditional approach to leadership research attempted to explain leadership on the basis of an individual's intelligence, dominance, task orientation, or need for power (Krug, 1993). While it was found that the analysis of the personal characteristics of leaders was useful in understanding what they did and why they did it, this approach failed to explain the relationship between leaders and followers. Even though this early work has been largely abandoned, it has continued to influence current theoretical and experimental work. The primary problem with the traits, behavior, and situational approaches was that they specified leadership as the possession of an individual holding a position, and failed to consider the importance of the group members.

McGregor's (1960) work suggested that the way followers were perceived by their leaders and the way leaders were perceived by their followers could have a profound effect on productivity and efficiency. The need for a wider range of experience for an aspiring leader that included interpersonal skills being applied in specific situations was identified by Hersey and Blanchard (1969). Analyzing the behavior of followers was theorized to be necessary for maximizing human resources.

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Why was it thought that followers had to be managed? Could it be that we have viewed *followership* as the antithesis of leadership rather than considering followers as collaborators in organizational efforts? Kelley (1992) stated that most people are both leaders and followers. Terry (1993) revealed that recognizing individual contributions and personal motivations of individuals in a group or team were paramount in importance to effective leadership. Schwarz (1994) indicated that a key to more effective groups or teams was the identification and adherence to ground rules or guidelines for performance.

Purpose and Objectives of the Study

The purpose of this study was to determine and measure the attitude of individuals in leadership development labs toward leadership. The study examined the extent of harmony that existed among designated follower's perceptions of leadership theory, specifically perceptions toward leader control and team (follower) control.

Methodology

The design of this inquiry was correlational, distinguished by a lack of random assignment of subjects and nonequivalent groups. Only participants that registered for selected labs were included in the study. According to Babbie (1992), this sampling technique, purposive sampling, would be appropriate under certain conditions. This method of sampling acknowledged that only subjects interested in leadership development would be studied. If any grouping variable had less than five respondents, no comparisons were made as results would be invalid due to small sample size.

The instrument used to collect data for this study was an adaptation of a survey used in a university leadership development course (Carter, 1980) and was used from 1980-1994 in undergraduate and graduate courses. The updated survey consisted of 20 items with a five point, Likert-type scale which included a range from "strongly disagree" to "strongly agree." Three demographic items identified subjects by ethnicity, gender, and age. The questions were grouped into two scales (leader and team [follower] control) by an expert panel of leadership research graduate students and graduate faculty members. The two scales were analyzed to compute a Team Control Score (maximum = 50) and a Leader Control Score (maximum = 50) A higher numeric value for a particular scale would indicate a stronger preference toward the team (follower) or leader control of process. The SPSS[a] procedure RELIABILITY was used to compute instrument reliability for the entire sample and for each subgroup. Results are reported in Table 1. Subjects completed the questionnaire immediately prior to receiving training. A confidence level of .05 was set a priori for all comparisons.

Table 1.
Reliability Coefficients Measuring Team Scale Items and Leader Scale Items

Scale	*Combined Samples*	*TOTAL*	*AGED 340*	*TALL*	*AGED 340H*
Team Items	.60	.55	.76	.66	.43
Leader Items	.66	.60	.70	.59	.67

The sample for this study consisted of 122 subjects registered for selected Leadership Labs. The Leadership Labs were designed for specific groups. Participants self-selected the labs based on their eligibility as follows: (1) Teens Of Texas Acquiring Leadership (*TOTAL*), youth ages 14-17; (2) Agricultural Education 340 (*AGED 340*), Professional Leadership Development, young adults ages 18-22; (3) Texas Agricultural Lifetime Leadership (*TALL*), adults ages 25-40; (4) Agricultural Education 340 Honors (*AGED 340H*), Professional Leadership Development, young adults ages 18-22 with a grade point average above 3.25 on a 4.0 scale. The data for the combined sample are shown in Table 2.

Table 2.
Sample Demographics: Participants in Leadership Labs

Age by Gender		Hispanic	Black	White	Other
Youth					
	female	7	0	20	0
	male	1	4	4	0
Young adult					
	female	1	1	21	0
	male	1	1	20	4
Adult					
	female	0	0	9	0
	male	2	1	25	0

Results and Findings

The procedure ONE-WAY ANOVA and a post hoc Scheffe' test were used to compute the comparisons among groups on the Team Control Scale. No significant differences were found among the distinct groups regarding participants' attitudes toward group control as operationalized by the Team Control cumulative score. Significant differences were found when Team Scale items were compared by more intensive demographic

categories. When the procedure ONE-WAY ANOVA was used to compare Team Scale items by age, three items showed statistical difference. The youngest participants were less inclined to challenge the leader, were less confident in the ability of all members to contribute to the group's discussion, and were more inclined to depend upon the leader for group direction. These analyses of variance are reported in Table 3.

Table 3.
Analysis of Variance of Team Scale by Age

	Mean Score by Age[1]				
Scale Item	Youth	Young Adult	Adult	F	Prob
	N=36	N=49	N=37		
Item 10 Member freedom to challenge leader	3.33	3.98[a]	3.65[a]	4.85	.0095
Item 14 Members as potential contributors	4.36	4.80[b]	4.60[b]	4.96	.0086
Item 16 Decrease dependence on Leader	3.06	3.55[c]	3.81[c]	6.24	.0026

Note. [1]Means having letter designations in common are not significantly different at the .05 level using the Scheffe' post hoc analysis method. 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

A t-test revealed no difference when Team Control cumulative scores were compared by gender. Mean scores for all Team Control items for all groups and the *Combined Samples* item mean score are reported in Table 4.

Table 4.
Mean Scores for Team Scale Items by Group

Item	*Combined Samples*	*TOTAL*	*AGED 340*	*TALL*	*AGED 340H*
Members Contribute	4.53	4.63	4.58	4.50	4.32
Group Goals	3.82	3.79	3.92	3.73	3.88
Members Can Lead	3.44	3.61	3.33	3.23	3.52
Group Has Authority	3.42	3.56	3.42	3.20	3.44
Members Can Challenge	3.69	3.35	4.00	3.70	3.96
No Status Differences	3.91	3.77	3.96	4.20	3.76
Members Are Contributors	4.61	4.42	4.75	4.57	4.84
Decrease Leader Dependence	3.46	3.14	3.58	3.77	3.52
Leaders Should Not Have Power	2.76	2.88	2.71	2.73	2.64
Members Desire Freedom	3.92	3.86	4.08	3.87	3.92

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

A ONE-WAY ANOVA with a post hoc Scheffe' test was used to compute the comparisons among groups on the Leader Control Scale cumulative mean score. A significant difference was found between the *AGED 340* Leadership Lab and the *AGED 340H* Leadership Lab. The mean score range for this comparison had a low response of 26.52 (*AGED 340H*) and a high response of 31.08 (*AGED 340*), indicating participants in *AGED 340* were more positive in their pre-training attitude toward Leader control of the group than were participants in *AGED 340H*. The results are reported in Table 5.

Table 5.
Analysis of Variance of Leader Scale Cumulative Score by Group

	Mean Score by Group					
Scale	*TOTAL* N=43	*AGED 340* N=24	*TALL* N=30	*AGED 340H* N=25	F	Prob
Leader	29.65[bc]	31.08[b]	28.07[bc]	26.52[c]	4.16	.0077

Note. [1]Means having letter designations in common are not significantly different at the .05 level using the Scheffe' post hoc analysis method. 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

Additionally, a t-test to compare Leader Scale cumulative mean scores by gender revealed no statistical significance.

The ANOVA procedure for Leader Control items by group revealed differences among groups on item 13. *TALL* and *AGED 340H* participants were more positive in their attitude that most people are informed enough to contribute to a group discussion. Results are reported in Table 6.

Table 6.
Analysis of Variance of Leader Scale Item 13 by Group

	Mean Score by Item[1]					
Scale Item	*TOTAL* N=43	*AGED 340* N=24	*TALL* N=30	*AGED 340H* N=25	F	Prob
Item 13 Most people are too uninformed to contribute	2.60[a]	2.50[a]	1.83[b]	1.84[b]	4.79	.0035

Note. [1]Means having letter designations in common are not significantly different at the .05 level using the Scheffe' post hoc analysis method. 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

Significant differences were found when Leader Control items were compared on demographic categories with the ONE-WAY ANOVA procedure and a post hoc Scheffe' test. Participants in "Other" were not included in the comparisons due to the small cell size. Leader Scale items by ethnicity revealed Hispanic and Black mean scores to be significantly different from White on one item, indicating Hispanic participants and Black participants were more positive in their attitude toward the leader having higher status than members of the group. An additional item revealed significant differences among

ethnic groups regarding an individual's ability to contribute to a group discussion, with Black participants having the least positive attitude. Results are reported in Table 7.

Table 7.
Analysis of Variance of Leader Scale Items by Ethnicity

	Mean Score by Ethnicity[1]					
Scale Item	Hispanic	Black	White	Other	F	Prob
	N=12	N=7	N=99	N=4		
Item 12 Leader should have higher status	2.58[a]	3.86	2.19[a]	*	6.79	.0003
Item 13 Most people are too uninformed to contribute	2.67[b]	3.43	2.12[b]	*	4.18	.0075

Note. [1]Means having letter designations in common are not significantly different at the .05 level using the Scheffe' post hoc analysis method. 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.
*N too few for valid comparison.

An additional difference was discovered when Leader Control items were compared by age. Adults were more positive in their attitude that most people are informed enough to contribute to a group discussion. Results are reported in Table 8. Mean scores for all Leader Scale items for all groups and a sample item mean score are reported in Table 9.

Table 8.
Analysis of Variance of Leader Scale Item 13 by Age

	Mean Score by Age[1]				
Scale Item	Youth	Young Adult	Adult	F	Prob
	N=36	N=49	N=37		
Item 13 Most people are too uninformed to contribute	2.64	2.16[a]	1.95[a]	3.89	.0231

Note. [1]Means having letter designations in common are not significantly different at the .05 level using the Scheffe' post hoc analysis method. 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

Table 9.
Mean Scores for Leader Scale Items by Group

Item	*Combined Samples*	*TOTAL*	*AGED 340*	*TALL*	*AGED 340H*
Leader Has Wisdom	3.01	3.26	3.04	2.83	2.76
Leader Makes Goals	2.60	2.44	2.75	2.53	2.80
Single Leader Best	2.76	2.63	3.13	2.87	2.52
Leader Has Authority	4.03	3.88	4.25	4.23	3.84
Leaders Are Not Challenged	2.59	2.77	2.63	2.40	2.48
Leader Has Status	2.30	2.37	2.67	2.03	2.16
Members Uninformed	2.24	2.61	2.50	1.83	1.84
Members Depend On Leader	3.20	3.30	3.29	3.23	2.88
Leaders Need Power	3.42	3.51	3.83	3.20	3.12
Members Want Direction	2.75	2.88	3.00	2.90	2.12

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

Conclusions

The conclusions for this study are based on the findings related to the purposes of the study and the established theoretical base. The researchers recognize that there are some limitations due to the relatively low reliability of the instrument. However, as the baseline study to begin to understand what attitudes people have about leadership, the conclusions have potential merit. Lundin and Lancaster (1990) stated that the success of great leaders depended partly on their ability to establish a base of loyal, knowledgeable followers. Supporting their conclusions, our study revealed that those who participate in leadership training, before any training occurs, were positive in their attitudes toward group participation and group responsibility. These members have the potential to be loyal, knowledgeable followers, in a group where the leader recognizes the importance of group participation. This conclusion is critical to leader success based on Terry's (1993) contention that leadership is evolving to a group-centered system.

Schwarz (1994) stated that a key to more effective groups was the identification and adherence to guidelines for performance. The current study revealed that prior to training, some participants have different guidelines for group performance than other participants. It was found that some participants expected the leader of a group to establish goals, guidelines, and expectations for the group, while others expected the group to establish goals. Also, some participants, prior to training, indicated that their attitude toward leadership was influenced by the status and authority of the leader in the group, while others were not influenced by the status and authority of the leader. Finally, attempts to interpret leadership from a narrow perspective has led to extensive generalizations about what constitutes leadership. Schein (1992) believed that those inaccuracies should be confronted. Although the results of this study should not be generalized to the general population, the findings could suggest areas for additional research.

Statistical analysis of the participant surveys administered prior to leadership training revealed no significant differences among distinct groups regarding their attitude toward the construct team (follower) control of group process. When Team Scale data were analyzed by the variables gender and ethnicity, no differences were statistical. When Team Scale items were compared by age, it was revealed that the youngest participants were significantly less inclined to challenge the leader; youth were significantly less confident in the ability of all members to contribute to group discussions; and, youth were significantly more inclined to depend on the leader for group direction than either young adults or adults. Therefore, leadership educators should be aware that those who register for leadership training generally have the same leadership attitudes regardless of their gender or ethnicity. However, it was noted that younger participants retained some attitudes that leaders have more power than they (the youth).

When leader control data were analyzed, statistical differences were revealed among the distinct groups. *AGED 340* participants were more favorable in their attitude toward the leader controlling the group process than the subgroups. When Leader Scale items were

compared by distinct groups, it was revealed participants from *TALL* and *AGED 340H* were more inclined than the *TOTAL* and *AGED 340* participants to have the attitude that most people are well enough informed to contribute to the group process.

Recommendations

1. Because, in general, participants had favorable attitudes toward team or follower control of a group, in leadership education classes, time should be spent assisting participants in developing team leadership skills that support their attitudes. Several researchers, including Terry (1993), indicated team leadership as the emerging leadership paradigm.

2. The study should be replicated with further revision of the instrument. The assessment of participants' attitudes toward leadership is essential to successful educational preparation of leaders.

3. The relationship between gender/ ethnicity and leadership attitude should be further investigated. Are there differences in leadership attitudes in diverse and single characteristic education groups?

4. This study should be replicated with non-volunteers studying leadership to examine their attitudes toward leadership.

5. The effects of training on attitude should be investigated. Is there an effect on leadership attitudes after training programs? Do different methodologies effect attitudes?

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THE LEADERSHIP ATTITUDES OF INDIVIDUALS ENROLLED IN LEADERSHIP DEVELOPMENT LABS

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The authors are commended for their preliminary inquiry into an area that has long been included as a component of 4-H, the FFA, and other youth and adult programs in agricultural and extension education. Historically, leadership has been included because of traditions, tenets, and practices that have not been subjected to rigorous research. The authors' attempt to add to our limited research base is needed because courses and various types of curricula are increasingly being added to instructional programs on all levels.

Their paper begins with a theoretical framework based primarily on books and related works. Although this section is labeled a theoretical framework, their reference list contains few studies that have tested the many suppositions and beliefs that appear in the leadership literature. Collectively, the works provide a good rationale for an exploratory study, but a comprehensive synthesis of related research is needed to gain insight about variables that impact attitude toward leadership. To elevate their inquiry, the authors should perhaps look to political science, sociology, and other disciplines that encompass various dimensions of leadership. Such an examination would perhaps identify research about how variables such as ethnicity, gender, and age relate to leadership attitudes. As one reads this study, a question should arise about the existence of theories of leadership that can be used to formulate hypotheses.

Most of their procedures are sound. Demographic variables (age, gender, and ethnicity) were studied to determine relationships to the dependent variables. An instrument (Carter, 1980) was modified to collect their data. The 20 items measured constructs using Likert type scaling. However, the reader might question why reliability coefficients are computed yet means for individual items on the Team and the Leader Scales are presented in Tables 4 and 9. Further, the authors acknowledge that the instrument did not have high reliability regarding two constructs (i.e. leadership involving teams and leaders). Because of low reliability coefficients (most in the .60 range), the reader should interpret their findings with a caution that measurement error limits the internal validity of their findings.

The authors present their findings in a manner that one expects for a study of this nature. Descriptive data provide an idea of the types of subjects included in their study. Although ANOVAs were followed-up with post hoc procedures, the reader must perhaps question why inferential statistics were used with a purposive sample. If the purpose of the study was to measure attitudes of individuals in leadership labs, descriptive statistics should be sufficient. Yet, the authors used went beyond description to infer differences across the groups included in the study. Also, their conclusions tended to go beyond the stated purpose. Alternative analysis procedures could have included correlation coefficients to describe relationships between and among variables.

Their recommendations are germane regardless of the limitations and weaknesses of the study. Recommendations for practice focus on questions needing more insight. Answers to questions they pose will result in leadership oriented courses and programs that focus on identified needs rather than those based on tradition, hunches, and whims of instructors. In total, the authors are to be commended for adding to a limited knowledge base regarding the leadership dimension in agricultural and extension education. One hopes the authors will continue this inquiry and identify the levels of knowledge that students have about leadership and how that knowledge impacts their attitude and leadership behavior.

Factors Influencing Enrollment in Agricultural Education Programs as Expressed by Iowa Secondary Agricultural Education Students

Randal Edward Reis*   Alan A. Kahler*

Perhaps no other discipline has experienced the dilemma that agricultural education at the secondary level has over the years. Seemingly, the dilemma is one of misconception based on the belief that agricultural education programs are designed to train students only for production agriculture. The notions that students with limited academic abilities can succeed in an agricultural occupation, and that agricultural education is for someone else's child, are two frequently stated misconceptions about agricultural education (Warmbrod, 1968; Smoker, 1974).

According to The National Research Council (1988), agricultural education has a long history in American education. Based on the beliefs of students enrolled in the program, agricultural education remains one of the most widely praised secondary programs in the country. Most programs consist of three parts: classroom and laboratory instruction, supervised occupational experiences, and the FFA. Students and teachers spend considerable time in and outside school following the curriculum and working on projects.

When federally supported agricultural education was created in 1917, about one-third of the U.S. population lived on farms. Farm businesses dominated rural life and sustained rural communities. Today, the U.S. farm population is about 2.2 percent of the overall population. Technological evolution over the last half century has transformed the nature and vastly broadened the range of agricultural occupations and professional careers. U.S. industries that serve agriculture by producing, processing, marketing, and preparing food and fiber products for consumers account for about $700 billion in economic activity each year. This is about 16.5 percent of the gross national product (U.S. Department of Agriculture and Commerce, 1986; U.S. Department of Commerce Bureau of the Census, 1988).

Agriculture, broadly defined, is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing studies in agriculture. Students should come to appreciate that the plants and animals providing our food and fiber are part of a vast web of life that functions as an integrated whole. Every species of plant and animal depends not only on its physical environment, but on the biological component of the environment as well. All living creatures are part of the same cycles of matter and energy. Education will be incomplete unless students learn what is essential for the lives of our crops, animals, and plants (Moore, 1987).

Most Americans know very little about agriculture, its social and economic significance in the United States, and particularly its links to human health and environmental quality. Few systematic educational efforts are being made to teach or otherwise develop agricultural literacy in students of any age. Although children are taught something about agriculture, the material tends to be fragmented, frequently outdated, usually only farm oriented, and often negative or condescending in tone (National Research Council, 1988).

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In a 1988 national survey conducted by Communicating for Agriculture, FFA state advisors and executive secretaries reported that student enrollment in agricultural education had decreased significantly. Eighty-eight percent of the respondents reported a decrease in enrollment, 11 percent reported no change in enrollment, while none reported an increase in enrollment. Declining enrollment is a major concern for agricultural education programs all across the country.

There are many possible reasons for the decline in vocational agriculture enrollment. Population trends have shown a decline in the number of high school-aged students. Increased high school graduation requirements have put pressure on students to ensure that they are adequately prepared to graduate. College entrance requirements have changed, making students hesitant to take vocational courses. Lam (1982) identified interpersonal reasons, school factors, significant others, socioeconomic and home factors as barriers that influenced students not to enroll in further educational pursuits. Kotrlik (1987) found that parents were the dominant influence on a students decision whether to enroll in agriculture classes when attending high school. Herr (1987) found that students will seek the advice of a teacher, parents, friends, counselors and others before enrolling in agriculture classes. In a Michigan study (1989), 45 percent of the nonFFA members responded that they enrolled in agricultural education because they were interested in agriculture, they needed a science credit, and they thought it would be an easy class or they were forced to enroll.

In order to improve recruitment, agricultural educators need to understand what motivates students to enroll in an agricultural education class. We need to understand why students are or are not participating in agricultural education classes today. With this knowledge, they can better understand how to improve the program and improve enrollment, and serve more students.

Purpose and Objectives

The purpose of this study was to analyze the factors that led students to enroll and participate in secondary agricultural education programs in Iowa. Specific research questions were as follows:

Who influences students to enroll in secondary agriculture courses?

What personal and organizational influences stimulate students to enroll in secondary agriculture classes?

Are students satisfied with their agricultural education programs?

Procedures

The data for this study was collected by means of a questionnaire. A list of people and factors that influence students to enroll in an agricultural education program at the secondary level was complied based on the results of other relevant studies (Birkenholz, 1986; Eaddy, 1986; Herring, Marshall, and Briers, 1989; Rossetti, Elliot, Price, and McClay, 1989; Martin, 1985), the experience of the researcher, and the experience of members of the faculty in the Department of Agricultural Education and Studies at Iowa State University.

The questionnaire consisted of 13 demographic questions about the background of the respondents (Part I), 27 statements assessing the degree of influence each person or factor had on the respondent's decision to enroll in agriculture classes (Part II), and nine

statements assessing the degree of satisfaction the respondents had with different phases of the agriculture program (Part III). The cover page of the questionnaire contained a letter to the instructor along with instructions for students when filling out the questionnaire.

Using a Likert-type scale respondents were asked to rate each item on Part II of the questionnaire from 1 to 5 where 1 represented no influence and 5 represented very much influence. For Part III of the questionnaire respondents were asked to rate the items on a scale of 1 to 4 where one represented very dissatisfied and 4 represented very satisfied. A descriptor of "no opinion" was not used in the scale.

The questionnaire was administered to twenty secondary students not participating in the study to assess the reliability of the parts of the instrument.

To provide information that would satisfy the objectives of the study, a random sample of 66 of 259 Iowa high schools conducting agricultural education programs were selected to participate in the study. The questionnaires were mailed to the agriculture instructors at the 66 selected schools. Each instructor was directed to administer the questionnaires to all students in their agriculture classes (grades 9-12). Student responses were received from fifty-five schools. The instructors in the remaining 11 schools were contacted by letter and telephone encouraging them to administer the questionnaires to their students and return them to the researcher. The 55 responding schools provided 1429 student responses that were used in this study.

The students responses were analyzed using frequencies, percentages, means, standard deviations, t-tests and analysis of variance. The alpha level of .05 was used to determine significant differences between or among mean scores.

Findings

Of the respondents, 28.3 percent were in the 9th grade, 27.4 percent were in the 10th grade, 23.5 percent were in the eleventh grade, and 20.8 percent were in the 12th grade. Eighty-six percent were males and 14 percent were females. Fifty-eight percent lived on the farm, whereas 42 percent lived in small towns or urban areas. Forty-four percent planned to work in an agricultural occupation after high school graduatation, whereas 52 percent planned to work in nonagricultural occupations.

Based on the mean scores presented in Table 1, the people who most influenced the respondents to enroll in agricultural education were parents, the agriculture instructor, a friend, and a former agricultural education student. The people who least influenced the respondents were the county extension director, another teacher, the 4-H leader and the high school counselor.

The personal and organizational factors which most influenced the respondents to enroll in agricultural education while attending high school were "personal interests," "personal desires," "possession of a farm background," and "the fun of participating in an interesting agriculture course." Those personal and organizational factors with least influence were "4-H activities," "pre-high school recruitment program," "farm organizations," and "interest in agriculture as a major in college." These observations were made based on data presented in Table 2.

Table 1. Means and standard deviations by persons influencing enrollment in agriculture (N=1429)

Person	Mean[a]	Standard deviation
Former agriculture student	2.75	1.34
Student outside of agriculture	2.00	1.20
A friend	2.87	1.37
Student enrolled in agriculture	2.89	1.33
Fellow student	2.70	1.33
Agriculture instructor	2.93	1.45
High school counselor	1.78	1.14
Another teacher	1.64	1.04
Pastor	1.41	0.91
County extension director	1.59	1.08
Parents	2.95	1.46
Brother or sister	2.17	1.45
Relative	2.18	1.38
Neighbor	1.79	1.20
4-H leader	1.71	1.20
People associated with agricultural businesses	2.22	1.35

[a]A five point scale using the following descriptors was used to determine the mean. 5=very much influence; 4=much influence; 3=some influence; 2=little influence, and 1=no influence.

Table 2. Student means and standard deviations by personal and organizational influences on enrollment in agriculture (N=1429)

Personal or organizational influence	Mean[a]	Standard deviation
4-H activities	1.91	1.34
Reputation of FFA chapter	2.58	1.40
Farm organization	2.16	1.39
Past agricultural experience	2.96	1.52
Personal desires	3.57	1.41
Occupational opportunities	2.98	1.45
Farm background	3.17	1.51
Interest in agriculture as a major in college	2.41	1.47
Fun of participating in an interesting agriculture course	3.14	1.38
Personal interests	3.59	1.35
Pre-high school recruitment program	1.98	1.24

[a]The following five point scale was used to determine the mean. 5=very much influence, 4=much influence; 3=some influence; 2=little influence, 1=no influence.

Based on data presented in Table 3, the phase of the agricultural education program that the respondents were most satisfied with was "FFA activities," "activities associated with their course work in agriculture," "contest activities," and "the supervised

Table 3. Student satisfaction means and standard deviations with phases of the agriculture program (N=1429)

Program phase	Mean[a]	Standard deviation
Agriculture course work	3.15	.71
Activities in agriculture	3.21	.74
Supvervised occupational experience program	3.17	.74
Leadership activities	3.11	.82
Contest activities	3.18	.81
FFA activities	3.29	.79
Agriculture mechanics course work	2.95	.86
Classroom facilities	2.95	.86
Shop facilities	3.06	.90

[a]The following four point scale was used to determine the mean. 4=Very satisfied, 3= Satisfied; 2=dissatisfied; 1=very dissatisfied.

occupational experience program." Phases that the respondents were least satisfied with were "classroom facilities," "agricultural mechanics coursework," "shop facilities," and "leadership activities.

Comparison of the people, personal and organizational influence mean scores grouped by grade level and Iowa Vocational Agriculture Teachers District revealed no significant differences among group means. A similar observation was made when mean scores were compared for satisfaction with phases of the agriculture program for both of these variables.

When the people, personal and organizational influences and satisfaction means were grouped by level of academic achievement, significant higher mean scores were observed for those respondents with higher levels of academic achievement for a large number of the influences studied. These observations were based on data presented in Table 4.

Table 4. People, personal and organizational influence group means, standard deviations, F-values and F-probabilities by academic achievement.

Person, personal or organizational influence		Academic achievement A	B	C	D	F- Total	F- Value	prob.
		N= 181	N= 622	N= 572	N= 54	N= 1429		
Person Influence								
Former agriculture student	M[a]	2.92	2.72	2.76	2.48	2.75	1.76	.15
	SD[b]	1.34	1.31	11.35	1.55	1.34		
Student outside of agriculture		1.83	1.95	2.10	2.13	2.00	3.12	.03
		1.15	1.15	1.26	1.33	1.20		
Friend		2.88	2.87	2.92	2.24	2.87	4.13	.006
		1.36	1.35	1.38	1.29	1.37		
Student enrolled in agriculture		2.11	2.90	2.86	2.31	2.89	4.86	.002
		1.38	1.32	1.41	1.36	1.37		
Fellow student		2.78	2.69	2.70	2.43	2.70	.99	.40
		1.34	1.31	1.35	1.27	1.33		

Table 4 continued.

Person, personal or organizational influence	Academic achievement A	B	C	D	Total	F-value	F-value
	N= 181	N= 622	N= 572	N= 54	N= 1492		
Agriculture instructor	3.15	3.01	2.85	2.17	2.93	7.65	.000
	1.48	1.40	1.47	1.36	1.45		
High school counselor	1.72	1.68	1.91	1.76	1.78	4.64	.003
	1.13	1.05	1.23	1.15	1.14		
Teacher outside of vocational	1.72	1.54	1.72	1.63	1.64	3.50	.02
agriculture	1.19	.92	1.11	1.03	1.04		
Personal and Organizational Influence							
4-H activities	2.14	1.95	1.81	1.85	1.91	2.97	.03
	2.49	1.36	1.27	1.29	1.34		
Reputation of the FFA chapter	2.77	2.59	2.53	2.17	2.57	2.92	.03
	1.46	1.37	1.42	1.41	1.40		
Farm organization	2.03	2.16	2.15	2.52	2.16	1.71	.16
	1.39	1.34	1.41	1.5			
Past agriculture experience	3.34	3.08	2.78	2.33	2.96	11.12	.000
	1.59	1.48	1.51	1.43	1.52		
Personal desires	3.90	3.64	3.45	2.96	3.57	8.53	.000
	1.35	1.37	1.44	1.60	1.41		
Occupational opportunities	3.23	3.11	2.81	2.35	2.98	9.72	.000
	1.45	1.40	1.46	1.47	1.45		
Farm background	3.51	3.26	3.02	2.67	3.17	7.64	.000
	1.54	1.47	1.51	1.57	1.51		
Interest in agriculture as a major in	2.76	2.56	2.20	1.80	2.41	13.20	.000
college	1.64	1.50	1.36	1.26	1.47		
Fun of participating in interesting	3.36	3.22	3.02	2.63	3.14	6.24	.000
agriculture course	1.38	1.32	1.39	1.58	1.38		
Personal interests	3.85	3.64	3.50	2.94	3.59	7.57	.000
	1.24	1.29	1.41	1.60	1.35		
Pre-high school recruitment	2.02	2.00	1.96	1.91	1.98	.23	.87
program	1.33	1.21	1.24	1.28	1.24		

[a]M=The following scale was used to determine the mean score. 5=very much influence; 4= much influence; 3=some influence; 2=little influence; and 1= no influence.
[b]SD=Standard deviation

Residence of the respondents had little or no effect on how the respondents rated the influence of people on their decision to enroll in agricultural education. Significant differences were observed among means for 9 to eleven personal and organizational influences when grouped by residence. In each comparison, the means for the respondents who lived on a farm had higher mean scores than did those who lived in small towns or urban areas. These observations were made based on data presented in Table 6.

When the influences and satisfaction mean scores were grouped by gender, few significant differences were observed. For the personal and organizational influences and satisfaction with program areas were compared by gender, female mean scores tended to be higher than those for males. These observations are based on data presented in Tables 7 and 8.

Table 5. Means, standard deviations, F-values and F-probabilities for satisfaction with phase of the vocational agriculture program by academic achievement.

Program phase		Academic achievement A	B	C	D	Total	F-value	F-prob.
		N= 181	N= 622	N= 572	N= 54	N= 1429		
Agriculture coursework	M[a]	3.25	3.16	3.13	2.93	3.15	3.31	.02
	SD[b]	.75	.66	.75	.87	.71		
Activities involved with agriculture		3.34	3.25	3.17	2.87	3.21	6.72	.000
		.68	.68	.79	.89	.74		
Leadership activities		3.30	3.19	3.02	2.67	3.11	13.32	.000
		.76	.75	.85	1.03	.82		
Contest activities		3.31	3.25	3.10	2.70	3.17	11.17	.000
		.82	.75	.83	1.00	.81		
FFA activities		3.41	3.35	3.23	2.91	3.29	8.07	.000
		.76	.71	.84	.94	.79		
Supervised occupational experience program		3.29	3.20	3.12	2.96	3.17	4.09	.01
		.70	.71	.77	.89	.74		
Agricultural Mechanics course work		2.94	3.01	2.98	2.93	2.99	.38	.77
		.86	.85	.88	.93	.87		
Classroom facilities		3.06	2.97	2.93	2.63	2.95	3.61	.01
		.83	.80	.90	1.03	.86		

[a]The following four point scale was used to determine the mean. 4=Very satisfied; 3=Satisfied; 2=Dissatisfied; 1=Very dissatisfied.

[b]SD=Standard deviation.

Conclusions/Recommendations

Conclusions

It was observed that the most often cited personal and organizational influence that influenced students to enroll in agricultural education were personal interests followed by personal desires and farm background. This is very interesting because many other studies have not studied personal desires and personal interests in their research. Findlay (1982) found that an ambition to pursue a professional career was the primary factor that influenced black students to enroll in vocational agriculture. In this study, occupational opportunities were not ranked high. Farm background probably ranked high because a majority of the respondents grew up on farms. One could hypothesize that many students are participating in agricultural education programs, because of interest or curiosity in certain areas of agriculture, and not just for preparation for a certain occupation or agricultural discipline such as farming.

It was observed that the person with the greatest influence on students' participation in agricultural education was their parents followed by the agriculture instructor and former agricultural education students. This finding is similar to findings reported by Herring and Kotrlik in their studies of barriers to student enrollment in secondary agriculture programs.

Table 6. Personal and organizational group means, standard deviations, F-values and F-probabilities by respondent residence.

Personal and organization influence		Residence						
			Rural Farm	Small acre-	Urban town	Total	F-value	F-prob.
		N= 833	N= 164	N= 404	N= 28	N= 1429		
4-H activities	M[a]	2.05	1.77	1.71	1.82	1.91	6.68	.000
	SD[b]	1.39	1.24	1.25	1.22	1.34		
Reputation of the FFA chapter		2.68	2.54	2.37	2.46	2.57	4.55	.004
		1.41	1.37	1.39	1.26	1.40		
Farm organization		2.31	1.95	1.96	2.57	2.16	9.16	.000
		1.42	1.34	1.33	.92	1.39		
Past agricultural experience		3.29	2.59	2.49	2.29	2.96	33.38	.000
		1.45	1.54	1.47	1.61	1.52		
Personal desires		3.73	3.45	3.28	3.57	3.57	9.75	.000
		1.33	1.54	1.47	1.35	1.41		
Occupational opportunities		3.13	2.94	2.69	2.93	2.98	8.50	.000
		1.40	1.51	1.47	1.49	1.45		
Farm background		3.72	2.68	2.35	1.79	3.17	11.02	.000
		1.29	1.44	1.47	1.13	1.51		
Interest in agriculture as a major in college		2.65	2.13	2.05	2.39	2.41	17.56	.000
		1.50	1.38	1.34	1.61	1.47		
Fun of participating in interesting agriculture course work		3.20	3.01	3.05	3.14	3.14	1.60	.19
		1.34	1.43	1.42	1.56	1.38		
Personal interest		3.72	3.45	3.36	3.71	3.59	7.07	.000
		1.28	1.42	1.45	1.38	1.35		
Pre-high school recruitment program		2.04	1.91	1.90	1.93	1.98	1.41	.24
		1.23	1.24	1.26	1.18	1.24		

[a]M=Mean

[b]SD=Standard Deviation

Respondents were most satisfied with "FFA activities", "activities conducted as a part of the agricultural education program," and "contest activities." They were least satisfied with the facilities in which the program was conducted and agricultural mechanics course work.

Recommendations

Agricultural education instructors throughout the state of Iowa should establish and maintain an active recruitment program for their programs. This program should have two main purposes; namely, recruiting students to enroll in the agricultural education program and providing information to potential students, parents, school administrators and the public about the program.

The mechanics phase of the agricultural education program should be carefully analyzed to find out why students were most dissatisfied with it and steps taken to reorganize and update this phase of the program. Historically, this phase of the program has been one of the main attractions of the agricultural education program leading students to enroll in the program.

Table 7. Personal and organizational influence group means, standard deviations, t-values and t-probabilities by gender of respondents.

Personal and organizational influences		Gender Males	Females	t-value	t-prob.
		N= 1223	N= 206		
4-H activities	M[a]	1.89	2.07	-1.65	.10
	SD[b]	1.32	1.48		
Reputation of FFA chapter		2.53	2.82	-2.73	.006
		1.40	1.39		
Farm organization		2.19	1.97	2.13	.03
		1.39	1.37		
Past agricultural experience		3.01	2.67	3.05	.002
		1.50	1.60		
Personal desires		3.54	3.74	-1.82	.069
		1.42	1.33		
Occupational opportunities		3.00	2.84	1.47	.141
		1.44	1.47		
Farm background		3.26	2.66	5.34	.000
		1.49	1.54		
Interest in agriculture as a major in college		2.44	2.26	1.60	.109
		1.47	1.47		
Fun of participating in interesting agriculture course		3.09	3.41	-3.06	.002
		1.38	1.33		
Personal interests		3.56	3.73	-1.63	.104
		1.36	1.30		
Pre-high school recruitment program		1.97	2.06	- .93	.353
		1.23	1.31		

[a]M=Mean

[b]SD=Standard deviation

It is highly recommended that the counselors in schools that are conducting agricultural education programs be made aware of those factors that influence students to enroll in agricultural education programs. In particular, counselors should be made aware of the low level of influence they have on students as they consider enrolling in agriculture classes and plan their studies while they attend high school. The agriculture teacher should work with his or her counselor to develop a thorough understanding of the program. In doing so, the counselor can do a better job counseling prospective students about the agriculture program and encouraging all students to consider enrolling in agriculture classes.

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Table 8. Respondent means, standard deviations, t-values and t-probabilities for satisfaction with phases of the vocational agriculture program by gender of the respondents.

Program phases		Gender: Males	Gender: Females	t-value	t-prob.
		N= 1223	N= 206		
Vocational course work	M[a]	3.14	3.20	-1.32	.187
	SD[b]	.73	.64		
Activities involved with agriculture		3.19	3.34	-2.94	.000
		.75	.65		
Supervised occupational experience program		3.16	3.28	-2.35	.02
		.75	.67		
Leadership activities		3.08	3.34	-4.23	.000
		.82	.74		
FFA activities		3.26	3.50	-4.78	.000
		.80	.68		
Agriculture mechanics course work		3.00	2.92	1.47	.143
		.90	.63		
Classroom facilities		2.93	3.10	-2.92	.004
		.88	.74		
Shop facilities		3.07	3.01	.97	.334
		.92	.72		
Contest activities		3.14	3.41	-4.98	.000
		.82	.70		

[a]M=Mean; [b]SD=Standard deviation

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FACTORS INFLUENCING ENROLLMENT IN AGRICULTURAL EDUCATION PROGRAMS AS EXPRESSED BY IOWA SECONDARY AGRICULTURAL TEACHERS
A Critique

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The authors of this paper attempt to address an important issue for the agricultural education profession. The downward shift in enrollments in our programs over the past decade is indicative of a problem in our programs. The better we understand our students, the more likely we will come to grip with the problem. I commend the authors for addressing this very important issue.

The paper provides an adequate discussion of the historical evolution of the decrease in enrollment. Further, it cites appropriate literature which identifies why agricultural education should be an important part of the public school curriculum. The authors have clearly identified the need to research the topic of "who" and "what" influences students to enroll in agriculture. However, they fall short of providing an adequate theoretical basis for "how" to measure this influence. I wonder about respondents' ability to clearly differentiate between "former AG student" and "student outside of agriculture", or "fellow student", or "neighbor". Are these response categories mutually exclusive... and if not, what can be learned by analyzing the difference between their relative ratings? The interpretation of the mean scores in Table 1 may be somewhat misleading. Although the arithmetical means are able to be ranked relatively, perhaps the most important finding reflected in Table 1 is that, in reality, <u>nobody</u> appears to have much influence upon a student's decision to enroll in agriculture, if the construct has been adequately measured. Even parents (with the highest mean rating) rank somewhere between "some influence" and "little influence".

The same could be said for trying to differentiate between "personal desires" and "personal interests". However, Table 2 does offer some interesting food for thought regarding the reasons students enroll in agricultural classes. First, it may be concluded that students' decisions to enroll in agricultural classes are mostly "personal". However, "having a farm background" and a perception that it is "fun to participate in an AG course" are also strong influences. Although we cannot control students' "personal interests" or "farming backgrounds", we do have some control over whether our programs are perceived to be "fun". Perhaps we should pay more attention to this finding as we recruit.

Although significant differences exist between students of different academic ability, I do not see the relevance of the analyses reported in Tables 4 and 5. One would expect that satisfaction would be positively related with performance. However, knowledge of this fact offers little to those wishing to increase enrollments. A much more interesting analysis would be the relationships between "personal and organizational influences" and "satisfaction". Does the importance of a farm background as an influence to enroll in agricultural classes positively relate to satisfaction with the various phases of the program? Do those who consider "fun of participating in an... AG course" a strong influencing factor find the phases of the program more satisfactory than those who don't? Finally, I found it extremely interesting that even though females were significantly more satisfied with most phases of vocational AG programs than males (excluding Ag mechanics), male enrollment seems to outweigh female enrollment nearly six-to-one.

EVALUATING THE PHYSICAL ACCESSIBILITY OF INDIANA HIGH SCHOOL AGRICULTURAL EDUCATION FACILITIES

Adrienne J. Ploss Martin J. Frick*

Introduction/Theoretical Framework

Public school systems throughout the United States must evaluate the accessibility of their programs and facilities for students with disabilities in order to determine their compliance level with Title II of the ADA (Morrissey, 1993; United States Department of Justice [USDJ] [Title II], 1992). The ADA prohibits discrimination in employment, public services, public accommodations, and communications by a public entity on the basis of an individual's disability (Morrissey, 1993; USDJ [Title II], 1992). High school agricultural education programs qualify under Title II because they are state funded.

The ADA has implications for furnishing high school agricultural education teachers with guidelines required to remove barriers that will make local high school agricultural education programs more accessible for all students (Delks & Sillery, 1993). Accessibility guidelines (United States Architectural and Transportation Barriers Compliance Board [USATBCB], 1992) under the ADA indicate where most "trouble spots" are within most facilities. On a practical level, this means that a number of students, who, in spirit, desire to enroll in agricultural education may be more inclined to do so once ADA Accessibility Guidelines have been complied with by a high school agricultural education program.

Approximately 49 million Americans have a disability (United States Census Bureau, 1993). In the 1992-1993 school year, 15% (144,400) of all students enrolled in Indiana public schools possessed a disability (Binder, 1993). The Indiana Commission on Vocational and Technical Education (1991) reported that students with a disability accounted for 8,200 individuals or 10.4% of all students enrolled in high school agricultural education and vocational technical programs (Binder, 1993). More than 14,000[1] high school students enrolled in Indiana high school agricultural education during

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the 1992-1993 school year (Stewart, 1993). It is possible 1,400 or 10% of these youth in the state's high school agricultural education programs could have a disability (Bice, 1980; Petrea, 1993).

For many rural communities, agriculture is still the mainstay of the local economy. In this context, the local school and the agricultural education program are seen as a centerpiece of the community (Hobbs, 1992; Nachtigal, 1992). Many barriers exist in rural communities due to lack of resources or agencies available to satisfy those needs (Helge, 1992; Jansen, 1988). Rural and farm families desire to have accessible agricultural education programs for their children with disabilities so that families can continue to utilize the program related to their occupation and way of life. Some students with a disability may not have enrolled in the high school agricultural education program due to limited accessibility of the program or the image of agricultural education being unwilling to accommodate these students (Collins & Mohr, 1985; Phipps & Osborne, 1988).

Purpose/Objectives

The major purpose of this study was to determine the existing physical barriers under Title II faced by students with physical disabilities in Indiana high school agricultural education programs. To accomplish the primary goal, the researchers conducted on-site assessments of 20 high school agricultural education facilities in Indiana to determine their compliance level with the ADA Accessibility Guidelines (USATBCB, 1992). The objectives of the study were as follows:

(1) To determine the building history of the agricultural facilities assessed;
(2) To assess the accessibility of the high school agricultural education facilities according to the ADA Accessibility Guidelines, including:
    (a) parking/walkways;
    (b) entrances to the agricultural education facility;
    (c) entrances to the agricultural education classroom;
    (d) laboratory facilities;
    (e) rest rooms.

Methods and/or Procedures

All 224 schools in Indiana with a high school agricultural education facility served as the population for this study. To satisfy grant requirements of the study, 20 schools were used in the on-site assessment process. Twelve schools were randomly selected and

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[1] Figure of 14,000 students could be duplicated; a student may have been enrolled in more than one agricultural education class.

stratified by state agricultural education districts to reduce researcher bias and represent each of the 12 agricultural education districts. The remaining eight schools volunteered or were solicited by the researcher, totaling 20 schools. Over 120 hours were spent on-site conducting the 20 assessments.

This descriptive study used the on-site assessment form administered by the researcher. The on-site assessment form for facility accessibility was adapted from three surveys used for evaluating the accessibility of existing public facilities (Adaptive Environments Center & Barrier Free Environments, 1992; National Rehabilitation Association, 1991; USATBCB, 1990). It consisted of five sections: (a) building history/general information; (b) parking/walkways; (c) entrances to the agricultural education facility; (d) entrances to the agricultural education classroom; (e) laboratory facilities, including the agricultural mechanics shop, greenhouse or outdoor learning areas such as testing plots; and (f) public rest rooms.

Two staff members from Breaking New Ground[2] (BNG) who conducted ADA assessments and a professor in agricultural education at Purdue University reviewed the on-site assessment form for content validity. One BNG staff member accompanied the researcher on a school visit to train her in conducting an ADA assessment. Reliability for the on-site assessment form was not determined because the form was investigating accessibility measurements.

Equipment used in the on-site assessments included a 32 foot tape measure, slope finder, and fish scale. Following the topical order of the assessment form, a building was surveyed first for availability of accessible parking; next, entrances into the agricultural education facility; then access to the agricultural education classroom and laboratory facility, including agricultural mechanics shop, greenhouse, or outdoor learning area, and public rest rooms was determined. Individual components were then addressed, including stairs, elevators, doors, signage (public notices), telephones, water fountains, and other building features. Building floor plans were not consulted for the on-site assessments.

Upon departure, general impressions of the assessment were discussed with the agricultural education teacher because draft reports were not written. Assessment findings were reported in frequencies and percentages.

[2] Breaking New Ground is an outreach program at Purdue University that provides technical assistance to agricultural workers who desire to continue farming or ranching with a disability.

Results and/or Findings

Findings from this study are presented in the same order they appeared in the on-site assessment form: (a) building history; (b) parking/walkways; (c) entrances to the agricultural education facility; (d) entrances to the agricultural education classroom; (e) laboratory facilities; and (f) rest rooms.

Building History

Not all schools in the on-site assessments housed their agricultural education facilities in the main school building. Of the 20 schools surveyed, four or 20% located their agricultural education department in buildings unattached to the main school. All agricultural education departments taught laboratory classes and held their local FFA chapter meetings in the same building occupied by agricultural education. The mean age of the agricultural education facilities was 24 years, with an age range of three months to 43 years.

Parking Accessibility

Although every school had accessible parking, only one (5%) school designated an accessible parking space near the agricultural education facility. Schools most often located their accessible parking near the gymnasium.

Entrances to the Agricultural Education Facility

Nearly 80% (16) of schools located accessible entrances at the schools' front entrance. A summary of exterior entrances is located in Table 1. Only one (5%) school provided directional signs indicating its accessible entrance, excluding the agricultural education facilities. Entrances to two agricultural education facilities were inaccessible due to steps leading to the entrances and the absence of ramps or curb cuts. In these two cases, a wheelchair user could access the agricultural education classroom and laboratory, but could not gain entry into the agricultural education building.

Table 1
Summary of Exterior Entrances

Accessibility Item	Frequency (n=20)	Percent Total
Directional signs indicate accessible entrance	1	0.05
Accessibility symbol used	1	0.05
Walkways have curb cuts	3	15.0
Primary entrance with ramp	17	85.0
Ramp with a slope ratio of 1:12 or less	9	45.0
Handrail on ramp	10	50.0
Ramp made or permanent construction	1	0.05

Entrances to the Agricultural Education Classroom

Every agricultural education facility had doors to the agricultural education classroom that measured at least 32" wide in clear opening, had a door pull of less than five pounds and a threshold no higher than one-half inch. Ten (50%) of the schools surveyed required access to more than one level within the building; either an elevator or wheelchair lift could be used in eight out of the ten schools to access another level. Four schools with their agricultural education facilities on sunken levels had interior ramps to the agricultural education department exceeding a slope ratio of 1:8 (1" of ramp height for every 8" of ramp length) equivalent to a slope of 12.5%. In all schools surveyed, furniture, such as desks and tables could be rearranged to make the agricultural education classroom more accessible. Table 2 provides a summary of interior circulation of agricultural education classrooms assessed in this study.

Table 2
Summary of Interior Circulation of Agricultural Education Classroom

Accessibility Item	Frequency (n=20)	Percent Total
Directional signs indicate accessible entrance	1	0.05
Steps between buildings	4	80.0
Sunken levels in facility	13	65.0
Sunken levels accessible	12	60.0
Steps to classroom	10	50.0
Classrooms at ground level or served by elevator	18	90.0
More than one floor	9	45.0
Interior ramps with slope ratio of 1:8 or less	7	35.0
Ramps permanently constructed	18	90.0
Handrail one side of ramp	8	40.0
Clear opening classroom doors is at least 32 in.	20	100.0
Door pull require more than 5 lbs. to open	20	100.0
Door threshold higher than 1/2 in.	0	0.0
Water fountain with spout 36" or less from floor	14	70.0
Building directory available	2	10.0
Protrusions in hallway	1	0.05
Rearrange furniture for improved accessibility	20	100.0

Laboratory Facilities

In all cases laboratory facilities were adjacent to the agricultural education classroom. An agricultural mechanics laboratory, test plots, work tables, and supply storage areas comprised laboratory facilities in 14 or 70% of the facilities. Six schools or 30% had a greenhouse. All agricultural education facilities provided work tables between 28 and 34 inches in height and accessible supply areas with shelves, books and equipment within an acceptable reach. Thirteen or 65% of the 20 schools had outdoor learning areas. Ten of 13 (77%) agricultural education facilities had accessible outdoor learning areas. However, a curb or pathway material hindered accessibility in three of ten instances.

Rest Rooms

Fifteen or 75% of the schools did not have accessible rest rooms adjacent to the agricultural education facilities. If there were accessible rest rooms, they were usually located near the school cafeteria often on the opposite side of the school in which the

agricultural education department was situated. Accessible rest rooms and drinking fountains were also most likely to be found near the school auditorium or gymnasium. Only one school designated its accessible rest rooms with signage (public notices). None of the accessible rest rooms in the agricultural education facilities had signage (public notices) indicating that the rest rooms were accessible.

Conclusions/Recommendations/Implications

A majority of the agricultural education facilities were accessible to students with physical disabilities, but there was a lack of signage (public notices) indicating accessible facilities. Areas of noncompliance with the ADA Accessibility Guidelines were most frequently found in the following areas: signage (public notices) for accessible entrances and areas, which included outdoor learning areas; the number of spaces designated for accessible parking; railings on exterior and interior ramps; accessible urinals; grab bars in accessible toilet stalls; and public telephones that are hearing-aid compatible. Accessible parking was most likely to be located near the gymnasium or auditorium.

Building modifications in the agricultural education facilities primarily focused on wheelchair access. Agricultural education teachers appeared to be resourceful in accommodating students with physical disabilities. This included developing creative solutions to ensure participation in the classroom and laboratory activities.

Teacher educators and state supervisors in every state visit hundreds of agricultural education programs each year. The results of this study can make local programs more conscious of considerations when attempting to comply with the ADA Accessibility Guidelines. It is recommended that teacher educators and state supervisors consider the results of this study when consulting with teachers and administrators on how to make existing facilities more accessible in accordance with Title II of the ADA. In addition, teacher educators and state supervisors could use the results of this study when consulting with teachers and administrators who are considering the construction of new agricultural education facilities.

Results of this study should also be considered as teacher educators instruct pre-service agricultural education students or instruct in-service current agricultural education teachers on topics related to facility management. Furthermore, follow-up on-site assessments should be conducted on the Indiana schools assessed to determine what modifications teachers and schools have made to enhance the accessibility of their facilities and comply with ADA Accessibility Guidelines. This would confirm if the initial assessments and suggestions by the researcher had an impact.

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EVALUATING THE PHYSICAL ACCESSIBILITY
OF INDIANA HIGH SCHOOL
AGRICULTURAL EDUCATION FACILITIES
A Critique

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This paper reports findings regarding the physical accessibility of Indiana high school agricultural education facilities as defined by Title II of the Americans With Disabilities Act. The authors have studied a total of 20 school programs in order to report these findings. Although their findings are not disputed, I would suggest that the "population" for this study was those 20 schools, and not the 224 identified in the paper. The relatively small sample and the non-random selection process makes it impossible to make any inference from these findings to the remaining 204 agricultural education facilities.

Although findings are interesting, they are not beyond what one may have predicted for buildings within their age range. As such, the findings from this study are perhaps of more importance at the individual school site than in the summary format provided in this paper. It is interesting to note however, that the majority of the facilities are accessible to students, and that teachers are "resourceful" in accommodating students with disabilities.

One can only agree with the authors that teacher educators and department of education staff members should become aware of the requirements of Title II of ADA and they should try and assist teachers in an effort to make their facilities more accessible to students with disabilities. However, knowledge of the law does not necessarily mean that facilities will immediately be made accessible. Many school districts are fighting desperately to simply keep their busses running during an academic year. The ultimate accomplishment of the spirit of ADA will come as 25 to 30 year old buildings are finally demolished and replaced with adequate education facilities. In the interim, I suspect that we will have to continue to rely on the "resourcefulness" of those teachers to meet needs of individual students.

PRESENT AND FUTURE EMPHASIS OF SECONDARY SCHOOL AGRICULTURAL MECHANICS PROGRAMS IN THE UNITED STATES

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INTRODUCTION/THEORETICAL FRAMEWORK

Curriculum developers and teachers are constantly faced with three fundamental questions: what should be taught, why should it be taught, and how can it best be taught? In recent years secondary agricultural educators have found these questions to be increasingly complex as competing groups have sought to influence curriculum decisions, and as rapid change in agriculture's structure have brought about a call for agricultural education to expand its mission. These forces have caused agricultural educators to examine every component of their program and has led to many changes in the traditional agricultural education curriculum. Harper (1989) stated that "the most serious problems facing agricultural education are not the changes occurring, but rather the strategies, or more clearly the lack of strategies, we are pursuing to facilitate change" (p.20).

The agricultural mechanics portion of the agricultural education curriculum has not avoided change. The mechanics portion was rooted in production agriculture at the farm level and the goal of farm mechanics was to train the farm boy in the knowledge and skills necessary to meet the mechanical problems with which a farmer would have to deal.

Historically the inclusion of mechanics instruction in agricultural education was construed to contain many benefits. It provided a strong means for convincing communities of the need for supporting the total vocational agriculture program, it displayed the practical value of vocational education, it provided activities which met individual student needs, it added variety to the curriculum, and it was seen as one of the best ways of motivating and stimulating the student's interests (Cook and Walker, 1947).

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Recently Osborne (1992) observed the importance of agricultural mechanics and stated:

> When compared to other segments of the curriculum, agricultural mechanics may hold the greatest potential for addressing a blend of literacy, vocational, applied science, and basic study objectives. A new emphasis on physical science application in agriculture will diversify agricultural mechanics instruction and appropriately maintain Ag Mech as an important component of secondary agricultural education (p.4).

Several studies of secondary agricultural education programs have attempted to gain an understanding of the perceived importance of the agricultural mechanics portion of the curriculum. In a study of 56 Arizona vocational agriculture teachers and 44 secondary school principals, Cox and Zubrick (1986) found that both respondent groups felt providing instruction in agricultural mechanics was one of the most important activities that teachers could engage in. A national study of vocational agriculture teachers reported similar results (Kotrlik and Drueckhammer, 1987).

Despite these beliefs about its importance, many people have viewed agricultural mechanics with a critical eye. They have perceived it as being too narrowly focused on teaching of manipulative skills which are not easily transferred to diverse working situations. Because of the sophistication and technical nature of the modern agricultural industry some question whether secondary school programs can adequately provide the necessary resources and instruction that the work place demands. Others assert that agricultural mechanics is nothing more than a time-filler to let students have fun and keep them busy.

In their report, "Understanding Agriculture: New Directions for Education," the National Research Council (1988) discussed the lack of science instruction in agricultural education. This report then became the impetus for a movement to emphasize what has become known as "Agriscience." Some authors (Gleim, 1991; Buriak, 1992) have noted that this movement has largely been in the direction of the biological sciences while physical science applications have been mostly ignored. Many states are now requiring less and less agricultural mechanics for teacher certification, and universities such as Iowa State and Nebraska are no longer offering instruction in mechanics to prospective teachers.

Even student support for agricultural mechanics--traditionally very strong--has shown some signs of weakening. In his study of factors influencing enrollment in Iowa agricultural education programs, Reis (1991) found that student satisfaction with agricultural mechanics course work ranked only eighth out of nine agricultural program phases studied.

Many questions still surround agricultural mechanics. Are agricultural mechanics programs viable in a science-based curricula? Will sufficient methods be devised for providing instructors with appropriate agricultural mechanics knowledge and skill? Will agricultural mechanics slowly fade out of agricultural education?

Purpose and Objectives

The purpose of this study was to assess the status of the agricultural mechanics curriculum as perceived by secondary school agricultural education instructors in the United States. Specific research questions used to guide the study were as follows:

> What is the current instructional emphasis of secondary agricultural mechanics programs in the United States?
>
> How adequate are the program factors that affect the delivery of quality agricultural mechanics programs?
>
> What is the future direction of secondary agricultural mechanics programs in the United States?

Procedures

This study utilized a descriptive research design to assess the status of the agricultural mechanics curriculum. Data were collected by means of a mailed questionnaire. The questionnaire was divided into three parts. Part I of the questionnaire was designed to determine the depth at which respondents teach various agricultural mechanics instructional units and anticipate their importance for the future. Part II asked respondents to rate the adequacy of various program factors which might affect the quality of their agricultural mechanics program. Part III consisted of demographic questions concerning the background of the respondent or the respondent's school.

The questionnaire was pilot tested by a random sample of 20 Iowa secondary agricultural education teachers. Based on the results of this pilot test, one section was deleted from the questionnaire and other improvements in wording and format were made.

A horizontal, numeric scale with a 1 to 9 point response range was used to collect most of the data on the questionnaire. The horizontal, numeric scale is most applicable where evaluative responses are to be arrayed on a single dimension (Alreck and Settle, 1985). Three different dimensions were evaluated using this scale. Those dimensions

were: 1) the current depth at which selected agricultural mechanics instructional units were being taught, 2) the perceived level of future importance of those instructional units, and 3) the adequacy of various agricultural mechanics program factors in delivering a quality agricultural mechanics program.

The population of this study was the instructors of all the secondary agricultural education programs listed in the 1992 Agricultural Educators Directory (Henry, 1992). It was determined that the necessary sample size was 368 (Krejcie and Morgan, 1970.) A stratified random sample of 370 teachers were selected to participate in the study. Teachers were proportionately selected by individual state based on the number of teachers within that state relative to the overall research population. After appropriate follow-up procedures had been employed a final sample of 252 (71%) valid responses were received and provided the data to respond to the research questions. The following statistical procedures were used to analyze the data: reliability, frequencies, means, standard deviations, t-test, analysis of variance, and factor analysis. The overall Cronbach alpha reliability coefficient was .97 and all statistical tests were measured for significant differences at the .05 confidence level.

RESULTS

Current Instructional Emphasis

Respondents were asked to indicate how much depth their instruction currently provided in 60 agricultural mechanics instructional units. Means and standard deviations for the current teaching depth of the units are presented in Table 1. Respondents indicated that they taught project construction, arc welding, oxyacetylene welding and cutting, power tools, hand tools, project design, MIG welding and preventative maintenance, shop and tool safety, safety clothing and protective devices, chemical handling and storage, careers, cooperation and teamwork in most depth. Those instructional areas taught in least depth were metal machining, sheet metal working, plastic welding, TIG welding, electric motors, electric controls and automation devices, roofing, farmstead layout, fencing, waste handling systems, robotics, metric system, electric systems and monitoring devices, transmissions, and drive chains.

Adequacy of Program Factors that Affect Agricultural Mechanics Programs

Respondents were asked to indicate the adequacy of 15 factors in meeting their agricultural program needs. The factors that most adequately affected the respondents agricultural mechanics programs were the respondents personal interest in the subject, teaching methods used, respondents personal knowledge or skills in agricultural

Table 1. Means, standard deviations and ranking of means for current teaching depth of instructional units[a].

Item	Mean[b]	SD	R
Hand Tools	5.75	2.32	12
Power Tools	6.42	2.30	7
Project design	5.27	2.39	18
Project construction	6.00	2.46	9
Tool conditioning	4.51	2.34	25
Metal grinding	4.52	2.31	24
Metal machining	2.73	2.23	56
Sheet metalworking	2.90	2.23	54
Arc welding	6.84	2.35	4
MIG welding	5.45	2.92	15
TIG welding	3.17	2.71	49
Plastic welding	1.73	1.75	60
Soldering	4.08	2.33	34
Brazing	5.20	2.47	19
Oxyacetylene welding & cutting	6.43	2.44	6
Project design	5.49	2.49	13
Project construction	5.87	2.45	10
Electric motors	3.72	2.38	43
Circuits	4.94	2.57	21
Wiring	5.38	2.60	16
Electric controls & automation devices	3.72	2.47	42
Concrete & masonry	4.38	2.44	29
Framing	4.32	2.42	30
Roofing	3.97	2.47	36
Plumbing	4.24	2.51	33
Farmstead layout	3.02	2.12	51
Fencing	3.44	2.37	46
Energy conservation	4.29	2.38	32

[a]The N for each of items ranged from 224 to 240.

[b] Scale used to determine mean was 1 to 9.

Table 1. Continued

Item	Mean[b]	SD	R
Environment control	4.32	2.57	31
Waste handling systems	3.87	2.60	38
Machinery operation	4.63	2.60	22
Preventive maintenance	5.46	2.61	14
Diesel engines	3.44	2.53	45
Multi-cylinder gasoline engines	4.03	2.67	35
Small gasoline engines	5.85	2.57	11
Transmissions	2.64	2.21	58
Drive trains	2.72	2.22	57
Hydraulics	3.26	2.36	48
Electrical systems & monitoring devices	2.98	2.30	52
Machinery management	3.87	2.57	37
Manual & catalog usage	4.38	2.74	28
Surveying	4.49	2.68	26
Grading	3.36	2.57	47
Irrigation structures	3.03	2.54	50
Pumps	2.83	2.34	55
Conservation structures	3.77	2.57	41
Safety clothing & protection devices	7.64	1.92	2
Shop & tool safety	7.99	1.65	1
Chemical handling & storage	6.48	2.49	5
CPR & first aid	4.40	2.99	27
Computer usage in Ag mechanics	3.81	2.65	39
Applied mathematics	5.07	2.60	20
Applied Physics	3.79	2.66	40
Problem solving strategies	5.27	2.73	17
Robotics	2.01	2.07	59
Metric system	2.91	2.32	53
Painting & preserving	4.62	2.52	23
Shop layout	3.72	2.54	44
Careers	6.26	2.31	8
Cooperation & teamwork	6.90	2.27	3

mechanics, the support that the community provided the respondents' program, and student interest and student enrollment in the program. Those factors that least affected the adequacy of the respondents programs were the respondents participation in inservice programs, the amount of money budgeted for the agricultural mechanics program, and the availability of teaching and planning time.

When program factors that affect the agricultural mechanics program were analyzed by demographic variable, significant differences among group means were observed for years of teaching at the present position, age and sex of the respondents, and attendance at inservice workshops. Teachers with significantly higher mean scores had more experience, were male and older, and had participated more extensively in inservice workshops.

Future Importance of Instructional Units

When respondents were asked how important each of the 60 instructional units would be as a part of their agricultural mechanics program in the future, respondents indicated that teaching units entitled safety clothing and protective devices, shop and tool safety, careers, cooperation and teamwork, chemical handling and storage, machinery preventive maintenance, CPR and first aid, computer usage, applied mathematics, and problem solving strategies would be most important. Least important instructional units were shop layout, pumps, irrigation structures, grading, drive trains, transmissions, fencing, farmstead layout, and plastic welding.

When the mean scores for current depth and future importance were tested for significant differences for each instructional unit, highly significant differences between means were observed for 59 of the 60 units with the future importance mean score being the higher mean for all 60 units. Comparison of the "current depth" and "future importance" ranked means indicated changes in the perceived importance of teaching certain instructional units. Instructional units which made the greatest positive changes in ranking included "computer usage in ag mechanics" (+26), "TIG welding" (+21), "CPR and first aid" (+16), "applied physics" (+14), "waste handling" (+13), "electric controls and automation devices" (+13), "environment control" (+11), "problem solving strategies" (+10), "applied mathematics" (+10), "energy conservation" (+10), and "robotics" (+10). The greatest negative changes in ranking occurred with the instructional units "metal grinding" (-22), "tool conditioning" (-17), "painting and preserving" (-14), "soldering" (-13), "hand tools" (-12), "brazing" (-11), and "concrete and masonry" (-10).

Trends for the Future

Instructor responses to questions about current trends and the possible future direction of the agricultural mechanics curriculum revealed some differences of opinion. Nearly one-half of the instructors (47%) believed that student interest in agricultural mechanics had not changed in the past five years (Table 2). The remaining respondents were almost evenly divided, with 28% believing student interest had increased and 24% feeling it had decreased. Approximately 74% of the respondents felt that the value of agricultural mechanics to students had increased or remained the same over the past 5 year period. Most of the respondents (86.7%) agreed or strongly agreed that agricultural mechanics curriculum content would be different by the year 2000, but they were less sure whether agricultural mechanics programs would be stronger by that time. Approximately 45% of the respondents did agree or strongly agree that agricultural mechanics programs would be stronger by the year 2000, but 35.7% were still undecided.

Table 2. Description of responses about trends for the future of agricultural mechanics.

Item	Descriptors	Frequency	Valid Percent
Change of student interest in agricultural mechanics over the past five years	Increased	69	28.0
	Decreased	61	24.8
	No change	116	47.2
Change in the value of agricultural mechanics to students over the past five years.	Increased	99	40.7
	Decreased	60	24.7
	No change	84	34.6
Level of agreement that agricultural mechanics curriculum content will be different by the year 2000.	Strongly agree (1)	70	28.2
	Agree (2)	145	58.5
	Undecided (3)	23	9.3
	Disagree (4)	8	3.2
	Strongly disagree (5)	2	.8
	M[a]	1.90	
	SD[b]	.75	

[a]M = mean

[b]SD = standard deviation

Table 2. Continued

Item	Descriptors	Frequency	Valid Percent
Level of agreement that agricultural mechanics programs will be stronger by the year 2000.	Strongly agree (1)	20	8.0
	Agree (2)	92	36.9
	Undecided (3)	89	35.7
	Disagree (4)	40	16.1
	Strongly disagree (5)	8	3.2
	M	2.70	
	SD	.94	

Current Depth and Future Importance of Instructional Categories

The instructional category "safety" had the highest mean of all instructional units for both current depth and future importance. High means were also observed on both measures for the instructional unit "carpentry and woodworking." The lowest mean score was observed for the instructional unit "soil and water management." Ranking of the mean scores revealed the respondents' perception that the instructional unit "farm structures" and "metal processes and metal working" will be relatively less important to their programs in the future. The instructional units "computers and problem solving" and "electrical power" were perceived as becoming more important in the future. The t-values and t-probabilities revealed that the respondents perceived the future importance of all instructional categories to be higher than the current depth at which they were taught.

CONCLUSIONS/RECOMMENDATIONS/IMPLICATIONS

Conclusions:

The agricultural mechanics instructional units which were currently taught at greatest depth were "shop and tool safety", "safety clothing and protective devices", "cooperation and teamwork" and "arc welding". Agricultural mechanics instructional units which were perceived as being the most important for the future were "shop and tool safety", "safety clothing and protective devices" and "chemical handling and storage."

Agricultural mechanics program factors which were perceived as being the most adequate in meeting program needs included "personal interest in the subject", "teaching methods used" and "personal knowledge or skills in the subject matter".

The instructional category "safety" consistently had the highest mean score for both current teaching depth and future importance of instructional category.

When compared with the current depth at which they are taught, the instructional units which will have the greatest relative future importance are, "computer usage in agricultural mechanics", "TIG welding", "CPR and first aid", "applied physics", "waste handling", and "electronic controls and the automation devices".

Several significant differences were observed when current and future instructional emphases were compared by AAAE region and years of teaching experience. Mean scores for teachers in the Southern region were the highest for the current teaching depth and future importance of all instructional units. As years of teaching experience increased, the current teaching depth and future importance of all instructional units increased.

Recommendations

As a result of this investigation, the following recommendations are suggested by the researcher.

Continue to include agricultural mechanics instruction as a part of secondary agricultural education curricula.

Coordinate agricultural mechanics inservice instruction among state Department's of Education, university and college faculty, and secondary instructors. Careful needs assessment and follow-up evaluation should be included as a means of insuring that inservice programs are enhancing agricultural mechanics instruction.

Develop instructional units and teaching plans for topics which are increasing in importance, such as, computer usage in agricultural mechanics, mathematics and physics applications, energy conservation, waste handling, and environment control.

Develop instructional units and teaching plans which utilize scientific experimentation and encourage teamwork and problem-solving skills.

Continue to emphasize safety concepts in all areas of agricultural mechanics instruction.

Study student perceptions of the agricultural mechanics curriculum to discover their thoughts about how the curriculum can best meet their needs.

Study the effects of changes in teacher certification requirements on agricultural mechanics programs.

Study secondary schools which are using curriculum materials designed to incorporate science into agricultural mechanics. Both teacher and student input are needed to evaluate whether this type of curriculum will feasibly provide greater benefits to students and secondary agricultural education programs.

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PRESENT AND FUTURE EMPHASIS OF SECONDARY SCHOOL AGRICULTURAL MECHANICS PROGRAMS IN THE UNITED STATES
A Critique

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This is a very interesting paper which addresses an important topic. Curriculum revitalization is an essential component of any effort to revitalize agricultural education programs. This study assesses teachers' perceptions regarding present and future emphasis in agricultural mechanics. The theoretical framework is adequately developed and the purpose is clearly stated. The first and third research questions are also clearly stated. However, I am a bit unclear regarding what the authors are intending to study in research question number 2. Perhaps an opportunity to hear the paper presented will clarify this point. The discussion of findings related to this question were a bit "sparse" in the paper itself.

There are several methodological issues which raise questions. Most noteworthy is the reporting of an "overall Alpha coefficient for an instrument which is designed to measure perceptions regarding distinctly different units in a curriculum. Alpha is a coefficient designed to analyze the internal consistency of an attitudinal scale which proposes to assess a "single" construct. Aside from the fact that the Alpha coefficient is not appropriate for this instrument, the extremely high coefficient value (.97) suggests that respondents may not have taken time to analyze and respond appropriately to each item. For example, it is not logical to assume that teachers would teach <u>all</u> of the 60 units in Table 1 at the same depth. Yet, a high Alpha coefficient, literally interpreted, indicates just that. Either the Alpha was incorrectly calculated or there are serious questions regarding the validity of the findings. Further, regarding reported "significant differences" between current and future importance of each unit in the curriculum, it is unclear what statistical tool was used to determine these differences. Since these variables are probably highly correlated with one another, results from a common Student's *t*-test would be very suspect.

Discounting the methodological issues, the paper provides some interesting data regarding teachers' perceptions about importance of agricultural mechanics units. Further, data indicate that the majority of teachers perceive student interest in agricultural mechanics is either about the same or increased over that of five years ago. They view the value of agricultural mechanics in the curriculum similarly. They also perceive that the curriculum is going to be different by the year 2000 (only 5 years away). As a former high school teacher of agricultural mechanics, I found it interesting that eight of the top ten units identified in Table 1 would have been the same ones I would have identified when I was teaching agricultural mechanics more than 15 years ago. I wonder if the curriculum will indeed be different by the year 2000? Although I agree with the authors that, based upon the perceptions of the teachers, agricultural mechanics should remain in the curriculum, who is going to be responsible for making changes in the curriculum if universities are decreasing the importance they place upon it in teacher education programs?

MATHEMATICAL PROBLEM-SOLVING PROFICIENCY OF AGRICULTURAL EDUCATION TEACHERS IN ALABAMA

Frankel S. Hunnicutt Michael E. Newman*

Introduction and Theoretical Framework

There is a growing belief that vocational education should change from the present discipline form to one that coordinates with other disciplines. These changes are encouraged to produce a better trained work force and provide basic academic skills for greater student success in completing the requirements of higher education institutions.

Gray (1991) stated that if problems are not debated, and reform is not used to change and improve vocational education, it very well may cease to exist. The changing technology of business and industry creates a need for change in the educational process.

Vocational education must become aware of and adjust to this change in order to be an active part of the educational process of the future. Adapting to change by determining what must be done to reach the needs of future students and incorporating those needs into the goals of the discipline will strengthen and improve vocational education.

Over the last decade, there have been numerous reports that call for reform in vocational education. Recommendations regarding improvements in vocational education and, in particular, agricultural education have been made. These reports have recommended that (a) the role of vocational education should change to make youth more employable; (b) vocational education should complement academic education so that employability can best be accomplished; (c) academic and vocational education curricula should be integrated and their equal importance should be recognized by students, faculty, and administrators; and (d) students should be taught to see the connection between vocational subjects, academic subjects, and the skills needed to succeed in the vocation of their choice (Educational Testing Service, 1990; National Commission on Secondary Vocational Education, 1984; The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, 1991; William T Grant Foundation Commission on Work, Family and Citizenship, 1988).

In 1986, the Secretary's Commission on Achieving Necessary Skills (SCANS) (The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, 1991) report stated priority should be given to the integration of academic and vocational skills to improve the labor force. According to the SCANS report, all students should learn basic academic skills and be able to use them in a practical way to solve problem situations in the work place of the future. From this report, a trend developed giving emphasis to the integration of vocational and academic skills (Warnat, 1991). This report also provided suggestions to schools for providing a well-rounded, practical, and functional

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education that produces a competent, productive worker, a successful post secondary student, and a functional, beneficial member of society.

The Perkins Act (The Carl D Perkins Vocational and Applied Technology Education Act, 1990) is the legislation that mandates the approach recommended by the SCANS report. The Perkins Act provides standards designed to ensure that all vocational educators will integrate mathematics and science into their teaching plan. The intention of this legislation is to provide direction and emphasis to state departments of education, local school systems, and local schools to produce well rounded educated workers for the work force of tomorrow through the integration of academic and vocational training (Warnat, 1991). The suggestions from the SCANS report, which emphasized providing a competent future work force, are now mandated by the Perkins Act. The Perkins Act includes trend-setting legislation that calls for educationally well-rounded students through a combination of vocational and academic training. This training should be provided by all faculty members through coordination of disciplines and not be fragmented, as has usually existed within schools and school systems.

The standards developed from the Perkins Act have prompted state departments of education and local school systems to begin developing curriculums to incorporate the standards into new formats for lesson plans. These lesson plans provide for integration of academic skills into the agricultural education curriculum (J.D. Kendricks, personal communication, October, 1993). In Alabama, the Performance Based Accreditation System (PBAS) has incorporated these new formats into the evaluation of vocational programs throughout the state (Alabama State Department of Education, Accreditation Division, 1993).

Vocational educators have recognized the importance of academic proficiency to vocational students (Miller & Gliem, 1993a). Much of the work in academic content within agricultural education has concerned mathematics and science proficiency. Science is closely related to much of the curriculum of agricultural education, and such work has been done in that area to incorporate these two subjects (Butler & Lee 1993; Dormody, 1992).

Mathematics is used in many of the content units of agricultural education, but it has not, at this point, received as much study and attention as science (Gliem & Persinger, 1987). Pritiz (1988) stated that employers expect their employees to apply basic mathematics skills as well as other skills to their everyday specific tasks.

Mitchell (1990) found that employment situations typically require practical problem solving in mathematics not taught in the current mathematics curriculum. D'Augustine (1989) stated that rapidly changing requirements are placing new demands on the mathematics skills of students entering majors in business and vocational programs. Mitchell's (1990) findings that employees must be competent in mathematics skills in order to survive the work place of the future, and D'Augustine's (1989) findings concerning postsecondary students' need for mathematics, indicate that changes are needed in the educational process used to train the work force of the future, and to provide the basic academic skills needed for students to be successful at the postsecondary level. Vocational education, particularly agricultural education, can play an important role in the future of education through the integrating of academic and vocational subjects.

Changes are needed not only in the mathematics classes, but in the general approach to teaching mathematics (Miller & Gliem, 1993b). Agriculture teachers can provide instruction in practical mathematics that will help students become more proficient in mathematics skills. The integration of academic content and curriculum into the vocational curriculum is necessary according to the new federal standards that are the result of the Perkins Act (Alabama State Department of Education, Vocational Division, 1993a).

Miller and Gliem (1993a) found that Ohio teachers participating in a workshop were strongly positive regarding including mathematics in the vocational curriculum. Miller and Vogelzang (1983) found that Iowa teachers support inclusion of mathematics into the agricultural education curriculum and stated that integration could be used as a means of improvement in agricultural education.

In Ohio, 27% of the agriculture teachers studied indicated mathematics teachers asked them for examples of agriculture-related mathematics problems to be used as a part of the academic curriculum. Forty-seven percent of these agriculture teachers stated they asked the mathematics teacher for assistance in ways to present mathematics problems in the agricultural education curriculum (Miller & Gliem, 1993a). Coordination of disciplines is important in the effort to produce competent, successful graduates.

In response to the Perkins Act, state departments of education have begun emphasizing the integration of academic subjects into the vocational curriculum and teachers must be the ones to carry out the process. Agriculture teachers must be effective in carrying out this responsibility and they must possess certain competencies that will enable them to incorporate and teach the application of academics, and in particular mathematics, into the agricultural education curriculum (Warnat, 1991).

With the influence of the Perkins Act, the general school curriculum will involve integration of all subjects into a whole person education. Agricultural education must play a role in this process in order to survive changes the future will bring in the approach to education The ability of the vocational teacher to integrate academics, including mathematics, will determine the success of agriculture programs to a large degree. The Perkins Act will have an impact on all education programs for the next several years and vocational teachers, particularly agricultural education teachers, must be prepared (Warnat, 1991).

<u>Statement of the Problem</u>

Agriculture teachers in Alabama are required to teach and integrate mathematics skills into the agricultural education curriculum as required by the standards resulting from the Perkins Act. As it is required that integration take place and teachers will be evaluated, in part, on integration a problem exists as to whether teachers of agriculture possess the mathematical proficiency needed to integrate mathematics into their curriculums.

Applied academics, including programs for the integration of mathematics skills into the agricultural education curriculum, have been developed or used in very few agriculture programs. Approximately half of the teachers surveyed in Ohio were not coordinating their efforts with mathematics teachers (Miller & Gliem, 1993a). The Alabama State Department of Education has begun the Performance Based Evaluation System (PBES),

and because this system has integration as one of its components, it is necessary for agriculture teachers in Alabama to be proficient in mathematics skills.

Purpose and Objectives

The purpose of this study was to determine whether agricultural education teachers in Alabama have the mathematical skills to teach mathematics concepts as they relate to agricultural education. In addition, this study sought to determine if there is a relationship between the scores on a researcher-made mathematics test for agriculture teachers and the reported level of integration of mathematics in the agricultural units they teach.

To accomplish the purpose, the following research questions were investigated:

1. What is the mathematical problem-solving proficiency of agricultural education teachers in Alabama?

2. What is the self-reported level of integration of mathematical problem-solving skills into the agricultural education curriculum?

3. Do teachers with high levels of mathematical problem-solving proficiency report a different level of integration than teachers with low levels of mathematics problem-solving proficiency?

Methods And Procedures

The design of the study was descriptive-correlational. Selected agricultural education teachers were given a teacher-made instrument designed to measure their mathematical problem-solving proficiency. They were also asked to complete a data sheet requesting demographic information and information regarding the level at which they integrated mathematics concepts into their curriculum during the previous school year.

Population and Sampling

The population for the study consisted of all 380 agricultural education teachers in Alabama for the 1993-94 school year as identified by the Alabama Agricultural Teachers Directory (Alabama State Department of Education, Vocational Division, 1993b). These teachers attend district planning and inservice meetings organized each quarter by the state department of education. Each meeting has the same agenda and provides the same information to the teachers. A total of 12 meetings are held each quarter. A cluster sample of two of these meetings were randomly chosen to provide the 55 participants of this study, with a third meeting chosen to provide the 18 participants for the pilot study. The members of these clusters were compared to the total population on demographics and found to be no different on 5 of the 6 variables. Therefore, the findings are generalized to the population (Borg & Gall, 1989).

Instrumentation

A researcher-made mathematics proficiency test for agriculture teachers was used to determine the mathematical problem-solving proficiency of Alabama agricultural education teachers. The instrument was developed using instruments from Miller and Gliem (1993a & 1993b) and from Gliem and Warmbrod (1986).

A panel of experts established the content validity of the instrument. The panel consisted of agricultural teacher educators and mathematics teachers. The panel determined that each of the 40 items on the test were of a level an agricultural education teacher should be able to answer correctly. Because the test was a speed and power test, a minimum proficiency of 85% was determined by the panel.

A pilot test was conducted to determine the reliability of the instrument. The instrument was given to 18 teachers attending the first of the three meetings randomly selected. The Cronbach's alpha for the instrument was .92. Individual item alphas were analyzed and it was determined that all items should remain in the final instrument.

The primary researcher attended the meeting and administered the instrument personally. Each teacher in attendance was given two minutes to complete the demographic data sheet and 30 minutes to complete the test. The participants turned the test and demographic data sheet into an envelope containing the same number as the test. No names were provided on either the test or demographic sheet. One teacher was late for the meeting and did not participate.

Data Collection

Teachers attending the two meetings selected were the participants in the study. A total of 55 teachers were scheduled to attend the two meetings. All 55 teachers attended and all 55 teachers completed the instrument. Data collection procedures were carried out identically to those used in the pilot test described above.

Findings

Demographic information about the participants is provided below. Then the findings are reported based on the research questions of the study.

Demographic Characteristics of Participants

The demographic data collected from this sample included age, gender, race, years of teaching experience, educational level, number of college mathematics courses taken, and type of school in which they taught. Additionally, teachers were asked for their perceptions regarding the following: where they learned most of their mathematics skills, whether it is necessary for agricultural education teachers to integrate mathematics into their curriculum, and the extent to which they integrate mathematics into their agricultural education curricula.

The sample ranged in age from 22 to 54 years. The mean age of the sample was 37.8 years, with a standard deviation of 7.84. They had been teaching agriculture for an average of 14.4 years.

Most of the participants in the two meetings were white, had degrees above the bachelors level, had taken two or more mathematics courses in college, and taught in a comprehensive high school. All participants were male. Table 1 contains a summary of these demographic variables.

Table 1.

Summary of Demographic Variables (N = 55).

Variable	Frequency	Percent
Race		
White	53	96.4
African American	2	3.6
Total	55	100.0
Education		
Bachelors	15	27.3
Masters	21	38.2
AA Certification	19	34.5
Total	55	100.0
Number of College Math Courses		
One	13	23.6
Two	18	32.7
Three or more	24	43.7
Total	55	100.0
Type of School		
Junior High	1	1.8
Comprehensive High School	50	91.0
Vocational School or Center	4	7.2
Total	55	100.0

Research Question 1

The first research question asked, "What is the mathematical problem-solving proficiency of agricultural education teachers in Alabama?" The mathematical problem-solving proficiency is one means of determining whether teachers have the ability to implement the mathematical integration required by state and federal standards. The participants scores ranged from a low of 4 (10% correct) to a high of 40 (100%). The mean percent correct was 66.16, indicating an average of 26 of 40 items answered correctly. The standard deviation was 20.09, with a raw score standard deviation of 8.0.

Research Question 2

The second research question asked, "What is the self-reported level of integration of mathematical problem-solving skills into the agricultural education curriculum?" Participants were asked to report the percentage of units taught during the previous school year in which they integrated mathematics concepts. The following scale was used in the question: 0-25% of the units; 26-50% of the units; 51-75% of the units; and 75-100% of the units. Over two-thirds (67.2%) of the participants indicated that they integrated mathematics into 50% or fewer of the units they taught. Teacher responses are summarized in Table 2.

Table 2.

Self-Reported Level of Mathematics Integration by Teachers (N = 55).

Integration Level	Frequency	Percent
0-25% of units integrated	17	30.9
26-50% of units integrated	20	36.4
51-75% of units integrated	11	20.0
76-100% of units integrated	7	12.7
Total	55	100.0

Research Question 3

The third research question asked, "Do teachers with high levels of mathematical problem-solving proficiency report a different level of integration than teachers with low levels of mathematics problem-solving proficiency?" Before separating the sample into subgroups for the purpose of calculating a t-test on mean differences for high and low

proficiency, a Spearman Rho test was calculated for the entire group to determine the extent of the relationship between proficiency score and integration rate. The Spearman Rho calculated was not significant ($r_s = .15$).

Comparison of Possible Extraneous Variables

Teachers' mathematical problem-solving proficiency and self-reported levels of integration were compared with five variables identified in the literature as possibly being related. The five variables were age, years of experience teaching agriculture, number of college math courses taken, educational level, and type of school. None of the variables were significantly related to mathematics problem-solving proficiency. Two variables, years of teaching experience ($r = .28$) and type of school taught in (Cramer's $v = .33$) were significantly related to self-reported level of integration.

Conclusions

The following conclusions and recommendations are based on the findings of this study.

1. The mathematical problem-solving proficiency of the majority of Alabama agricultural education teachers sampled is lower than the established proficiency as considered by the panel of teachers and teachers training staff that established content validity. The panel suggested an acceptable proficiency of 85%. The mean proficiency level was 66%.

2. The amount of integration of mathematics into the agricultural education curriculum was in the range of 26-50% of the total units that were taught by teachers.

3. According to the requirements of the Perkins Act, mathematics skills are required in 80-85% of the units for grades 9-12. For the Alabama PBES, the amount of mathematical integration is 80-85% for grades 7 and 8 also. The respondents were found to be integrating mathematics into 26-50% of the units they teach. The rate of integration found in this study will not meet the federal standards from the Perkins Act or those from the PBES.

4. Teachers within the sample that demonstrated a high mathematical problem-solving proficiency were not integrating mathematics into the curriculum at a significantly higher percentage than those that demonstrated a low level of mathematical problem-solving proficiency.

5. Those teachers with 15 or more years of experience teaching agriculture reported integrating mathematics into a higher percentage of the units they teach than do teachers with fewer years of experience teaching agriculture.

6. Those teachers who teach in an vocational school or center within agricultural education integrate mathematics into a higher percent of the total units they teach than those in the general agricultural curriculum.

7. The selected variables of age, number of mathematics courses, or educational level were not significantly related to the level of integration.

8. None of the selected variables of age, years of experience, number of mathematics courses in college, educational level, or type of school significantly influenced the problem-solving proficiency score of the group.

Recommendations

The following recommendations are based on the findings and conclusions of the report.

1. The Alabama State Department of Education may consider several ways to increase the mathematical problem solving proficiency of teachers as this study and related literature review found as proficient as the established standards. Some of the possible approaches include the following: (a) district and summer in-service workshops that provide examples of mathematical problems related to agriculture; (b) by mail packets of supporting material that have examples of mathematical problems for different areas in agriculture; (c) a teachers reference or workbook manual of mathematical problems related to agriculture provided to each teacher, tabbed and indexed by subject, containing formulas and sample problems with illustrations that are related to the Alabama course of study and the PBES lesson plans; and (d) a developed format for PBES lesson plans which each teacher is to have as a part of their evaluation. This format could suggest suitable skills in mathematics and provide examples to be taught in the lesson.

2. According to Gliem and Warmbrod (1986), agricultural education departments may consider attempting to integrate more practical mathematics applicable to agriculture into the present course work. Offering related math in classes such as agricultural mechanics and construction may refresh skills and improve the mathematical problem-solving proficiency of future teachers.

3. The Alabama State Department of Education, Vocational Division, may consider an emphasis on integration throughout the state and show the relationship integration has with successful PBES evaluations. Some of the possible ways to accomplish this are; (a) professional development at district meetings; (b) letters from district and state specialists to teachers giving emphasis on the need for integration; and (c) in-service professional development workshops planned by vocational directors for agriculture teachers.

4. Additional research is needed to determine why teachers who exhibit a high level of mathematics problem-solving proficiency do not utilize their skills to integrate more mathematical concepts into their curricula.

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MATHEMATICAL PROBLEM-SOLVING PROFICIENCY OF AGRICULTURAL EDUCATION TEACHERS IN ALABAMA
A Critique

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In an educational bureaucracy we often study a problem; find a solution; implement policy to solve the problem; and, assume the "problem" should be resolved. To many, it seems logical that if vocational education classes need to have mathematics principles infused into their curricula, the simple solution is to establish a policy which requires teachers to "do that". Seldom do we attempt to determine if the teachers have the necessary "skills" or "training" to implement the policy. The authors are to be commended for their attempt to determine if agricultural teachers in Alabama have the necessary skills and training to infuse mathematics principles into their curricula.

The paper provides a well-written historical development of the need to infuse science and mathematics principles into vocational curricula. Further, the problem is well developed and the research questions are clearly stated. The sampling procedure, although not ideal, is adequate for the intended purpose. However, there are several methodological issues which do cause questions to arise.

First, regarding the proficiency test itself, the reporting of a Cronbach's Alpha Coefficient is somewhat misleading without additional discussion of how the authors actually coded their scores. The most commonly used internal consistency coefficient for multiple choice tests is one of two Kuder-Richardson formulas (KR_{20} or KR_{21}). The KR_{20} formula is most often reported. Although Alpha and KR_{20} are mathematically the same when answers to the multiple choice items are coded as dichotomous (either true or false), the Alpha coefficient is incorrectly calculated if all possible answers are coded (as if the test were a Likert-type scale). It is also interesting to note that the validating panel for the test was "agricultural teacher educators" and (high school?) "mathematics teachers". I wonder if mathematics "teacher educators" would have agreed with the "85 percent acceptable proficiency", or the level of difficulty of the items.

I also wonder whether a "self-reported level of integration" is a valid assessment of actual practice in the classroom. The fact that no relationship exists between mathematics proficiency and reported level of integration makes this question appropriate. While the reported correlation coefficient was not substantive, the authors alluded to a "t-test" which was used to study the relationship further. Yet there was no mention of findings from this analysis. Would such an analysis be appropriate when the independent variable is intervally scaled and the dependent variable is ordinally scaled?

The fact still remains however, that many agricultural teachers appear to lack needed mathematics skills. Further, teachers do not "perceive" they are integrating mathematics into their curricula. Both of these are important findings. Based upon these two findings alone, the researchers' recommendations are very appropriate. I wish them luck in implementing these recommendations.

ATTITUDES OF UNIVERSITY OF ILLINOIS COLLEGE OF AGRICULTURE FRESHMEN TOWARD AGRICULTURE

James E. Dyer Raquel Lacey Edward W. Osborne[1]

Introduction

Enrollment in Colleges of Agriculture have closely paralleled that of high school agriculture programs over the past three decades. Reaching their peaks in the late 1970s, enrollment at the two levels plummeted with the onset of the farm crisis in the late 1970s and early 1980s. Dyer and Osborne (1994) noted that secondary agricultural education enrollment in Illinois dropped by over 60% during this time period. Likewise, Manderscheid (1988) reported a 24% decline in Land Grant University agriculture enrollments and a 13% decrease in non-Land Grant University agriculture enrollments from 1978 to 1988. Over the past few years, however, enrollment at both the high school and college levels has begun to increase. Litzenberg, Whatley, and Scamardo (1992) reported that with the exception of the North Central Region, agricultural enrollments had recovered to early 1980 levels. However, the makeup of students now entering Colleges of Agriculture has changed (Russell, 1989). Russell contended that today's enrollees lack the agricultural background possessed by previous students. He noted that for the three year period 1983-85, 46.3% of incoming College of Agriculture freshmen at the University of Illinois had, at a minimum, been enrolled in high school agriculture programs. From 1986-88, however, the average had declined to 32.3%. Scofield (1995) likewise noted that a greater percentage (40%) of students enrolling in the College of Agriculture at Iowa State University were from urban residences as compared to farm settings (36.7%).

During the ten-year period from 1985-94, a total of 4,847 freshmen enrolled in the College of Agriculture at the University of Illinois (Office of Academic Programs, 1994), over 70% of which came from non-agricultural backgrounds (Gomes, 1994). However, during this same time period 1,840 students transferred out of the College of Agriculture to other colleges (Office of Academic Programs). From an enrollment viewpoint, this loss of students represents the approximate combined membership of the last four freshmen classes in the College. Fiscally, this translates to a loss of nearly 11 million dollars in instructional money (College of Agriculture, 1994). More devastating yet, however, may be the loss to the agricultural industry of individuals trained and experienced in agriculture. Russell (1993) warned of an impending "brain drain" in the agricultural industry, jeopardizing its long term future if the trend continues.

The problem addressed by this action research was how to identify and retain students who are likely to complete a program of instruction and seek employment in the industry of agriculture. The conceptual model for this study emphasized the need to study those

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factors which influence a student's selection and pursuit of a field of study and corresponding career choice. The theoretical framework was provided by Fishbein and Ajzen (1975). They determined that intentions to participate in an activity could be predicted based upon knowledge, observation, or other information about some issue. This suggested that a person's intent to pursue study in a field of agriculture or to become actively involved in an agricultural career may be predicted by analyzing his/her beliefs about agriculture. Greenwald (1989) supported this theory, reporting that individuals with positive attitudes toward a subject or situation tend to evaluate them positively.

Purpose

The primary purpose of this study was to determine the attitudes and intentions of College of Agriculture freshmen students at the University of Illinois toward high school and university agriculture programs and the field of agriculture. The following questions were used to guide the study:

1. What were the attitudes of College of Agriculture freshmen toward the field of agriculture?
2. What were the attitudes of freshmen College of Agriculture students toward their major areas of study?
3. What was the influence of high school agriculture program experiences on the attitudes of students who are now pursuing agricultural majors?

Procedures

The study used a descriptive survey design. The sample, target, and accessible populations were all 1994-95 University of Illinois College of Agriculture freshmen ($\underline{N}$ = 495). Since all freshmen students must enroll in an introductory agriculture course, the class rosters served as the population frame. The entire population in attendance was surveyed. Instruments were administered by Teaching Assistants during the final week of the Fall 1994 semester. A total of 324 (65.5%) usable instruments were collected. Nonrespondents were determined from class rosters. Ten percent of the nonrespondents were randomly selected and contacted by telephone as outlined by Miller and Smith (1983). No significant differences were found in data obtained from nonrespondents and that obtained from initial participants. Therefore, data were generalized to the entire population.

A two-part questionnaire specific to the questions addressed by the study was developed by the researchers and reviewed for content and face validity by a panel of experts from the University of Illinois College of Agriculture staff. Part I of the instrument contained demographic information, close-ended, and partially close-ended items. Part II identified attitudes of students toward the field of agriculture. A five-point Likert-type scale (1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree) was used for the 21 items comprising Part II of the questionnaire. The instrument was pilot tested using 12 freshmen students not enrolled in the College and 11 sophomore and junior College of Agriculture students ($\underline{n}$ = 23). Part II of the instrument was divided into three constructs: Attitudes Toward Agriculture as an Area of Study,

Attitudes Toward High School Agriculture Programs, and Attitudes Toward University Agriculture Programs. Reliability estimates were determined for the three constructs using Cronbach's Alpha (r = .85, .78, .88, respectively). Data were analyzed using descriptive statistics, including measures of central tendency and variability.

Results

The majority of students in the sample were female (55.6%, n = 179) and Caucasian (90.7%, n = 283). Other races represented were African-American (1.9%, n = 6), Asian (5.4%, n = 17), Hispanic (1.3%, n = 4), and "Other" (0.6%, n = 6).

Only 59 students (18.4%) indicated that they had completed high school agriculture courses. A total of 44 students (13.8%) indicated that they had been FFA members in high school, while 86 students (27.3%) indicated they had been 4-H members. Of those who completed high school agriculture programs, 77.6% (n = 45) rated the program "Good." An additional 15.5% (n = 9) rated their programs as "Average" and 6.9% (n = 4) rated the programs as "Poor." The major reasons listed for not enrolling in high school agriculture courses were that no program was offered (54.6%, n = 177), the poor reputation of the program among students (19.1%, n = 62), and that agriculture programs are too vocational (16.4%, n = 53).

No significant differences were detected in high school grade point averages of students who had been enrolled in high school agriculture courses (M = 4.14) and those students who had not (M = 4.07). Likewise, no significant differences were found in ACT scores between the two groups (M = 25.44, M = 25.56, respectively).

Only 22.2% (n = 72) of the freshmen students indicated they had farm backgrounds. A total of 66.4% (n = 215) of the students reported they were from large or medium urban areas (populations over 10,000). The remaining students came from towns of less than 10,000 (7.7%, n = 25) or rural areas not considered farms (3.7%, n = 12). The mean size of farms from which students came was 988.9 acres with a range of 10 to 3,956 acres reported. The principal agricultural products produced included corn/soybeans (reported by 62.2% of the students), swine (16.2%), beef (10.8%), dairy (6.8%), and sheep, vegetables, and horses (1.4% each). Sixty-six (25.8%) of the students reported paid work experience in agriculture. Eighty students (31.3%) reported no prior experience of any kind with agriculture.

<u>Research Question 1:</u> *What were the attitudes of College of Agriculture freshmen toward the field of agriculture?*

Generally, the attitudes of College of Agriculture freshmen toward the field of agriculture were positive. As indicated in Table 1, students viewed the field of agriculture as both scientific and technical. They also believed the image of agriculture to be improving. Students disagreed that only students with a farm background should pursue agricultural careers.

Table 1
Attitudes Toward Agriculture as an Area of Study

Statement	Agree f (%)	Uncertain f (%)	Disagree f (%)
Agriculture is a scientific area of study.	264 (87.7)	28 (9.3)	9 (3.0)
Agriculture is a blend of scientific principles and agricultural practices.	270 (89.7)	26 (8.6)	5 (1.7)
Agriculture is a highly technical field of study.	235 (78.3)	49 (16.3)	16 (5.3)
The image of agriculture is improving.	201 (66.6)	61 (20.2)	40 (13.2)
Only students with farm backgrounds should pursue careers in agriculture.	30 (10.0)	37 (12.3)	234 (77.8)

Note. The term "agree" refers to combined responses of "Strongly Agree" and "Agree." The term "disagree" refers to combined responses of "Strongly Disagree" and "Disagree."

A majority (81.6%) of freshmen did not complete high school agriculture courses. Correspondingly, students were generally uncertain in their attitudes toward high school agriculture programs (Table 2). A majority did agree, however, that high school agriculture is good preparation for college, that stronger ties should be made between high school agriculture and science curricula, and that more students should be encouraged to enroll in high school agriculture courses. The students disagreed with the statements that high school agriculture courses are better suited for male students and that only students pursuing careers in agriculture should enroll in high school agriculture.

Table 2
Attitudes Toward High School Agriculture Programs

Statement	Agree f (%)	Uncertain f (%)	Disagree f (%)
Students can complete a high school agriculture program and still meet college preparatory requirements.	140 (46.7)	122 (40.7)	38 (12.7)
College-bound students should be encouraged to enroll in high school agriculture courses.	122 (40.6)	127 (42.2)	52 (17.3)
High school agriculture is good preparation for college study in agriculture.	161 (53.5)	119 (39.5)	21 (7.0)
Stronger ties should be made between high school agriculture and science curricula.	182 (60.9)	89 (29.8)	28 (9.4)
High school agriculture should become less vocational.	111 (37.0)	158 (52.7)	31 (10.3)

Table 2 (Continued)

Statement	Agree f (%)	Uncertain f (%)	Disagree f (%)
High school agriculture should become more scientific.	145 (48.3)	123 (41.0)	32 (10.7)
More students should be encouraged to enroll in high school agriculture programs.	156 (52.3)	105 (35.2)	37 (12.4)
High school agriculture courses are better suited to male students.	40 (13.4)	107 (35.8)	152 (50.8)
High school agriculture courses are beneficial for higher-achieving students.	66 (22.0)	179 (59.7)	55 (18.3)
High school agriculture courses are beneficial for lower-achieving students.	53 (17.8)	175 (58.9)	69 (23.2)
Most high school students should take some course work in agriculture.	117 (39.1)	130 (43.5)	52 (17.4)
Only students pursuing careers in agriculture should enroll in high school agriculture.	58 (19.3)	84 (28.0)	158 (52.7)

Note. The term "agree" refers to combined responses of "Strongly Agree" and "Agree." The term "disagree" refers to combined responses of "Strongly Disagree" and "Disagree."

As indicated in Table 3, only slightly over half of the respondents (57.8%) believed that more students should be encouraged to enroll in university agriculture programs. Also, a frequent comment on the questionnaire was that too many "non-agriculture" students were enrolled, and that their negative attitudes toward agriculture detracted from classes. Likewise, slightly over half of the respondents (52.3%) disagreed with the statement that only students pursuing careers in agriculture should enroll in college agriculture courses. Nearly two-thirds of the students (65.1%) disagreed that college agriculture courses are better suited to male students.

Table 3
Attitudes Toward University Agriculture Programs

	Agree f (%)	Uncertain f (%)	Disagree f (%)
More students should be encouraged to enroll in university agriculture programs.	174 (57.8)	102 (33.9)	25 (8.3)
College agriculture courses are better suited to male students.	38 (12.8)	66 (22.1)	194 (65.1)
College study in agriculture is easier than in most other majors.	67 (22.3)	86 (28.7)	147 (49.0)
Only students pursuing careers in agriculture should enroll in college agriculture courses.	66 (22.0)	77 (25.7)	157 (52.3)

Research Question 2: *What were the attitudes of freshmen College of Agriculture students toward their major areas of study?*

Many students indicated that they were not happy in the College of Agriculture. Only 60.4% of the students (n = 195) indicated they planned to graduate with majors in the College. Eighty-six students (26.7%) reported they were definitely transferring to another college. An additional 42 students (13.0%) indicated they were considering a change of colleges. Likewise, 110 students (34.2%) indicated they were planning a change of majors before graduating. An additional 47 students (14.6%) reported they were considering a change of majors. Colleges to which students intend to transfer included Liberal Arts and Sciences (45.5%, n = 58), Commerce and Business Administration (15.6%, n = 20), Education (8.9%, n = 11), Engineering (2.3%, n = 3), and Kinesiology (0.8%, n = 1). The remaining transfers were unsure of location (20.3%, n = 26) or did not indicate a college (4.7%, n = 6).

This dissatisfaction with the College of Agriculture appears to reside in about one half of the programs in the College (Table 4). Specifically, majors in which a majority of the students were considering a change of college included Food Science/Industry (62.5%), Restaurant Management (57.1%), Agricultural Communications (54.5%), Agricultural Economics (54.5%), and Human Resources and Family Studies (53.1%). Those programs with no reported losses of majors included Agronomy and Agricultural Education.

Table 4
Students Planning to Transfer from the College of Agriculture

Major	Number	Percent of Respondents
Agricultural Communications	6	54.5
Agricultural Economics	30	54.5
Agricultural Education	0	0.0
Agricultural Mechanics/Engineering	1	7.7
Agronomy	0	0.0
Animal Sciences	15	18.1
Food Science/Industry[a]	15	62.5
Forestry	7	38.9
Horticulture/Ornamental Horticulture	3	23.1
Human Resources and Family Studies	30	53.1
Restaurant Management	3	57.1
Undecided/Core Curriculum	12	60.0

[a] Several students listed only the word "Foods" as their majors.

When asked to list what they most liked about the College of Agriculture, 124 students (44.4%) responded the "friendly atmosphere" of the College, followed by "faculty" (14.7%, n = 41), and "learning about my subject" (10.4%, n = 29). Characteristics freshmen liked least included the required course work outside of their major (28.5%, n = 63) and the attitude toward agriculture majors by others on campus and

within the College of Agriculture (6.8%, n = 15). However, 41 students (18.6%) indicated that there was no aspect of the College of Agriculture which they did not like. The top five reasons for choosing the College of Agriculture included program offerings, career opportunities, love of animals, enjoyment of agriculture, and lower entrance requirements than other colleges in the university.

Of the areas which most interested the students, agribusiness (n = 66, 19.3%), livestock production (n = 46, 14.8%), and biotechnology (n = 40, 12.9%) were identified. Forty-two students (13.5%) indicated that they had no interests in agriculture. Twenty-two of those individuals (52.4%) indicated majors in the Human Resources and Family Studies curriculum, eight of the students (19.0%) indicated majors in Food Science/Industry, and five (11.9%) reported majors in Agricultural Economics.

Research Question 3: *What was the influence of high school agriculture program experiences on the attitudes of students who are now pursuing agricultural majors?*

Almost all students (94.9%, n = 56) from high school agriculture programs indicated that they intended to graduate from the College of Agriculture and pursue a career in agriculture. Only three students indicated otherwise. By comparison, only 52.9% (n = 138) of those students who did not enroll in high school agriculture programs indicated that they plan to graduate in the College of Agriculture. Of the 44 students who had been enrolled in high school agriculture programs and were also FFA members, 43 (97.7%) indicated intentions to graduate with a degree in the College of Agriculture. The remaining student entered the College with an undeclared major. Likewise, of the 86 students who had been 4-H members, 74 (86.0%) also indicated intentions to graduate through the College of Agriculture.

Students who had completed high school agriculture courses displayed different attitudes toward the field of agriculture than did students who were not high school agriculture program participants (Table 5). Generally, students who were products of high school agriculture programs possessed attitudes which were much more supportive of agriculture as a career field, high school agriculture programs, and university agriculture programs. No significant differences were identified between the two groups on attitudes toward farm backgrounds, the need for agriculture to become more scientific, the suitability of college agriculture courses for female students, or attitudes toward the difficulty of college agriculture study.

Table 5
Comparison of Attitudes of High School Agriculture Program Versus Non-Program Graduates

	High School Agriculture			No High School Agriculture	
Statement	M	SD		M	SD
Agriculture as an Area of Study					
Agriculture is a scientific area of study.	4.54[a]	.70		4.20	.78

36.1

Table 5 (Continued)

Statement	High School Agriculture			No High School Agriculture	
	M	SD		M	SD
Agriculture is a blend of scientific principles and agricultural practices.	4.64[a]	.52		4.23	.73
Agriculture is a highly technical field of study.	4.30	.70		3.98	.86
The image of agriculture is improving.	4.11	.91		3.60	.94
Only students with farm backgrounds should pursue careers in agriculture.	1.86	1.18		1.80	1.08
High School Agriculture Programs					
Students can complete a high school agriculture program and still meet college preparatory requirements.	3.90[a]	1.09		3.36	.88
College-bound students should be encouraged to enroll in high school agriculture courses.	3.79[a]	.91		3.21	.93
High school agriculture is good preparation for college study in agriculture.	4.08	1.07		3.54	.84
Stronger ties should be made between high school agriculture and science curricula.	4.12	.84		3.67	.96
High school agriculture should become less vocational.	3.09	1.07		3.41	.85
High school agriculture should become more scientific.	3.51	.98		3.46	.94
More students should be encouraged to enroll in high school agriculture programs.	4.25[a]	.90		3.41	.94
High school agriculture courses are better suited to male students.	2.60	1.25		2.27	1.10
High school agriculture courses are beneficial for higher-achieving students.	3.26	.96		3.00	.86
High school agriculture courses are beneficial for lower-achieving students.	3.19	.95		2.84	.91
Most high school students should take some course work in agriculture.	3.85[a]	.93		3.16	.94
Only students pursuing careers in agriculture should enroll in high school agriculture.	2.26[a]	1.08		2.61	1.11

Table 5 (Continued)

Statement	High School Agriculture			No High School Agriculture	
	M	SD		M	SD
University Agriculture Programs					
More students should be encouraged to enroll in university agriculture programs.	4.00	1.02		3.59	.87
College agriculture courses are better suited to male students.	2.27	1.24		2.08	1.21
College study in agriculture is easier than in most other majors.	2.67	1.21		2.52	1.16
Only students pursuing careers in agriculture should enroll in college agriculture courses.	2.28[a]	1.18		2.62	1.11

[a]Means were categorically different. Categories of agreement were: "Strongly Disagree" (M = 0-1.50), "Disagree" (M = 1.51-2.50), "Uncertain" (M = 2.51-3.50), "Agree" (M = 3.51-4.50), and "Strongly Agree" (M >4.50).

Conclusions

1. A high percentage of College of Agriculture freshmen do not plan to complete their undergraduate degree in the College. Furthermore, for those students without high school agriculture coursework, this percentage is even higher (nearly 50%).

2. The number of students enrolling in the College of Agriculture at the University of Illinois who have completed high school agriculture courses, who have farm backgrounds, or who have experience in agriculture represent a clear minority of those freshmen enrolling in the College.

3. Students who have completed high school agriculture courses, and those who were FFA and/or 4-H members, are much more likely to complete a degree in the College of Agriculture than are freshmen who have not had those experiences.

4. College of Agriculture freshmen view agriculture as being both scientific and technical, and view high school agriculture courses as good preparation for college.

5. College of Agriculture freshmen who completed high school agriculture programs have more positive attitudes toward university agriculture programs, high school agriculture programs, and agriculture as a career than do freshmen with no high school agriculture courses.

Recommendations

1. A revised admission and/or counseling program should be implemented to better identify and retain students who are interested in pursuing degrees from the College of Agriculture.

2. A greater number of students who completed high school agriculture programs or who have been FFA and/or 4-H members should be recruited by the College of Agriculture.

3. Most secondary students in Illinois do not have an opportunity to enroll in high school agriculture programs. The number of agriculture programs in secondary schools should increase so that all students in Illinois have the opportunity for agricultural experience.

4. Additional qualitative research should be conducted to explore the relationships between groups of students in the College of Agriculture and their attitudes toward the College and various majors.

5. This study should be replicated at the beginning of the Fall semester to assist in determining if students enter the College of Agriculture with the intention of leaving or if they are disillusioned by their experiences in the College. In addition, a follow-up study of these students should be conducted during their senior years to determine if the expressed intentions are realized.

6. Several students from primarily two major areas of study indicated that they were not enrolled in the College of Agriculture. Considerable frustration and resentment were directed by many of those students toward the College and its requirement of freshmen enrollment in "agriculture" courses (Agriculture/HRFS 100). The College should develop a more effective approach in conveying the relationships of all majors to the field of agriculture and to the mission of the College.

Implications

Whereas the majority of freshmen indicated they were happy with the College of Agriculture, nearly 40% were contemplating a transfer to another college. Additionally, over one-third of the students indicated an imminent change of majors within the College. Based upon student responses, some programs are serving as "warehouses" for transient students. If the mission of the College of Agriculture is to produce graduates for entry into the agricultural industry, valuable resources are being wasted. Improvement needs to be made in both the identification and retention of students who are accepted into many departments and who are expected to complete a degree within the College. Currently, nearly one half of the programs in the College may lose 50% or more of their freshmen enrollment. These programs may need special counseling assistance in an effort to stabilize enrollment. By implementing more stringent identification, recruitment, and counseling programs, a more efficient utilization of College of Agriculture and departmental resources should be possible.

According to the results of this research, students who completed high school agriculture courses represent the best investment by the College of Agriculture. Almost all (94.9%) College of Agriculture freshmen who were enrolled in high school agriculture programs reported they planned to graduate in the College of Agriculture. If the student was an FFA member, the percentage increased to 97.7%.

According to Bekkum (1993), the agricultural industry places considerable importance on the background and experience of graduates. However, only 22.2% of the students reported farm backgrounds. Likewise, the majority of students in Illinois are not afforded

the opportunity gain agricultural experience and/or training at the secondary level. According to Guilinger (1995), only 296 of the 522 schools in Illinois offered any type of agriculture program during the 1993-94 school year. At the University of Illinois, the number of students with high school agriculture experience has decreased from 46.3% in 1983-85, to 32.3% in 1986-88, and finally to 18.4% in 1994-95. As a result, students are not entering the University with the agricultural experience desired by prospective employers. By increasing the number of high school agriculture programs, the College of Agriculture should reap benefits from increased numbers of majors who remain in the College through graduation.

Based upon comments from the questionnaires, attitudes of agricultural majors appeared very unfavorable toward transient students, and vice versa. Whereas slightly over half of the freshmen class responded that classes should be open to non-majors, almost an equal number complained that "non-agriculture" students detracted from their opportunity to learn because of the "non-agricultural" focus of the classes. Likewise, some comments indicated that majors in areas generally considered traditional agriculture were being ignored by the College. Clearly, both the "traditional" and "non-traditional" students are unhappy with the direction of the College. Additional study is needed to identify and solve this phenomenon.

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ATTITUDES OF UNIVERSITY OF ILLINOIS COLLEGE OF AGRICULTURE FRESHMEN TOWARD AGRICULTURE

Discussant
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Student recruitment and retention are important factors to those who must play the numbers game to obtain funds and justify their existence, which would describe just about every department and college on any public university campus in the United States. Knowing what students and potential students are thinking can help in designing programs that will meet their needs.

The authors of this article developed a theoretical frame work and introduction that established the need for the study. The concern about the number of students that start in the College of Agriculture and then transfer to other colleges is understandable. The data about the decline of student background experiences in agriculture education and related organizations such as 4-H and FFA are also a concern.

The authors stated clear objectives and were very complete in their description of the procedures. The 10 percent follow-up of non-respondents strengthens the data.

The findings of the study were presented in a clear and concise manner. Because this a census study the use of the term "No significant differences" referring to data when comparing the attitudes between those students who had taken high school agriculture versus those who had not was not warrented. Table 5 identified several items as having "categorical" differences. This is not a term commonly used in this way. The authors should have provided a more clear discussion of what was meant by that term.

Students indicated that one of the top five reasons for choosing the College of Agriculture was lower entrance requirements than the other colleges in the university. It would have helped the reader to know how great the differences are especially in light of the recommendation concerning revised admission standards. Since the data indicate that many of the students are planning to transfer out to other colleges; this area is important and deserves more discussion than was provided by the authors. Are students simply using the College of Agriculture, because of its lower entrance requirements, as a means to gain entrance to the university without any intent of majoring in an agricultural field?

The recommendation that the number of secondary agricultural education programs should be increased is probably a suggestion welcomed by the Illinois Department of Education, but is perhaps beyond the findings of this study.

The study was well done and should be of value not only to the University of Illinois but to all institutions with concerns about student retention.

HOW OHIO TEACHERS USE AGVENTURE MAGAZINE TO INCREASE AGRICULTURAL LITERACY AMONG THEIR STUDENTS

Kirk A. Swortzel*

Introduction and Theoretical Framework

Agricultural literacy is defined as understanding and possessing knowledge of our food and fiber system (Frick, 1991). Individuals possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture (Frick, 1991). However, many Americans know little about agriculture and its role in society. Leaders in the agriculture industry, realizing that more Americans know less about the nature and scope of agriculture, proposed agricultural literacy to become a major function of the agricultural education profession (Strategies to Promote Agricultural Literacy, 1992).

Goal Number 1 from the National Summit on Agricultural Education (1989) was "To update instruction in and expand programs about agriculture." To expand programs about agriculture meant making people more aware about agriculture and the related industry. Agricultural literacy efforts were also to help produce informed citizens who would be able to more fully participate in the establishment of policies which support a high competency of agricultural understanding in their country and abroad (Strategies to Promote Agricultural Literacy, 1992).

The Committee on Agricultural Education in Secondary Schools (1988) published the report Understanding Agriculture: New Directions for Education, devoting one entire section to agricultural literacy. The Committee reported on many disturbing trends regarding agricultural literacy and made recommendations on how agricultural literacy could be promoted in our nation's schools.

Various researchers have concluded that elementary school children know very little about agriculture, its social and economic significance, and particularly, its links to human health and environmental quality (Committee on Agricultural Education in Secondary Schools, 1988). Horn & Vining (1986) found that fewer than 30 percent of students surveyed in Kansas gave correct answers to relatively basic questions on agriculture. In Virginia, fourth grade students only had rudimentary concepts of where their food and fiber originated (Oliver, 1986). In fact, these students were not even curious to find out where their food and fiber came from. Research in Oklahoma concluded that students knew least about the concept that agriculture is historically significant to the development of our nation (Williams

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& White, 1991). Furthermore, low test scores revealed a low level of basic knowledge about agriculture among youth (Williams & White, 1991).

To make school-aged children across our nation more literate about agriculture, the Committee on Agricultural Education in Secondary Schools (1988) recommended that all students should receive at least some kind of systematic instruction about agriculture beginning in kindergarten or first grade and continuing through twelfth grade. Few systematic efforts are made to teach or develop agricultural literacy in students of any age (Committee on Agricultural Education in Secondary Schools, 1988). For students to receive such instruction, education leaders across the nation would have to develop and implement plans to foster school instruction about scientific, economic, and public health aspects of agriculture. Support materials would have to be developed to accomplish the goal of agricultural literacy. Whatever teachers wanted to do to promote agriculture could be done in existing courses; agriculture would not have to be taught separately.

The state of Ohio answered the call to make school-aged children more agriculturally literate. Through the support of the Ohio Agricultural Council, Ohio State University Extension, Ohio State University College of Food, Agricultural, and Environmental Sciences, and Ohio's agricultural community, AgVenture Magazine was developed to make fourth grade students aware about the importance of Ohio agriculture. AgVenture Magazine has been distributed to every public and private fourth-grade classroom in Ohio for the past four years. Three issues were published each year, one each during the fall, winter, and spring. Each issue discussed a particular topic or dealt with a specific theme.

The Editorial Review Board to AgVenture Magazine, consisting of fourteen members, meets to discuss the content of each issue and make recommendations to its content and format before an issue is published. Each major commodity group in Ohio has one representative on the Board. Four fourth-grade teachers also set on the Editorial Review Board to make sure the language and reading level of AgVenture Magazine is appropriate for fourth-grade students. Other members of the Board consist of the Executive Director of the Ohio Agricultural Council, two members of the Ohio Agricultural Council, and the author of this paper.

Individuals, businesses, and organizations who have donated their time and financial resources to support the production and distribution of AgVenture Magazine want to know how the magazine is being used in the classroom by fourth-grade teachers to promote Ohio agriculture. How well the content and activities of AgVenture Magazine makes elementary school students more literate about Ohio agriculture will determine whether support is provided in the future for such a project.

Teachers who teach their students about agriculture want a publication that provides current and relevant information about Ohio agriculture. This publication needs to be on an appropriate reading level for students and contain a variety of hands-on activities to help reinforce what students learn about agricultu . Ideas and suggestions from teachers on how AgVenture Magazine can be improved are important to the writers of AgVenture Magazine

as they plan and write future issues.

Purpose and Objectives

The purpose of the study was to identify those Ohio fourth-grade teachers who had used AgVenture Magazine during the 1993-94 school year and describe how they used AgVenture Magazine in their classrooms to make their students more literate about Ohio agriculture. The specific objectives of the study were to:

1) describe Ohio fourth-grade teachers on demographic characteristics;

2) identify ways fourth-grade teachers used AgVenture Magazine with their classes;

3) identify reasons why fourth-grade teachers did not use AgVenture Magazine with their students;

4) identify other resources fourth-grade teachers used when teaching their students about agriculture; and

5) describe fourth-grade teacher perceptions regarding AgVenture Magazine and its effectiveness in promoting Ohio agriculture.

Methods/Procedures

Descriptive-survey research methods were used to collect data for the study. The target population was all public school and private school fourth-grade teachers in Ohio (N = 6,046). A randomly-selected sample of 750 fourth-grade teachers was mailed a two-part questionnaire to complete. Part one of the questionnaire collected demographic data on Ohio fourth-grade teachers using both open-ended and closed-ended questions. Part two contained 13 Likert-type statements, using a four-point scale (1 = strongly disagree to 4 = strongly agree), to determine fourth-grade teacher perceptions regarding the content, activities and educational value of AgVenture Magazine in promoting Ohio agriculture.

A panel of experts who were specialists in 4-H youth development and familiar with the content and organization of AgVenture Magazine reviewed the questionnaire and determined that the questionnaire had content validity. Minor changes in wording were recommended to the questionnaire to improve clarity of some statements. A Cronbach's alpha coefficient of .92 was calculated post-hoc on part two of the instrument from usable responses, indicating that the Likert-type scale was reliable.

After three mailings, the final usable response rate was 58 percent (N = 423). An analysis was done to determine if significant differences existed between early and late responders. There were no significant differences between early and late responders. Since late responders are similar to non-responders (Miller & Smith, 1983), no additional follow-up

was considered necessary. It was assumed that findings from the sample were generalizable to the population from which it was gathered. However, some respondents indicated they did not teach fourth grade, suggesting that the sampling frame used for the study was contaminated. Based on this fact, the results should be generalized only to the sample that responded in the study.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Release 4.1). Descriptive statistics, including frequencies, percentages, means, and standard deviations were used to summarize data.

Results and Findings

Demographic Characteristics

The average Ohio teacher responding in the study was female, had 17 years of teaching experience, taught in a city school system, taught fourth grade, had 27 students in the class last year, was not raised on a farm, and currently did not live on a farm. A majority (70 percent) of teachers did not know if agricultural education programs or FFA chapters existed in their school district, had not taken their class to participate in a Food for America Program (98 percent), and had not attended an Ag-in-the Classroom Workshop (97 percent).

Uses of AgVenture Magazine

Teachers used AgVenture Magazine an average of 8.6 hours per school year with their students. Table 1 reports the classes in which teachers used AgVenture Magazine. AgVenture Magazine was used the most in social studies classes (f = 220) and was used the least in math classes (f = 77).

Reasons for Not Using AgVenture Magazine

Teachers who did not use AgVenture Magazine with their students cited that they did not have time to use it with their students, they did not know about AgVenture Magazine, or simply were not interested in using it. Over one-half of the teachers who did not use AgVenture Magazine last year said they would use it this school year (1994-95) if they had the time.

Outside Resources Used By Teachers

Teachers used a variety of outside resources to assist in teaching their students about agriculture. Table 2 reports the various resources used by teachers when teaching their students about agriculture. The most commonly used outside resources cited by teachers included Ag-in-the-Classroom materials (f = 58), soil and water conservation districts (f = 52), and county extension agents (f = 46). The least-used outside resource by teachers were agribusinesses (f = 3).

Table 1. Frequency of Classes in Which Teachers Used AgVenture Magazine (n = 423)

Class	f	%
Language Arts	114	27.0
Math	77	18.2
Social Studies	220	52.0
Science	122	28.8
Introduce Careers	100	23.6
Environmental Issues	165	39.0
Other	31	7.3

Table 2. Outside Resources Utilized by Teachers using AgVenture Magazine (n = 423)

Outside Resource	f	%
Extension agents (4-H)	46	16.5
Agricultural education programs	20	7.2
FFA Chapters	[illegible]	6.8
Farm Bureau	8	2.9
Ag-in-the-Classroom	58	20.8
Agribusinesses	3	1.1
Local Cooperatives	11	3.9
Soil and Water Conservation Districts	52	18.6
Other Resources	11	3.9

Some teachers used extension programs and projects available through their county and State 4-H office. The frequency of such programs being used by teachers is reported in Table 3. The most commonly used extension projects were Exploring Plants (f = 48) and The Incredible Egg (f = 46). The least used extension project was a newly created project Fishy Science (f = 11).

Table 3. Extension Programs and Projects Used by Teachers with AgVenture Magazine (n = 423)

Program/Project	f	%
Acorn to Oaks	28	10.0
Blue Sky Below My Feet	20	5.7
Exploring Animals	30	10.8
Exploring Plants	48	17.2
Fishy Science	11	3.9
The Incredible Egg	46	16.5
Other Extension Programs	5	1.8

Teacher Perceptions Regarding AgVenture Magazine

Overall, teachers had positive perceptions regarding AgVenture Magazine. Table 4 reports the means for these 13 statements. Mean scores on the 13 Likert-type statements ranged from 3.07 to 3.49. The highest rated statement was "AgVenture provides valuable agricultural information for my students" (M = 3.49, SD = .50). The lowest rate statement was "The Pretest and Posttest provided in the Teacher's Guide are valuable in helping me determine students' knowledge about agriculture" (M = 3.07, SD = .59).

Teachers were also asked to respond to a series of open-ended questions dealing with that they specifically liked about AgVenture Magazine and the corresponding Teacher's Guide and how each could be improved. Teachers liked the fact that the magazine was "user-friendly" and helped make students aware about careers in agriculture. Teachers wished the magazine would contain more hands-on activities for students to do to help them practice agriculture.

Table 4. Teachers Perceptions to Various Aspects of AgVenture Magazine

Statement	n	Mean	s.d.
AgVenture provides valuable agricultural information for my students.	274	3.49	.50
The content of AgVenture is relevant to current curriculum needs.	277	3.27	.58
Integrating AgVenture into subject areas is easy.	275	3.19	.60
My students find AgVenture to be fun and exciting.	269	3.26	.56
My students find AgVenture to be informative.	274	3.32	.49
AgVenture contains appropriate learning activities for students to apply what they have learned about agriculture.	276	3.26	.51
Terms used in AgVenture are at an appropriate reading level for fourth-grade students.	273	3.17	.57
AgVenture is organized in a logical manner.	277	3.29	.49
The Teacher's Guide to AgVenture is easy to use.	269	3.31	.51
The Teacher's Guide to AgVenture is organized in a logical manner.	268	3.30	.49
The Teacher's Guide provides helpful suggestions for integrating agriculture into the core curriculum.	261	3.28	.51
The Pretest and Posttest provided in the Teacher's Guide are valuable in helping determine students' knowledge about agriculture.	232	3.07	.59
The Discussion Prompters in the Teacher's Guide help me get my students talking about agriculture.	253	3.18	.50

Scale: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree

Conclusions/Recommendations/Implications

Teachers in Ohio use AgVenture Magazine in a variety of classes to teach their students about the importance of Ohio agriculture. Teachers used few outside resources to help teach their students about agriculture and its importance to society. Teachers who used AgVenture Magazine had positive perceptions regarding the content,. activities, and educational value of AgVenture Magazine. However, there were still those teachers who either lacked the time or commitment to use AgVenture Magazine to make their students more literate about Ohio agriculture.

While many results and comments from teachers are positive, there are some concerns that must be addressed if AgVenture Magazine is to continue to have a positive impact in improving agricultural literacy among students in Ohio. The main concern is getting teachers to use AgVenture Magazine. Many teachers either do not have the time to use it or simply do not want to find time to incorporate AgVenture Magazine into their curriculum. Further follow-up should be conducted to help teachers understand the benefits of using AgVenture Magazine and suggest ways to incorporate the magazine into the core curriculum.

Another concern deals with to whom AgVenture Magazine is being mailed. While AgVenture Magazine is geared to fourth-grade students, past issues of AgVenture Magazine have been sent to teachers from kindergarten to eighth-grade. A conscious effort needs to be made by those who distribute AgVenture Magazine to see that an accurate and up-to-date list of fourth-grade teachers is available when mailing AgVenture Magazine.

A third concern is the fact that many teachers are unaware that agricultural education programs and FFA chapters exist within close proximity of their schools. There are many agricultural education programs and FFA chapters that are within reasonable distance to these schools that can assist in helping teachers provide relevant and up-to-date information about agriculture. One avenue that agricultural education programs and FFA chapters can use to promote agriculture is by conducting Food For America Programs Agricultural education programs and FFA chapters should correspond with local elementary school teachers to offer their assistance throughout the school year in promoting Ohio agriculture.

To help ensure that AgVenture Magazine continues to help improve agricultural literacy in the state, the following recommendations are offered to the Editorial Review Board for their consideration:

1) include in the Teacher's Guide science experiments or other similar activities that can help students apply agricultural principles and concepts;

2) print in the Teacher's Guide a list of outside resources (names, addresses, and phone numbers) teachers may contact to get additional information about agriculture;

3) include in the student magazine places where students can write to get more information about agriculture;

4) work with elementary education specialists to assure that the reading level is appropriate for the grade level AgVenture Magazine intends to educate and inform;

5) include a section in the student magazine that encourages parents to help their child understand the importance of Ohio agriculture;

6) use fourth-grade teachers on the Editorial Review Board to provide assistance when planning future issues of AgVenture Magazine; and

7) continue to provide suggestions to teachers on how to integrate AgVenture Magazine into the core state curriculum.

The following are recommendations for further research in agricultural education:

1) replications of this study should be done on a periodic basis to gather demographic information on teachers who are using AgVenture Magazine;

2) replication of this study should be completed on a periodic basis to gather information on how improve AgVenture Magazine;

3) conduct a study of students' perceptions on AgVenture Magazine;

4) conduct a study to determine if AgVenture Magazine helps increase students knowledge about agriculture; and

5) conduct a study to determine if future support should continue be provided by individuals and organizations.

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HOW OHIO TEACHERS USE AGVENTURE MAGAZINE
TO INCREASE AGRICULTURAL LITERACY
AMONG THEIR STUDENTS

Discussant
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Agricultural literacy is a topic that has been given a great deal of discussion within the agricultural education profession. This study provided a look at a directed literacy effort in the state of Ohio. The researcher provided a good foundation for the study and a clear description of the Agventure Magazine and how it is developed and how it is expected to be used.

The researcher was clear in the purposes and objectives of the study, and the procedures were complete and easy to follow. The researcher takes care to limit the generalizability of the study based upon possible frame error.

The data reported how much and in what subjects the magazine was used in teaching but it was never clear the percent of teachers responding that actually used the magazine. This in turn makes it hard for the reader to determine importance of the responses related to those who did not use the magazine. Were teachers' perceptions of the magazine limited to those teachers who had used the magazine in class?

The researcher recommends that agricultural education programs and FFA chapters try and work more closely with elementary teachers relating to agricultural literacy. Are agricultural education teachers aware of the Agventure Magazine? How could they and their students be used in the development and implementation of hands-on activities for the fourth grade students? Has the Editorial Review Board considered the inclusion of secondary agricultural educators in planning and writing for the magazine?

The researcher is to be commended for doing the follow-up study on what appears to be a very costly project. As suggested in the needs for further research, funding sources must know that their money is being well spent with positive results if the funding stream is to continue.

Too often instructional materials are developed without the input of those who are to use them. This study asks important questions that provide the basis for change and further development of what can be an important teaching tool about agriculture in the state of Ohio. This vehicle for agricultural literacy might deserve review in other states as well.

A COMPARISON OF THE CAREER CHOICE AND JOB SATISFACTION OF SCHOLARSHIP RECIPIENTS WITH NON-SCHOLARS IN A COLLEGE OF AGRICULTURE

Steven D. Fraze Rudy A. Ritz*

Introduction and Theoretical Framework

Since 1957 the Houston Livestock Show and Rodeo (HLS&R) Scholarship program has assisted young people pursuing degrees in higher education. One hundred scholarships are awarded annually to graduating high school seniors who were active in 4-H and FFA. Fifty scholarships are awarded to 4-H members. The other fifty are awarded to members of the FFA organization. In recent years, the HLS&R scholarship program awarded $800,000 annually in scholarships to 4-H and FFA scholars. In 1993, the scholarship program increased to $1 million annually (HLS&R Program, 1994).

Scholarship are awarded to individuals based on academic talent, FFA/4-H leadership, and financial need. The academic criteria include standardized test scores, rank in class, and high school grades. In the past, scholars have been limited to those majoring in the the fields of agricultural science. The HLS&R scholarship program has sought to increase leadership in agriculture by encouraging outstanding students to enroll in agricultural programs. In 1991, the scholarship program permitted students to major in biotechnology and textiles outside agricultural programs (Couch, 1993).

Many students majoring in agriculture at Texas colleges and universities have benefited from the scholarship program. These benefits are not solely financial. The academic requirements recipients must meet provide an incentive to excel in school. Students are required to file reports to HLS&R on completion of each college semester. The scholarship is awarded on an installment payment to the college/university each semester (Couch, 1993).

The scholarship program has proven to be successful while students are in college. Retention rates and grade point average have been measured and indicate scholarship recepients excel (Weeks, 1989). However, there has been no measure of success after college. Researchers contend that the success of educational programs, or of the college degree earned, is measured in terms of career choice and job satisfaction (Fraze, 1986; Weeks, 1989). In order to measure the success of the HLS&R Scholarship program, the post-college success of HLS&R Scholarship recipients must be evaluated.

Cheek and McGhee (1987) stated that effective evaluation is necessary for improving educational programs. This study will determine if there is a need for revision of existing scholarship programs. Just as an educational institution evaluates a class or program, the HLS&R scholarship program should do the same. The large sum of money invested in future collegiate students is very important to the HLS&R. The standards, requirements, and specification should be reviewed at regular intervals.

Since 1957, more than 3,000 students have received HLS&R Scholarships at a cost exceeding $24 million. Seven different scholarship programs exist within the HLS&R: 4-H, FFA, Go Texan, School Art, Metropolitan, Endowment and Dedicated Endowment. Currently, the 4-H / FFA scholarships are the largest of the programs listed above. In 1993, HLS&R recipients in the two organizations received scholarships worth $10,000 each. Fifty scholarships per organization were awarded (HLS&R Program, 1994). The

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large sums of money provided by the HLS&R should be carefully invested. The long-term benefits of the generous donations need to be evaluated.

The HLS&R awarded its first scholarship in 1957. A student studying agriculture at Texas A&M College was the recipient. The HLS&R has grown to become the largest donor of agricultural scholarships in the world (HLS&R Program, 1994). Each year the HLS&R invests $2 million to support scholarships, research, endowments, and educational projects across the State of Texas (HLS&R Catalog, 1992).

Weeks (1989) stated that although organizations and corporations target scholarships to specific fields of study, they have little information about the return on their investment. According to Weeks, the importance of an individual's career success is equal to evaluation of collegiate success.

Studies and related literature mentioned indicate the significance of targeted scholarship programs. A study by Cheek and McGhee (1990) shows that follow-up on graduates' career patterns will represent the effectiveness of an educational program.

The status of HLS&R graduates' involvement in agriculture was reviewed by a Texas A&M University study (Department of Agricultural Education, 1983). The study found that 50% of HLS&R Scholarship recipients stayed in the agricultural industry after graduation. Fifty percent of those not in an agriculturally related field had worked in agriculture for a short time after college and were involved in at least one agriculturally related organization.

Russell and Thompson (1993) concluded that groups with more positive beliefs and intentions towards careers in agriculture are people with formal education beyond high school. Moreover, these groups were residents of large urban communities. Beliefs and intentions of minorities were virtually the same as those of whites.

The career choice of program completers of secondary vocational agriculture was reviewed by Fraze (1986). He found individuals in a balanced FFA program of activities tended to enter agricultural careers at a higher rate than those who had high participation in one activity. Fraze also found that 60% of program completers received post-secondary education of some type.

Wrye's (1992) study on occupational status and needs of the College of Agricultural Sciences and Natural Resources graduates of Texas Tech University showed a list of descriptors of the population. She found that "Most of the respondents were employed as either Scientists, Engineers or Related Specialists, Agricultural Production Specialists, or as Managers and Financial Specialists." Wrye's conclusions also showed that the largest percentage of the respondents' salaries were in the range of $ 25,000 - $ 29,000 within five years of graduation.

The career choice of the graduates of the College of Agricultural Sciences and Natural Resources who were HLS&R Scholars reflects on the educational experience of the student. The occupational status of HLS&R scholarship recipients who graduated from Texas Tech University has not been assessed according to current literature.

Job satisfaction has been a common research topic in psychology. Weeks (1989) included a comparison of job satisfaction of HLS&R scholars with opportunity award scholars (targeted vs. non-targeted). Weeks found that both groups had high degrees of general satisfaction.

Bowen and Radhakirshna (1991) found that agricultural education faculty are very satisfied with their jobs. Claycomb and Steward (1980) compared job satisfaction of instructors of secondary vocational agriculture with young adult farmers. They did not show any significant differences of levels of satisfaction. However, when enrollment in secondary agricultural science was introduced as a variable, there was a significance difference in satisfaction. Instructors of agriculture who had not enrolled in high school agriculture were less satisfied with their jobs than young adult farmers who had been enrolled.

Desy, Mertins, and Gardner (1984) reported on graduates enrolled in vocational education. They concluded that satisfaction with job rewards was not solely attributable to pay even though satisfactory pay is one element of satisfaction.

When job satisfaction is addressed, most researchers deal with factors other than family or personal life. Odell, Cochran, Lawrence, and Gartin (1990) found that satisfaction on the job is not entirely dependent on work related factors. Marital satisfaction and status, children at home, and time away from home were significant to job satisfaction of agriculture teachers. The authors recommended further research on other factors which may predict job satisfaction.

Post-college community participation was reviewed by Weeks (1989). Weeks concluded that HLS&R Scholars were significantly more active in their communities than opportunity award scholars. There may be a relationship between job satisfaction and community participation according to Weeks.

Purpose and Objectives

The major purpose of the study was to compare career choice and job satisfaction of graduates of the College of Agricultural Sciences and Natural Resources at Texas Tech University who were HLS&R Scholarship recipients with graduates of the College of Agricultural Sciences and Natural Resources who were not HLS&R Scholarship recipients. As a means of accomplishing this purpose, the following objectives were pursued:

1. compare the career choice of HLS&R Scholars to Non-Scholars;
2. describe the populations in terms of selected personal characteristics;
3. compare job satisfaction of HLS&R Scholars to Non-Scholars.

Methods and Procedures

An ex post facto research design was the research method of this study. The population for the study was graduates from May 1986 through May 1992. The sample consisted of 83 graduates of the College of Agricultural Sciences and Natural Resources who were HLS&R Scholarship recipients in 4-H and FFA. The HLS&R Scholars were compared to 83 randomly selected graduates of the College of AS&NR who were not HLS&R Scholars.

A questionnaire was developed to obtain information on the career choice of graduates, personal characteristics of the graduates, and level of job satisfaction of the graduates. Using a review of literature, questions for the instrument were gathered. The questionnaire was reviewed and revised by a panel of experts consisting of faculty of the Department of Agricultural Education and Communications at Texas Tech University. Revisions were also made by recommendations from a group of graduate students enrolled in a research methods course.

The questionnaires for each of the sample groups differed slightly. HLS&R Scholars were asked questions relating to the scholarship in the first section. Non-scholarship graduates were asked questions pertaining to financial aid not related to HLS&R on the same section. The remaining portions of the questionnaires were identical.

The first section of the questionnaire was designed to collect personal data and background characteristics. Some questions were in a multiple answer format where the answer was selected by placing a check in the provided space, while other questions were open-ended. Respondents were asked to provide information in the space provided.

Section II of the instrument was designed to collect job satisfaction levels of the participant. After a review of relevant literature, the short-form of the Minnesota Satisfaction Questionnaire (MSQ) developed by Weiss, Dawis, England, and Lofquist (1967) was selected. The MSQ is a reliable and valid instrument. Permission to use the MSQ (copyright 1977) was granted by Vocational Psychology Research, University of

Minnesota. A royalty fee of $ .35 per instrument was paid to the University of Minnesota. The MSQ has 20 items, each indicating a category of job satisfaction. Responses for items are made on a 5-point Likert-type scale with Very Dissatisfied being the lowest ranking, and Very Satisfied being the highest.

The short-form MSQ consists of three scales: General Satisfaction, Intrinsic Satisfaction, and Extrinsic Satisfaction. The General Satisfaction scale is a summary of all 20 items and measures an individual's overall job satisfaction. The Intrinsic Satisfaction scale measures an individual's satisfaction with internal factors on the job. The Extrinsic Satisfaction scale measures satisfaction with an individual's external job factors.

On February 28, 1994, a cover letter, questionnaire, and postage-paid return envelope were mailed to both sample groups. The cover letter was printed on official letterhead of the Department of Agricultural Education and Communications at Texas Tech University and signed by the committee chairman and the researcher. Participants were asked to respond by completing the questionnaire and returning it to the researcher by March 10, 1994. On April 1, 1994 a second cover letter, questionnaire, and postage-paid return envelope were mailed to non-respondents from the first mail-out. The final response rate was 73.5 % of the HLS&R Scholars (62) and 56.6 % of the Non-Scholars (47).

Results and Findings

The purpose of this study was to compare career choice and job satisfaction of graduates of the College of Agricultural Sciences and Natural Resources at Texas Tech University who were Houston Livestock Show and Rodeo Scholarship Recipients with non-scholarship graduates. The data are organized to correspond with the objectives of the study.

Objective 1

The following tables compare the career choice of Houston Livestock Show and Rodeo scholarship recipients (HLS&R Scholars) to non-scholarship graduates (Non-Scholars). The participants in the study were asked if their current job was in the field of agriculture (Table 1). Seventy-six percent of the Non-Scholars indicated that they are

Table 1. Respondents' Answers to the Question "Is your present job in the field of Agriculture?"

Response	Group					
	HLS&R Scholars		Non-Scholars		Combination	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
No	25	40.3	11	23.4	36	33.0
Yes	37	59.7	36	76.6	73	67.0
TOTALS	62	100.0	47	100.0	109	100.0

working in agricultural jobs. Only 59% of the HLS&R Scholars were employed in the agricultural industry. Combined data for the total of both groups is shown in the fourth column.

Respondents who indicated they were not presently working in agricultural jobs were asked, "Did you ever work in the field of agriculture?" Table 2 shows that 10% of the Non-Scholars and 25% of the HLS&R Scholars had never worked in agriculture.

Those previously employed in agricultural jobs consisted of 12.8% of the Non-Scholars compared to 14.5% of the HLS&R Scholars. Combined data for the total of both groups is shown in the fourth column.

Table 2. Respondents' Answers to the Question "Did you ever work in the field of Agriculture?"

Response	Group					
	HLS&R Scholars		Non-Scholars		Combination	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Never	16	25.8	5	10.6	21	19.3
Previously	9	14.5	6	12.8	15	13.8
Currently	37	59.7	36	76.6	73	67.0
TOTALS	109	100.0	47	100.0	109	100.0

Participants who said they never worked in the field of agriculture were asked, "Why did you never enter the field agriculture?" The responses from both groups were recorded. Participants who answered that they previously worked in agriculture but are not presently were asked, "Why did you leave the field of agriculture?" Responses from both groups were recorded.Respondents were also asked to report their current occupation. The responses were also recorded.

Table 3. Number of Years on Present Job

Response	Group					
	HLS&R Scholars		Non-Scholars		Combination	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
0-1	22	36.0	12	25.5	34	31.5
2-3	23	37.8	18	38.3	41	38.0
4-5	10	16.4	8	17.0	18	16.6
6-8	6	19.8	9	19.2	15	13.9
TOTALS	61[a]	100.0	47	100.0	108	100.0

[a] one missing case

Table 3 displays the number of years respondents' have held their present job. More than one-third of both the Non-Scholars (38.35%) and the HLS&R Scholars (37.8%) have been on their present job for two to three years. Of the respondents, 36.2% of the Non-Scholars reported they had been in their current job four to eight years compared to 36.2% of the HLS&R Scholars. Combined data for the total of both groups are shown in the fourth column.

Objective 2

The second objective of this study was to describe the population in terms of personal characteristics. The following tables include personal information of HLS&R Scholars and Non-Scholars.

Of the respondents, 32.3% of the HLS&R Scholars and 19.1% of the Non-Scholars reported to be agricultural economics majors (Table 4). Agricultural education was the major of 14.5% of the HLS&R Scholars and 25.5% of the Non-Scholars. Agricultural communications majors composed 17.7% of the HLS&R Scholars and 8.5% of the Non-Scholars. Animal business and food technology each composed of 6.5% of the HLS&R Scholars. Non-Scholars also majored in land use planning (8.5%), animal production (6.4%), and range management (6.4%). Combined data for the total of both groups are shown in the fourth column.

Table 4. Undergraduate Major

Response	HLS&R Scholars		Non-Scholars		Combination	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Agricultural Economics	20	32.3	9	19.1	29	26.6
Agricultural Education	9	14.5	12	25.5	21	19.3
Agricultural Communications	11	17.7	4	8.5	15	13.8
Animal Business	4	6.5	1	2.1	5	4.6
Animal Production	3	4.8	3	6.4	6	5.5
Animal Science	5	8.1	1	2.1	6	5.5
Crops	3	4.8	2	2.4	5	4.6
Ornamental Horticulture	0	0.0	1	2.1	1	0.9
Land Use Planning	0	0.0	4	8.5	4	3.7
Production Horticulture	1	1.6	2	4.3	3	2.8
Pre-Veterinary Medicine	2	3.2	0	0.0	2	1.8
Range Management	0	0.0	3	6.4	3	2.8
Range Science	0	0.0	1	2.1	1	0.9
Wildlife Management	0	0.0	2	4.3	2	1.8
Food Technology	4	6.5	2	4.3	6	5.5
TOTALS	62	100.0	47	100.0	109	100.0

Graduate school attendance is displayed in Table 5. More than one-half (58.1%) of the HLS&R Scholars were attending or completed graduate school. Of the Non-Scholars, 29.8% reported that they were attending or completed graduate school. Combined data for the total of both groups are shown in the fourth column.

Table 5. Graduate School Attendance

Response	Group					
	HLS&R Scholars		Non-Scholars		Combination	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Did not attend	26	41.9	33	70.2	59	54.1
Attending or Completed	36	58.1	14	29.8	50	45.9
TOTALS	62	100.0	47	100.0	109	100.0

A majority (51.1%) of the Non-Scholars were not recipients of any scholarships while attending Texas Tech University (Table 6). The respondents of the Non-Scholar group who received some type of scholarship consisted of 23 respondents (48.9%). The scholarships discussed in the Non-Scholar data were not HLS&R scholarships.

Table 6. Non-Scholar Respondents Who Were Scholarship Recipients.

Response	Group	
	Non-Scholars	
	Freq.	Percent
No Scholarships	24	51.1
Scholarship Recipients	23	48.9
TOTALS	47	100.0

Table 7 shows the distribution of 4-H or FFA scholarship awards in the HLS&R Scholar group. Of the respondents, 54.8% of the HLS&R Scholars received scholarships through the FFA. Less than one-half (45.2%) of the HLS&R Scholars were 4-H recipients.

Table 7. HLS&R Scholarship 4-H or FFA Distribution of Awards

Response	Group	
	HLS&R Scholars	
	Freq.	Percent
4-H	28	45.2
FFA	34	54.8
TOTALS	62	100.0

Table 8 shows both the HLS&R Scholars and the Non-Scholars answers to the question "What would you have done if you had not received a scholarship?" Of the HLS&R Scholars, 69.3% reported that they would major in agriculture at Texas Tech compared to very large portion of the Non-Scholars (94.4%). In addition, 21.0% of the HLS&R Scholars reported that they would have chosen another major at TexasTech compared to 5.6% of the Non Scholars. Only the Non-Scholars who did receive a scholarship were asked to answer this question.

Table 8. Respondents' Answers to the question "What would you have done if you had not received a scholarship?"

Response	Group			
	HLS&R Scholars		Non-Scholars	
	Freq.	Percent	Freq.	Percent
Majored in agriculture at Texas Tech.	43	69.3	17	94.4
Chosen another major at Texas Tech.	13	21.0	1	5.6
Majored in agriculture at another college.	2	3.2	0	0.0
Attended another college/university.	4	6.5	0	0.0
Not attended any college/university.	0	0.0	0	0.0
TOTALS	62	100.0	18[a]	100.0

[a] five missing cases

Objective 3

The Minnesota Satisfaction Questionnaire (MSQ) was used to measure the job satisfaction of the HLS&R Scholars and the randomly selected Non-Scholars. The MSQ measures job satisfaction on a scale of 1 (very dissatisfied) to 5 (very satisfied) for the 20 items of the questionnaire (possible score of 100).

Normative data for the MSQ suggest a score of 75 or higher represents a high degree of general satisfaction. Scoring in the 26 to 74 range indicates average satisfaction. A score of 25 or lower represents a low level of satisfaction (Weiss et al., 1967).

Table 9 shows 75.8% of the HLS&R Scholars and 53.2% of the Non-Scholars scored 75 or higher on the general job sastisfaction scale of the MSQ indicating a high degree of satisfaction with their jobs. Twenty-four percent of the HLS&R Scholars and 46.8% of the Non-Scholars scored average.

Table 9. Distribution of General Job Satisfaction

Response	HLS&R Scholars Freq.	HLS&R Scholars Percent	Non-Scholars Freq.	Non-Scholars Percent
20-25 (low)	0	0.0	0	0.0
26-74 (average)	15	24.2	22	46.8
75-100 (high)	47	75.8	25	53.2
TOTALS	62	100.0	47	100.0

The distribution of intrinsic job satisfaction scores for the two groups is shown in Table 10. An intrinsic score of 45 or more indicates a high intrinsic satisfaction (Weiss et al., 1967). Of the respondents, 82.3% of the HLS&R Scholars scored 45 or higher compared to 63.8% of the Non-Scholars.

Table 10. Distribution of Intrinsic Job Satisfaction

Response	HLS&R Scholars Freq.	HLS&R Scholars Percent	Non-Scholars Freq.	Non-Scholars Percent
12-15 (low)	0	0.0	0	0.0
16-44 (average)	11	17.7	17	36.2
45-60 (high)	51	82.3	30	63.8
TOTALS	62	100.0	47	100.0

On the extrinsic job satisfaction scale, a score of 22 or higher would indicate high extrinsic job satisfaction (Weiss et al., 1967). Table 11 shows the distribution of scores on

Table 11. Distribution of Extrinsic Job Satisfaction

Response	HLS&R Scholars Freq.	HLS&R Scholars Percent	Non-Scholars Freq.	Non-Scholars Percent
6-7.5 (low)	0	0.0	0	0.0
7.6-22.4 (average)	31	50.0	30	63.8
22.5-30 (high)	31	50.0	17	36.2
TOTALS	62	100.0	47	100.0

the extrinsic job satisfaction scale. Of the respondents, 54.8% of the HLS&R Scholars scored higher than 22 compared to 38.3 of the Non-Scholars.

Table 12 shows that in all three catergories of job satisfaction that HLS&R Scholars had significantly higher job satisfaction scores than did Non-Scholars at $p<.05$.

Table 12. Relationship Between HLS&R Scholars and Non-Scholars and Job Sastisfaction

Job Satisfaction	Correlation Coefficient[a]
General Job Satisfaction	.26*
Intrinsic Job Satisfaction	.21*
Extrinsic Job Satisfaction	.17*

[a]Point Biserial Coefficient. A positive relationship means HLS&R Scholars had a significantly higher job satisfaction than did Non-Scholars.

*Significant at the .05 level of significance

Conclusions and Recommedations

The analysis of collected data in this study produced the following conclusions:

1. Fewer HLS&R Scholars selected careers in the field of agriculture than Non-Scholars. (This may be seen as a positive result since the individuals from agricultural backrounds are entering non-agricultural groups. Therefore, agricultural literacy will increase among these non-agricultural people.)

2. There was a significant difference ($p<.05$) in general job satisfaction, intrinsic job satisfaction, and extrinsic job satisfaction between the HLS&R Scholars and the Non-Scholars. In all three categories, the mean scores were significantly higher for the HLS&R Scholars than for the Non-Scholars. The three scales of job sastisfaction were evaluated by using the short form of the Minnesota Satisfaction Questionnaire.

The following recommendations are made based on the conclusions of this study:

1. The HLS&R should continue the current 4-H and FFA scholarship programs.

2. The HLS&R should continue the current 4-H and FFA scholarship program to promote agricultural literacy. Since many HLS&R Scholars select non-agricultural careers, they have the opportunity to educate non-agricultural groups about their agricultural experience.

3. The high level of job satisfaction for the HLS&R Scholars should be publicized.

Based on the findings of this study, the following suggestions are made for further research:

1. Research is needed on the relationship of career choice and job satisfaction of HLS&R Scholars.

2. A replication of this study at other Texas universities having academic programs in agriculture is needed.

3. Scholarship programs similar to the HLS&R Association Scholarship should review the occupational status of graduates earning agricultural degrees.

Results and recommendations from this study will be of practical use to universities and colleges. Many educational institutions conduct their own scholarship programs. The findings from this study will assist colleges, universities, and non-profit organizations in evaluating their scholarship programs.

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A COMPARISON OF THE CAREER CHOICE AND JOB SATISFACTION OF SCHOLARSHIP RECIPIENTS WITH NON-SCHOLARS IN A COLLEGE OF AGRICULTURE

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Accountability and determining if money is being well-spent have been hallmarks of education in the 1990's. therefore it seems appropriate to look at the scholarship programs that support education as well. The authors developed the theoretical framework for the study. It was interesting to see the added dimension of job satisfaction with career choice in looking at the scholarship program.

The researchers had a clear purpose and objectives for the study and provided a concise review of the methods and procedures. The researchers are to be commended on using a standardized instrument with established reliability for the collection of the job satisfaction data.

The researchers were very complete in their presentations of the findings of this study. In at least one place they referred to information that was recorded but not presented. The readers' interest about how respondents answered the questions was piqued but never satisfied. Please don't lead the reader on.

The conclusion that the high percentage of the Houston Livestock Show and Rodeo scholars selecting careers outside of agriculture could be viewed as a positive result was surprising. The concept of students trained in agriculture entering non-agricultural careers as a means of increasing agricultural literacy is one that should be pursued more fully. How did or would the scholarship contributors view this finding? Would other scholarship contributors in other agricultural areas interpret this finding as positive?

This paper can provide us with an opportunity to discuss some differences in opinion in the profession related to the presentation of research. The authors provide complete information on some data in both complete text and table form -- is that a practice that is not necessary or expected? How abbreviated can authors be and still help the readers understand the data and the rationale for conclusions and implications? Do authors at times, when confined by page limits, relegate the answering of the infamous "so what" or significance question to a place of lesser importance in order to be very specific in discussing procedures and data?

FOOD AND AGRICULTURAL AWARENESS OF LAND GRANT UNIVERSITY EDUCATION FACULTY

Jack Elliot Marty Frick*

Introduction and Conceptual Framework

Agricultural literacy or a lack thereof is a direct result of the transition from a rural to an urban concentration in population. The knowledge base about agriculture becomes further removed from the vast majority of Americans over time. As a result, today's population is ill equipped to make informed decisions about food and fiber in their personal lives (Mayer & Mayer, 1974; NAS, 1988; & Tisdale, 1991). Of great concern to agriculture, the loss of knowledge means that a poorly informed public majority has input in policy decisions that may affect the agricultural industry's ability to function efficiently in an increasingly competitive world market (NAS, 1988). Communicating accurate agricultural information that is clear, concise, and complete is necessary for the population to make informed personal and public decisions.

It is important to understand the public's knowledge and opinions toward agriculture. However, it is of utmost importance to understand the way that a given population assimilates information on which it bases its decisions and/or choices. That population is teacher educators. They are the professionals who prepare the teachers for today's primary and secondary schools. Their impact on young people is multiplied exponentially as each class of new teachers enters the workforce.

Consensus by many leading agricultural professionals, and verified in various recent studies, indicates that an increasing proportion of the population is unable to answer questions posed about basic agricultural concepts - i.e., they are not agriculturally literate (ECOP, 1987; Elliot & Dado, 1992; Horn & Vining-Koch, 1986; NAS, 1988; Perry, 1989; Russell, et al. 1990; Zurbrick, 1990 & Zurbrick, 1991). This study measured and assessed two components that are integral to one's agricultural literacy - knowledge base and opinions. Underlying forces that contribute to the formation of one's knowledge base and opinions, and that were foundational to this study are presented in the conceptual framework.

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CONCEPTUAL FRAMEWORK

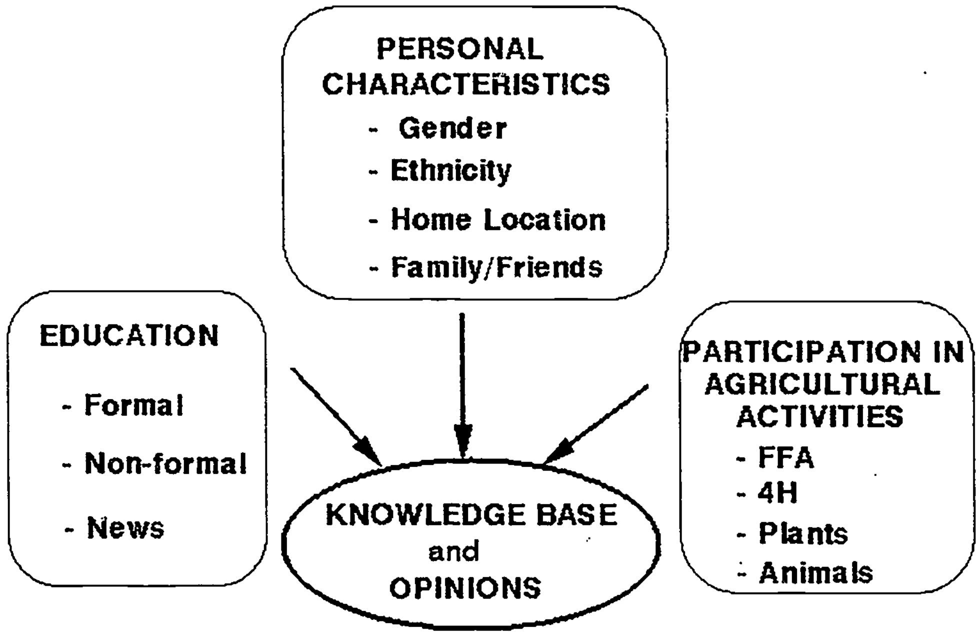

Figure 1. Conceptual Framework

Purpose and Research Questions

The purpose of this study was to determine the agricultural knowledge base and opinion levels of Land Grant University Education faculty. The research questions developed to address the above stated purposes were:

1. What was the agricultural knowledge base of Land Grant University Education faculty?

2. What level of agreement (opinions) toward agricultural issues was held by Land Grant University Education faculty?

3. What relationships existed among the respondents' knowledge base, opinions and demographics?

4. What are the critical issues related to agriculture?

5. Who is responsible for educating the populace about agriculture?

Methods and Procedures

The research employed a descriptive survey design, using a mail survey technique, and may be described as a descriptive and relational study. An 80-statement instrument was modified from an existing instrument (Birkenholz, et al., 1992, Flood & Elliot, 1994)

A modified true/false format for the collection of knowledge base data was developed. Table 1 illustrates the knowledge coding process. The modified true/false format asked respondents to answer whether or not the first 40 statements were true or false, and additionally to indicate whether or not they were sure or not sure of their initial response. This technique allowed for the construction of a knowledge base continuum model (see Figure 2), and statistical analysis of the true/false data at the ordinal level.

A 4-point Likert scale was used for the collection of opinion data in statements 41-80. Validity was established by experts in the field. The instrument was pilot tested, and reliability coefficients, using the Cronbach's alpha method, were calculated at 0.79 for the knowledge base portion of the study, and 0.78 for the opinion portion of the study.

Table 1
Knowledge Coding Process

Participant Response	Descriptive Code	Coding Value
True or False and Sure Respondent is Correct	Sure Correct - SC	4
True or False and Not Sure Respondent is Correct	Not Sure Correct - NSC	3
True or False and Not Sure Respondent is Incorrect	Not Sure Incorrect - NSI	2
True or False and Sure Respondent is Incorrect	Sure Incorrect - SI	1

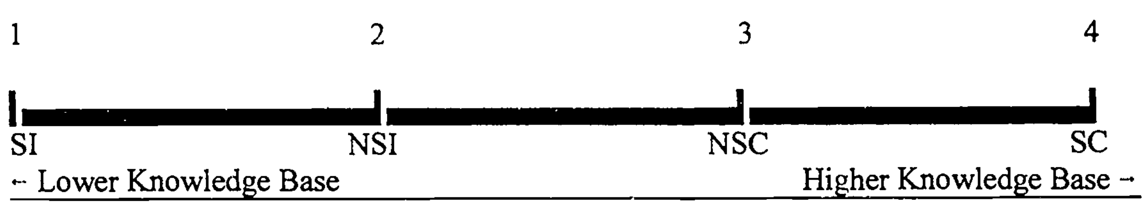

Figure 2. Knowledge base continuum model.

The target population for this study was College of Education faculty at land grant institutions. Due to time constraints and resource availability it was determined to limit the population to education faculties at only two land grant universities. At one land grant institution (The University of Arizona), agricultural education faculty held appointments within the College of Agriculture, whereas at the other land grant institution (Montana State University), agricultural education faculty held appointments within the College of Education.

The sampling units, education faculty, were determined by compiling a list of all full-time education faculty members in both universities. All education faculty members in both institutions were sent instruments. Fifty percent of the Montana State University Education faculty returned questionnaires. Forty-six percent of the University of Arizona College of Education faculty returned questionnaires. One should use caution when generalizing the results beyond the respondents due to a variety of possible selection bias concerns. Data were analyzed with SPSS/PC+, and employed frequencies, means, standard deviations, ANOVA, and t-tests as statistical measures. An alpha level of 0.05 was determined a prior.

Results and Conclusions

The following results should be viewed as generalizable only to the respondents:

Research Question 1

1. Grouped knowledge base analysis revealed that more than 8% of the accepting sample responded incorrectly to knowledge inquiries, and that 3% were sure of their incorrect responses. Two-thirds of the respondents were sure and correct (see Table 2).

2. A comparative group knowledge base analysis showed that 30% of the respondents were not sure of their responses about basic agricultural concepts (see Table 2).

Table 2

Grouped Analysis of Knowledge Base Assessment

Value	Label	Percent Response Montana	Arizona	TOTAL[1]
1	incorrect, sure	2.50	3.71	3.18
2	incorrect, not sure	5.17	6.45	5.88
3	correct, not sure	20.67	26.33	24.03
4	correct, sure	71.66	63.51	66.91
	TOTAL	100.00	100.00	100.00

[1]Note: Due to different number of respondents from the 2 institutions, the total is not an average of the two values, but an actual weighted figure.

Research Question 2

3. The grouped analysis for opinion assessment produced a mean of 1.94 on 4-point scale, placing the mean between strongly agree (1) and agree (2). A majority (80%) of the respondents felt favorable toward the opinion statements (see Table 3).

4. More than 82% of the respondents agreed that they need facts about agriculture in order to make informed decisions.

Table 3

Grouped Analysis of Opinion Assessment

Value	Label	Percent Response Montana	Arizona	TOTAL[1]
1	strongly agree	20.67	18.47	19.55
2	agree	64.20	56.25	60.11
3	disagree	14.62	16.01	15.35
4	strongly disagree	0.50	9.27	5.11
	TOTAL	100.00	100.00	100.00

[1]Note: Due to different number of respondents from the 2 institutions, the total is not an average of the two values, but an actual weighted figure.

Research Question 3

5. Individuals who raised plants responded to inquiries in the knowledge base portion of the study significantly higher than those with no such experience.

6. There were no significant differences on knowledge and opinion scores between those individuals with previous agricultural education experience and those individuals who reported no previous experience.

7. There were no significant differences on knowledge and opinion scores with the following variables: university, gender, home location, relatives or friends in farming or agricultural business, FFA and/or 4-H membership and experience raising animals.

Research Question 4

8. Environmental and food issues were ranked as more critical than media issue topics such as animal welfare (see Table 4).

Table 4

Mean Rank of Critical Issues Related to Agriculture[1]

Rank	Critical Issues	Mean Rank[2]
1	conservation of natural resources	2.41
2	agricultural practices that affect the environment	2.94
3	food safety	3.35
4	current government economic policies that impact production	3.35
5	rural economic resource base	3.59
6	animal welfare	5.35

[1]Note: 1=most critical to address and 6=least critical to address.
[2]Note: The mean scores from both institutions were combined in this table.

Research Question 5

9. Secondary agricultural education programs and state departments of agriculture are not perceived to be instrumental in addressing agricultural literacy (see Table 5). "Ag in the Classroom" and colleges of agriculture were not identified as important to this effort. Science education, farm and ranch groups and the Cooperative Extension Service were selected as more important to educating the populace on agriculture.

Table 5

Who Educates the Populace About Agriculture

Agency	Frequency[1]
Cooperative Extension Service	15
Science Education	9
Farm/Ranch Interest Groups	7
College of Agriculture	3
Ag in the Classroom	3
Other Agriculture Related Government Agencies	2
Secondary Agricultural Education Programs	2
State Department of Agriculture	1

[1]Note: The responses from both institutions were combined in this table.

Educational Importance of the Study and Recommendations

1. Education faculty knowledge and opinion levels indicated a good basic knowledge and opinion about agriculture, agricultural issues and who delivers agricultural education.

2. Education faculty did desire agricultural information in order to make accurate assessments about the issues. Effective educational programs need to be developed for that purpose, especially because they viewed themselves as more important than traditional agricultural education programs for educating the populace.

3. Further research is needed to assess the value of participation in 4-H, FFA, and other agriculturally related experiences as it relates to overall agricultural literacy.

4. Current formal agricultural education programs, both vocational and non-vocational efforts, should be reevaluated to incorporate content and delivery methods that will increase awareness about agriculture.

5. The results of this study indicate that perhaps the current method of assessing agricultural literacy may need to be reevaluated. In fact, these results lend support to a future study that would establish an agricultural literacy model.

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FOOD AND AGRICULTURAL AWARENESS OF LAND GRANT UNIVERSITY EDUCATION FACULTY

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Knowing what our counterparts in Colleges and Departments of Education know about agriculture and their opinions about critical agricultural issues can be of value to agricultural educators. This knowledge base can provide a basis for open discussion and the pursuit of agricultural literacy activities.

The theoretical framework provided a background in the area of agricultural literacy but did not help the reader understand why the population of the study was selected. The conceptual framework model presented should provide the profession with fertile ground for discussion.

The purpose of the study was clear, however the reader had difficulty with some of the research questions being somewhat vague. This made it hard to determine if some of the findings and conclusions were appropriate.

The procedures used were appropriate and easy to follow. The percent responding from each institution was included but it was never made clear how many responses were actually received from each institution. A later table totals 42 respondents. A notation was made that weighted means were used in place of a grand mean because of the differences in the sample size from each institution. This allows the reader to infer a large difference in the number of respondents between the institutions. Is this the case?

The researchers reported information on an opinion assessment. More detail related to the content of this assessment would be helpful to the reader in determining the value of the results presented and the appropriateness of the recommendations.

The conclusions and recommendations are appropriate and are within the purview of the study and the data presented.

A broader question for the profession might be the importance of a similar study with other university faculty such as those in arts, sciences and humanities which have frequent interaction with not only our students but other future teachers as well.

A COMPARATIVE STUDY OF THE PUBLIC'S KNOWLEDGE AND ASSESSMENT OF THE PURPOSE AND PROGRAMS OF THE TEXAS AGRICULTURAL EXTENSION SERVICE IN METROPOLITAN VERSUS NONMETROPOLITAN COUNTIES

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Introduction and Theoretical Framework

The Texas Agricultural Extension Service (TAEX) was created in 1915 by a joint resolution of both houses of the Texas Legislature that accepted the terms of the Smith-Lever Act (Haney, 1989). The organization has a proven history of success for improving the life of rural Texans. Historically, programming has been directed primarily at the rural population, and the service has experienced favorable support and funding (Meier, 1989). However, as we move into the mid '90s, it is a reality that not only Cooperative Extension Service programs, but all governmental agencies, have come under close scrutiny from both the general public and legislators. For such organizations to be responsive to needed changes, continuous assessment of the efficiency and effectiveness of their programming is crucial. Survival of any agency in today's environment of close examination demands a competent, potent, and responsive organization that can and will adjust in order to achieve its intended mission.

A major criticism of Extension today is that its "target" population, rural farmers, represents a far smaller portion of the population than it did in 1914. Warner and Christenson (1984) asked a pointed question: "Can an organization conceived in 1914 as a way to get farmers to adopt improved agricultural practices continue to be relevant when it celebrates its 100th birthday?" (p. 125). "Change is the one constant in today's world, and patterns of change are varied and mixed" (Extension Committee on Organization and Policy (ECOP), 1991, p. 1). TAEX has attempted to adjust programming to meet the new challenges presented by the rapid and constant change Texas is experiencing. Just as in many states, Texas has seen a large movement of the population from rural to metropolitan areas, resulting in an ever decreasing nonmetropolitan population. One of the greatest challenges facing TAEX is quality planning that will result in programs that will meet the needs of its changing clientele. To design effective strategies to implement appropriate educational programming, it is imperative that TAEX discern the characteristics of its audience.

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Nolan and Lasley (1979) discuss two questions relevant to Extension. "First, what's the current situation regarding the use of Extension services by the different segments of the agricultural community? Second, what client groups should Extension be working with if current trends continue?" (p. 21). How aware is the general public of TAEX purpose and programs? For any agency to be successful, potential clientele must be aware of the organization, its purpose, and potential value to the client (Katz, Gutek, Kahn and Barton, 1975). It might be assumed that traditional rural audiences would have a high degree of knowledge relating to TAEX activities and services, but the same assumptions cannot be made for non-traditional audiences. How many urban residents know TAEX exists? If they know of its existence, how much do they know about its programs and services? The need for dissemination of information about government services is considerably more acute in some service areas than others (Katz, et al., 1975).

Warner and Christenson (1984) found in their national study that less than half of those surveyed had ever heard of the Cooperative Extension Service. They also stated that awareness is an indicator of the image an organization projects to the public. "If a particular segment of the population is less aware of the organization and its programs, it is unlikely that they will become clientele or support the organization in the allocation of resources. An important reason for examining the image of Extension held by the general public is to be able to compare their perception with that of organizational leaders and policymakers" (p. 54).

The theoretical framework for this study was derived from work in evaluation and perception research. Several problems exist with long-range evaluation and perception studies. Warner and Christenson (1984) cited narrow focus, such as examining one specific program area, and agency bias as two major problems. Many of the studies have been conducted by Extension, USDA, or related agencies, and samples have often been composed primarily of Extension clientele. Agency evaluations are frequently criticized or ignored because they are seen as biased expressions of selected clientele by agency personnel (Warner and Christenson, 1984). Katz et al. (1975) indicated that many of the evaluation studies suffer from poor planning and inadequate implementation. "For the greater part they consist of monitoring techniques, cost-benefit analysis, case studies, secondary analyses of data gathered for other purposes, *ex post facto* measurements of the effectiveness of a single program, and non-systematic assessments by so-called experts. Generally the reactions of the recipients of a service program are neglected in evaluating the functioning of public agencies" (p. 8). "In spite of the popularity of the term *evaluation research*, there has been a conspicuous neglect of systematic assessment of the operations of public agencies and programs" (p. 180).

"Government agencies in particular have long been criticized for setting up informational feedback systems so limited that they safeguard the agencies from criticism and isolate them from adequate and valid information on matters of major relevance" (Katz, et al., 1975). Katz et al. further state:

The perceptions, attitudes, and experiential reports of people about specific government offices and procedures constitutes only one source of information about the functioning of public bureaucracy. It is, however, a relevant source, and its neglect in a pragmatic society is difficult to justify when many programs and agencies are in need of data to replace guesses and hunches.... Using the reactions of the clientele of an agency to help in the assessment of its functioning is of great practical importance (p. 2).

Most state Extension Services, including TAEX, have utilized a planning-by-objectives approach to program planning and reporting. Warner and Christenson (1984) state, "this goal-oriented system has been seen as providing the necessary information for purposes of accountability" (p. 16). It provides information related basically to county and state data on programs and clientele served. This approach provides information for monitoring the performance of personnel and programs, but does not serve as an evaluation of the impact of the agency on the general public. "The future of Extension depends on its ability to document its impact, to demonstrate its effectiveness, and to maintain a positive political climate for the organization as a whole" (Warner and Christenson, 1984, p. 19).

According to Allport (1955), perception is dependent on an understanding or awareness of the object. Thomas Reid (cited by Snowden, 1992) stated, "All philosophers, from Plato to Mr. Hume, agree in this, that the immediate object of perception must be some image present in the mind" (p. 49). O'Shaughnessy (1992) believed that perceptions are directly related to the actions of individuals. Sargent and Williamson (1966) stated that an individual's characteristics such as gender, ethnicity, aptitude, employment, and geographic background all influence his/her perception of a particular situation.

A number of studies dealing with the perceptions of various groups relative to the Cooperative Extension Service have been conducted, with the majority of these studies involving agricultural or Extension clientele (Jennings, 1983). The Guild Study (Guild Research, 1989) was the only documented study dealing with the general public's knowledge and awareness of TAEX, and it was limited to one metropolitan county. This study found that just over 40% of the sample of non-users (396) were aware of TAEX and its programs. The authors concluded that non-users were not generally aware of the diversity of services and programs offered by TAEX.

Cosner (1980), in a study of Oklahoma residents' perceptions of Extension, found that residents of large urban counties were less aware of Extension services that those in rural counties. A study by Warner and Christenson (1981) found that Extension in Kentucky served a larger percentage of rural residents that urban, and rural residents were more aware of Extension services than were urban dwellers.

"Extension needs to understand 'what is' before it can predict where the agency 'ought to be' in the future" (Warner and Christenson, 1984, p. 124). To chart precisely future program emphases and direction, TAEX must determine the level of the public's knowledge of its programs and services. This assessment of public awareness must include both metropolitan and nonmetropolitan areas of the State. The measurement of these distinctly different cultures will permit the design of specific strategies for future educational programming and public education efforts as to the purpose of, and services provided by, TAEX.

Purposes and Objectives

The purposes of this study were to determine the public's knowledge and assessment of the purpose and programs of the Texas Agricultural Extension Service in both metropolitan and nonmetropolitan counties, and to determine if differences in the knowledge and assessment of the organization existed between populations in metropolitan and nonmetropolitan counties.

The following objectives were used to accomplish the stated purposes of this study:

1. Determine the personal characteristics of the persons interviewed, and compare the personal characteristics of the metropolitan and nonmetropolitan samples.

2. Determine the public's knowledge and assessment of the purpose and programs of the Texas Agricultural Extension Service, and compare the knowledge and assessment of persons in metropolitan and nonmetropolitan counties.

3. Determine if a relationship existed between personal characteristics of the participants and their knowledge and assessment of the purpose and programs of the Texas Agricultural Extension Service.

Methods and Procedures

Research Design

The research design used in this study was the telephone survey. "It is safe to say that within the last decade, surveys by telephone have surpassed the more traditional face-to-face technique in the frequency of use and in methodological developments" (Frey, 1989, p. 11). Rossi, Wright and Anderson, and Frankel and Frankel, as cited by Frey (1989), indicate that a major portion of this shift is attributed to the rising costs and declining response rates encountered in utilization of the face-to-face household survey. Frey further notes, ". . . the rise to prominence of surveys by telephone is also the result of complete accessibility of any population via the telephone, . . . and availability of considerable information, based on experiment and experience, on what techniques work or do not work when doing telephone surveys" (Frey, 1989, p.11). Dillman (1978)

compared 24 characteristics of face-to-face surveys, telephone surveys, and mail surveys, and found the data indicated that the mail survey technique has more weaknesses than either face-to-face or the telephone method, which he indicates are approximately equal. Considering this information, it was determined that for this study the telephone interview would provide the most accurate data and result in the highest response rate.

Population and Sample

The population for this study was all individuals, 18 years of age or older, in Texas with a household telephone during August 16 - October 26, 1993. Bureau of Census (BC) figures for total population were adjusted to allow for inclusion of only those individuals 18 years of age or older, and this figure was further revised to account for percentages of households with a telephone in Texas. The adjusted state population used in the study was 10,269,088 persons 18 years of age or older with a household telephone.

It should be noted that differences between study and state population statistics can be explained to some degree by the fact that all minority groups in Texas have a lower percentage of household telephones than Whites (Federal Communications Commission, 1993). Furthermore, minority households contain a higher number of children than White households (BC, 1991), and this fact would account for still lower numbers of minorities that would be eligible for this study.

Selection of counties included in the study samples was accomplished by using the Bureau of Census definition of a metropolitan area (MA) as being "Each MA must contain...a total MA population of 100,000 (75,000 in New England)" (BC, 1991, p. A-8). For the purpose of this study, the MA boundaries utilized were existing county lines. Nonmetropolitan counties were all counties with a population of less than 100,000. Using these criteria for stratification, a total of 28 counties were identified as metropolitan and the remaining 226 were grouped as nonmetropolitan counties.

Each county was assigned consecutive numbers based on its adjusted population figures. In the metropolitan group Harris County was 1 - 2,791,938; Dallas County was 2,791,939 - 4,616,321, and so on until all counties had been assigned a range of numbers. The nonmetropolitan counties were assigned a range of numbers according to the same procedure. Based on the formula for computing sample size developed by Krejcie and Morgan (1970), it was determined that a sample size of 385 would be needed for each group (metropolitan and nonmetropolitan). A random number program was used to generate two sets of 385 numbers for selecting subjects from each of the two groups. All 14 Extension districts were represented in the study by 28 metropolitan counties and 145 nonmetropolitan counties.

Data Collection

Data were collected using a telephone survey process that used a two-step sequence of directory sampling. One method for drawing a sample from a directory is to

employ random numbers to generate a directory page number, and then a second set of random numbers to identify a name on that page (Dillman, 1978).

A separate set of random numbers was used to move up or down the page if the first number identified was obviously a business listing, disconnected, went unanswered after 10 rings, or remained "busy" after two successive calls placed fifteen minutes apart after the initial call. Interviewers were instructed to alternate direction of movement after each successive call, and if going up or down during the calling process required them to move forward or back a page to do so as necessary.

Instrument

The survey instrument consisted of 34 questions divided into three sections. The first section dealt with personal characteristics of the respondents, the second with their knowledge of TAEX purpose and programs, and the third with the respondents' assessment of TAEX and its programs.

The instrument was designed using survey instruments from previous studies conducted by Oren (1970), Curtis (1978), Cosner (1980), Jennings (1983), and Guild (1989), and was reviewed and revised by faculty members of the Department of Agricultural Education at Texas A&M University. Fifteen individuals were randomly selected in one metropolitan (Harris) and one nonmetropolitan county (Milam) to pilot test the instrument, conducted in August, 1993. As a result of the pilot test, further revisions were made to clarify some questions and to simplify data collection.

Survey questions related to assessment and knowledge of TAEX were tested for reliability using SPSS^x procedure RELIABILITY, and an alpha of .83 for the assessment scale and an alpha of .72 for the knowledge scale were found to exist.

Data Analysis

Descriptive statistics were used to accomplish objective one--to determine the personal characteristics of respondents. Data collected related to personal characteristics were analyzed using SPSS^x procedures FREQUENCIES, T-TEST, CROSSTABS, AND PEARSON CORR. The variables related to objective two, knowledge and assessment of TAEX, were dichotomous, and the data related to this objective were analyzed using SPSS^x procedures CROSSTABS and T-TEST. Assessment of TAEX was based on a scale of 1 to 5 (1=lowest; 5=highest) and data gathered related to assessment were examined by the ONEWAY procedure. Data collected for objective three, to determine if a relationship existed between personal characteristics and knowledge and assessment of TAEX, were analyzed using the procedures CORRELATION, CROSSTABS, and ONEWAY.

Results and Findings

Findings Related to Objective One

Objective one was to determine the personal characteristics of the persons interviewed, and to compare the personal characteristics of the metropolitan and nonmetropolitan samples.

The age range for the population was 18 to 91, with an average of 47; the nonmetropolitan sample was significantly older (50) than the metropolitan sample (44). A higher percentage of females than males existed in both samples with the metropolitan sample having the higher percentage of females (64.2%), compared to 57.1% for the nonmetropolitan group. A significant, but slight, relationship was found between the samples and ethnicity, with the nonmetropolitan groups showing a higher percentage of Whites, and lower percentages of minorities than the metropolitan group. The nonmetropolitan group also contained a higher percentage of widowed and married individuals, contained fewer college graduates but more high school graduates and more individuals who had not graduated from high school than did the metropolitan sample. Nonmetropolitan respondents had lower incomes, had more involvement in agricultural occupations, and contained more individuals who lived on a farm at some time, currently owned farm or ranch property, and owned their own homes more often than metropolitan respondents.

Findings Related to Objective Two

Objective two was to determine the public's knowledge and assessment of the purpose and programs of TAEX, and to compare knowledge and assessment of persons in metropolitan and nonmetropolitan counties.

Almost 57% of the respondents were aware of TAEX by its formal name, Texas Agricultural Extension Service, while 26% were totally unaware of TAEX. The remaining 17% recognized TAEX by one of the "unofficial" titles used in the study. A considerably higher degree of recognition was noted in the nonmetropolitan area when compared to the metropolitan area. These findings are supported by studies conducted by Cosner in 1980 and Warner and Christenson in 1984 which found that residents of rural areas were more aware of Extension services than those in urban counties.

More than 73% of the total sample were aware of a TAEX office in their county, but only 59.5% of those who knew of an office were aware of the office location. A higher percentage of the nonmetropolitan group knew of a TAEX office located in the county, and knew where the office was located.

Data from the study indicated that nonmetropolitan respondents were more likely to learn of TAEX from family and friends, while metropolitan respondents were more likely to learn of TAEX programs through mass media sources. Nonmetropolitan

respondents were also found to have a higher degree of contact with all types of county agents than the metropolitan group, and over twice as many nonmetropolitan respondents (59) indicated having participated in one or more TAEX activities than did the metropolitan respondents (20). The major reason identified for not participating in TAEX activities by both metropolitan (161) and nonmetropolitan (141) respondents was being unaware of services provided.

In relation to assessment of TAEX programs, greater percentages of nonmetropolitan respondents rated TAEX higher in the area of satisfaction, effectiveness, and performance. Nonmetropolitan respondents indicated a significantly higher degree of satisfaction (3.85) than the metropolitan group (3.61). Significant differences were also found to exist between samples on the variables of effectiveness and performance. The nonmetropolitan group gave TAEX an effectiveness rating of 3.73 (5 = very effective) while the metropolitan group gave TAEX a rating of 3.50 on effectiveness. The overall performance rating by nonmetropolitan respondents was 3.81 (5 = very effective), and metropolitan respondents gave TAEX an overall performance rating of 3.43 (Table 1).

Table 1. Comparison of Mean Satisfaction with, Mean Effectiveness of, and Mean Performance of TAEX by Residence Area

VARIABLE	N	MEAN	SD	t-VALUE	α
SATISFACTION					
Metro	249	3.61	.841	-3.20	.001
Nonmetro	310	3.85	.942		
EFFECTIVENESS					
Metro	246	3.50	.792	-3.12	.002
Nonmetro	309	3.73	.924		
PERFORMANCE					
Metro	246	3.43	.778	-5.15	<.001
Nonmetro	308	3.81	.925		

In the rating of TAEX program areas, 4-H received the highest overall importance rating, followed by agriculture, community development, and home economics. In all cases the nonmetropolitan respondents rated the importance of the program areas significantly higher than did metropolitan respondents.

Findings Related to Objective Three

Objective three was to determine if a relationship existed between personal characteristics of the participants and their knowledge and assessment of the purpose and programs of TAEX. Those who lived on a farm or owned farm or ranch property were consistently more knowledgeable about TAEX, and also gave TAEX higher assessment ratings.

Occupation was found to have a significant relationship to knowledge and assessment of TAEX with those in agricultural occupations having heard of TAEX more often, having greater contact with all agent types, and participating in TAEX programs more often than those in other occupations. Older individuals were also found to be more knowledgeable about TAEX programs and services, and they tended to rate TAEX higher in the assessment areas of satisfaction, effectiveness, and performance.

Educational level, ethnicity, and income level were all found to have a relationship to knowledge, with college degreed Whites with incomes in excess of $50,000 being more knowledgeable about TAEX. No relationships were found between level of education, ethnicity, and level of income and the assessment variables. However, minorities were found to be more likely to support expansion of TAEX programs, and more likely to support increased funding for TAEX.

Conclusions and Recommendations

The following conclusions, programmatic recommendations, and recommendations for further research are based on the major findings of the study.

Conclusions

The nonmetropolitan sample consisted of respondents who were older, contained more females and Whites, contained fewer college graduates but more high school graduates, and more individuals who had not graduated from high school than did the metropolitan sample. Nonmetropolitan residents were also found to have lower incomes, more involvement in agricultural occupations, and contained more individuals who lived on a farm, had lived on a farm at some time, currently owned farm or ranch property, and owned their homes more often than metropolitan respondents.

Nonmetropolitan respondents were more aware of TAEX and its purpose and programs, were more likely to have contact with the local county agent, and were more likely to participate in TAEX activities. However, a lack of general public awareness existed concerning TAEX. Guild Research (1989) concluded that those who were aware of TAEX knew very little about the organization. A primary reason more of the public does not use TAEX services is due to the widespread lack of awareness among the general public of services offered by TAEX.

Nonmetropolitan respondents had a higher opinion of TAEX and its programs than metropolitan residents, as evidenced by higher ratings of satisfaction, effectiveness, performance, and importance of various programs conducted by TAEX.

Individuals who lived on a farm, had lived on a farm, owned farm or ranch property, owned their own homes, and were involved in agricultural occupations were more knowledgeable about TAEX. Those individuals who were older, had children living at home, had a higher educational level, higher incomes, and were White tended to be

more knowledgeable about TAEX.

Individuals who currently lived on a farm, had lived on a farm, owned farm or ranch property, and owned their own homes rated TAEX higher than those who had never lived on a farm, did not own farm or ranch property, or did not own their own homes. Older persons were more likely to be more satisfied and felt TAEX was more effective than younger respondents.

Programmatic Recommendations

Efforts should be made by TAEX to increase the degree of public awareness. These efforts could include, but not be limited to, increased use of public service mass media access in newspapers, radio, and television media, creating a full-time public relations specialist to promote TAEX, and creation of volunteer groups similar to the Master Gardeners and Texas Agri-Food Masters (Vestal, 1994) to present information to the general public on TAEX. A 4-H project group should be created to train 4-H members on the history, purpose, mission, and philosophy of TAEX. The large number of 4-H members in Texas could serve as a significant network to spread the word about TAEX as they become adults.

Future Extension hiring practices should focus on employing individuals whose background and credentials would enable them to be more effective in involving nontraditional clientele in TAEX programming, and TAEX employee density (ratio of County Extension Agents to population) should be increased in metropolitan counties.

Specific efforts should be made by TAEX to involve minority groups. Minorities are predicted to be a majority of Texas residents by the year 2000, so it is critical that these ethnic groups be aware of and utilize TAEX services.

Greater efforts should be made to increase the degree of knowledge of TAEX among individuals in metropolitan counties. The nature of metropolitan and nonmetropolitan audiences differ greatly, and TAEX should design specific programs and delivery methods for the clientele in metropolitan counties.

Greater emphasis in the TAEX county plan of work should be given to promotional activities designed to increase the public's knowledge and awareness of county programs, and efforts should be made to increase participation of young adults. Specific programs designed to appeal to individuals from 18 to 40 should be created.

Recommendations for Further Research

Current users of TAEX services should be surveyed to describe the profile of the typical user of TAEX services, and to determine specific reasons why they use TAEX. This would allow TAEX personnel to design specific outreach programs that could be tailored to appeal to the individuals not currently using TAEX services.

A study of past 4-H members should be conducted to determine the degree of knowledge they have about TAEX. Information from this study could be used to produce training materials to increase 4-H members' knowledge of TAEX.

Studies of specific groups (ethnic, age, gender, etc.) should be conducted to identify why they do or do not use TAEX. Information from this type of study could be used to design programs to reach members of these distinct groups.

The effectiveness of new educational technologies should be studied to determine which will best serve the educational efforts of TAEX. Futuring studies should be conducted to help define the direction of TAEX for the coming years. Looking to and preparing for the future will help insure that TAEX will be an organization that will in fact be relevant when it reaches its 100th birthday.

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A COMPARATIVE STUDY OF THE PUBLIC'S KNOWLEDGE AND ASSESSMENT OF THE PURPOSE AND PROGRAMS OF THE TEXAS AGRICULTURAL EXTENSION SERVICE IN METROPOLITAN VERSUS NONMETROPPOLITAN COUNTRIES

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The authors present an interesting paper related to awareness and use of the Extension System in Texas. The paper is well organized and easy to read. I believe that the authors provided some interesting information to those who use and those who administer Extension programs in Texas.

The procedures used in this study represent the paper's strengths. Procedures are well defined and explained and they are easily understood. The authors did what they said they would do and they explained the results according to what they reported to be their procedures.

However, this research study may be an excellent example to use in trying to address the lingering issue about research in Agricultural Education. It is one thing to do research right and I believe this study was done right. It is quite another thing however, to determine if we have done the right research. The question is "right research for what purpose, use or need?" I am very troubled by the over use of old literature and the under use of literature since 1991. There are many excellent and recent books, articles and papers on the issues related to Extension and the real problems and solutions regarding its future. I believe the theoretical basis for this study is weak because of the lack of the most up-to-date literature relative to Extension's future and the need for public input.

I fail to see, nor do the authors state, the relevance this paper has to the national scene. What are the implications of the findings of this study. Why should a national audience be made aware of this study's results? What use can be made of what was found here? How has this study or could the results of this study help "practice"? What is the impact of this study and who will use it? What do we now know that we didn't know before and what difference will it make.

A PROFILE OF PENN STATE COOPERATIVE EXTENSION EDUCATORS WORKING WITH DIVERSE CLIENTELE IN PENNSYLVANIA

Floyd R. Holmes and Connie D. Baggett*

Theoretical Background

In the United States there has been a great need in the profession of agricultural education for educators and clientele from diverse populations (Whent, 1994). "In terms of measurable progress, agricultural education has had the least success with ethnic diversity" (Bowen, 1994, p.7). There are many clientele from different ethnic and family backgrounds who have different interests. For individuals, specifically minorities (e.g., African, Hispanic, and Asian Americans), to be successful in identifying their agricultural interests, a strong and effective instructional program is needed.

Teacher effectiveness is important in helping students achieve their goals. Teacher effectiveness should include the socialization of students and promoting students affective and personal development (Brophy & Good, 1985). Strickland, J. A. Page, F. M. Page, & Hawk (1990) conducted a study on a sample of 336 preservice teachers to determine their perceptions of qualities exhibited by effective instruction. The important qualities reported on a three point Likert-scale were: (1) clearly explain the subject matter (91.2%); (2) express interest in students through noticing them as individuals and not just learners (90.8%); (3) enjoy one's teaching (90.6%); (4) knowledgeable of the subject matter being taught (89.7%); and (5) being able to help students achieve their potential (89.7%).

Matteson, Bjoaker, & Jensen (1974) surveyed all agriculture teachers in Wisconsin and identified 89 competencies that were necessary for success in teaching. These competencies were also used to assess teacher competency level as well as to provide an indication of when a particular competency should be learned. Among these 89 competencies were: (1) determining the needs and goals for students; (2) developing objectives and lesson topics for each unit of study; (3) determining groups as well as individual learning experiences for a unit based on individual differences of students; (4) selecting appropriate teaching methods for a lesson as well as determine time needed to deliver a lesson; and (5) employing a variety of strategies in order to ensure that the instruction of a lesson meets individual student needs (Matteson, et al., 1974).

Purpose and Objectives

The purpose of this study was to determine instructional behaviors exhibited by extension educators working with racial/ethnic groups participating in Penn State Cooperative Extension Programs. Specific objectives of the study were to:

1. Determine the degree to which extension educators exhibit various instructional behaviors according to the clientele they work with most frequently.

2. Determine frequency of use and perceived effectiveness in methods of instruction used by extension educators in working with ethnically diverse clientele.

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Methods and Procedures

The study utilized a descriptive survey research design. The sample for the study consisted of a 50% random sample of all extension agents (n=150) and a census of nutrition education advisers (NEAs) (N=79) listed in the *1994 Penn State Cooperative Extension Staff Directory*. A total of 229 extension educators were selected for the study.

The researchers developed an instrument to collect data for the study. Modifications of instruments developed by Oberle (1981), Gonzalez (1982), Fennelly (1991), and Pierson (1993) were modified to fit the four sections contained in the study. The four sections of the instrument were: (1) Self-Assessment of Instructional Behavior; (2) Methods of Instruction; (3) Program Assessment; and (4) Personal Assessment. The items in section one and two of the instrument were measured on a five-point, Likert-type scale. A panel of instrument reviewers consisting of administrators, faculty, staff, and graduate students at The Pennsylvania State University eval-uated the instrument for content and face validity. A post-hoc reliability analysis indicated that the instrument had acceptable reliability (Cronbach's alpha=.91).

Data were collected through a mailed survey. A cover letter explaining the purpose of the study, a copy of the questionnaire, and a return envelope were mailed to the 229 extension educators. A total of three follow-up mailings were sent to extension educators from February to April of 1995. A final response of 80% was obtained for the study. Non-respondents were followed-up with a telephone contact. Non-respondents were not statistically different from respondents. Basic descriptive statistics were used to analyze the data (frequencies, percentages, means, and standard deviations).

Findings

Nearly two-thirds (70%) of the extension educators responding were female (100% were NEAs) and 30% were male. Thirty-three percent of the extension educators were 40 to 49 years of age. Forty-three percent of the NEAs were 50 to 59 years of age, while 3% were 20 to 29 years old. Eighty-six percent of the extension educators were white Americans, while 14% were ethnic minorities (African American, Latino/Hispanic American, Asian or Pacific Islander). The majority (70%) of NEAs were also white American. Forty-four percent of the extension educators had completed graduate work beyond a bachelor's degree, while ten percent had completed an associates degree. Seventy-one percent of the NEAs indicated that they had completed a high school diploma.

Table 1. Composited Competencies Exhibited by Extension Educators Working With Ethnically Diverse Clientele.

Area of Responsibility	Composite of Teaching Competency			Composite of Program Planning Competency			Composite of Communication Com		
	f	Mean	S.D.	f	Mean	S.D.	f	Mean	S
Family Living									
White American Clientele	30	3.82	.41	30	3.93	.54	30	4.06	[illegible]
Ethnic Minority Clientele	3	3.50	1.10	3	3.70	.53	3	3.77	[illegible]
4-H/Youth Development									
White American Clientele	16	3.60	.41	16	3.75	.54	16	3.98	[illegible]
Ethnic Minority Clientele	5	3.64	.34	5	3.93	.64	5	4.08	[illegible]
Community Development									
White American Clientele	3	3.42	.46	3	3.70	.45	3	4.36	[illegible]
Ethnic Minority Clientele	2	3.55	.13	2	3.72	.71	2	3.65	[illegible]
Agriculture									
White American Clientele	46	3.63	.36	46	3.79	.40	46	3.83	[illegible]
Ethnic Minority Clientele	4	3.96	.42	4	4.19	.62	4	3.92	[illegible]
EFNEP									
White American Clientele	40	3.83	.49	40	4.08	.55	40	4.17	[illegible]
Ethnic Minority Clientele	29	3.77	.82	28	4.33	.56	29	4.34	[illegible]

Scale: 1= never; 2= sometimes; 3= frequently; 4= always

Note: The five point scale was collapsed by statistically eliminating those that answered 3=uncertain. Frequently an were statistically recoded to 3 and 4 respectively.

Instructional Behaviors

Instructional behaviors were grouped into three competency themes to determine extension educators instructional behaviors when working most frequently with ethnically diverse clientele. Instructional behavior is operationally defined as those behaviors edu-cators possess to adequately inform clientele with useful data. A composite of instruc-tional behaviors were categorized into themes in section one of the instrument by utilizing competency areas defined in the study conducted by Gonzalez (1982). The three themes were: (1) teaching, consisting of a composite of eleven instructional behaviors; (2) pro-gram planning, consisting of a composite of nine instructional behaviors; and (3) commu-nication, consisting of a composite of thirteen instructional behaviors. Educators used a five point Likert-type scale (on a scale 1-5, 'never' to 'always') to rate themselves. The results are included in Table 1.

In teaching ethnic minority clientele, all extension educators rated their teaching theme fairly high. Mean composite ratings of agriculture agents was 3.96, followed by family living agents at 3.50, NEAs at 3.77, 4-H/youth agents at 3.64, and community development agents at 3.55. Extension educators rated themselves similarly when working with white American clientele.

In the program planning and communication themes, all extension educators rated themselves fairly high in the design of educational experiences based on clientele needs, interests, and problems while working with both white Americans and ethnic minority clientele.

Methods of Instruction

Extension educators were asked to indicate their use of methods of instruction (on a scale 1-5, 'never' to 'consistently') and effective methods of instruction (on a scale 1-5 'not effective' to 'very effective') relative to extension educators working with ethnically diverse clientele. The results are included in Tables 2 and 3.

Based on the rated mean, the more technically advanced media such as computer assisted programs and satellites were rated as 'rarely' used by extension educators in working with ethnically diverse clientele. The more traditional media used by extension educators such as, slide/audio tape presentations, videotape, audio tape, and slide presentations were rated as 'sometimes' used relative to working with ethnically diverse clientele. Printed materials and other media (e.g., overhead transparencies, television, flip charts) were rated as 'usually' used by extension educators in working with ethnically diverse clientele.

Computer assisted instruction and role playing were rated fairly low in working with ethnically diverse clientele. Independent learning was rated as 'sometimes' used by extension educators. Also in their ratings, extension educators 'usually' used experiential/hands-on, group learning, and other instructional methods in working with ethnically diverse clientele.

Table 2. Use of Methods of Instruction as Rated by Extension Educators Working With Ethnically Diverse Clientele

Methods of Instruction [a]	Area of Responsibility													
	Extension Agents													
	Family Living			4-H/Youth Development			Community Development			Agriculture			NEAs	
	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean
Media Use														
Slide/Audio Tape Presentation														
Wh. Am. Clientele	30	2.53	.73	16	2.81	.75	3	3.33	1.53	46	2.94	1.02	37	2.30
Ethn. Min. Clientele	2	3.00	.00	5	2.20	1.10	2	2.00	1.41	4	3.25	1.26	26	1.96
Computer Assisted Program														
Wh. Am. Clientele	30	1.57	.68	16	1.81	.91	3	3.33	1.53	46	1.94	.88	36	1.08
Ethn. Min. Clientele	2	1.00	.00	5	1.60	.89	2	1.50	.71	4	1.50	.58	27	1.04
Videotape														
Wh. Am. Clientele	30	3.23	.64	16	3.50	.82	3	3.33	1.53	46	3.17	.68	39	2.77
Ethn. Min. Clientele	2	3.50	.71	5	3.00	1.23	2	2.50	.71	4	3.75	.96	28	2.50
Audiotape														
Wh. Am. Clientele	30	2.10	.80	16	1.88	.81	3	3.00	1.73	46	1.70	.73	36	1.61
Ethn. Min. Clientele	2	1.00	.00	5	1.40	.55	2	1.00	.00	4	2.75	1.50	26	1.35
Printed Material														
Wh. Am. Clientele	30	4.60	.62	16	4.25	.86	3	4.33	1.16	46	4.48	.59	40	4.80
Ethn. Am. Clientele	2	4.00	.00	5	4.40	.55	2	4.00	.00	4	4.75	.50	27	4.78
Slide Presentation														
Wh. Am. Clientele	30	2.53	.86	16	2.63	.96	3	4.00	1.00	46	3.80	.75	36	1.90
Ethn. Min. Clientele	2	2.50	.71	5	2.80	.84	2	2.50	.71	4	4.00	1.16	27	1.59
Satellite														
Wh. Am. Clientele	28	2.61	.63	16	2.00	.89	3	3.00	1.73	45	2.53	.89	36	1.25
Ethn. Min. Clientele	2	1.50	.71	5	1.00	.00	2	1.00	.00	4	1.75	.96	26	1.12

Table 2. Use of Methods of Instruction as Rated by Extension Educators Working With Ethnically Diverse Clientele

Methods of Instruction [a]	Area of Responsibility: Extension Agents: Family Living			4-H/Youth Development			Community Development			Agriculture			NEAs	
	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean
Media Use														
Slide/Audio Tape Presentation														
Wh. Am. Clientele	30	2.53	.73	16	2.81	.75	3	3.33	1.53	46	2.94	1.02	37	2.30
Ethn. Min. Clientele	2	3.00	.00	5	2.20	1.10	2	2.00	1.41	4	3.25	1.26	26	1.96
Computer Assisted Program														
Wh. Am. Clientele	30	1.57	.68	16	1.81	.91	3	3.33	1.53	46	1.94	.88	36	1.08
Ethn. Min. Clientele	2	1.00	.00	5	1.60	.89	2	1.50	.71	4	1.50	.58	27	1.04
Videotape														
Wh. Am. Clientele	30	3.23	.64	16	3.50	.82	3	3.33	1.53	46	3.17	.68	39	2.77
Ethn. Min. Clientele	2	3.50	.71	5	3.00	1.23	2	2.50	.71	4	3.75	.96	28	2.50
Audiotape														
Wh. Am. Clientele	30	2.10	.80	16	1.88	.81	3	3.00	1.73	46	1.70	.73	36	1.61
Ethn. Min. Clientele	2	1.00	.00	5	1.40	.55	2	1.00	.00	4	2.75	1.50	26	1.35
Printed Material														
Wh. Am. Clientele	30	4.60	.62	16	4.25	.86	3	4.33	1.16	46	4.48	.59	40	4.80
Ethn. Am. Clientele	2	4.00	.00	5	4.40	.55	2	4.00	.00	4	4.75	.50	27	4.78
Slide Presentation														
Wh. Am. Clientele	30	2.53	.86	16	2.63	.96	3	4.00	1.00	46	3.80	.75	36	1.90
Ethn. Min. Clientele	2	2.50	.71	5	2.80	.84	2	2.50	.71	4	4.00	1.16	27	1.59
Satellite														
Wh. Am. Clientele	28	2.61	.63	16	2.00	.89	3	3.00	1.73	45	2.53	.89	36	1.25
Ethn. Min. Clientele	2	1.50	.71	5	1.00	.00	2	1.00	.00	4	1.75	.96	26	1.12

Table 2. Continued.

Methods of Instruction [a]	Family Living f	Family Living Mean	Family Living SD	4-H/Youth Development f	4-H/Youth Development Mean	4-H/Youth Development SD	Community Development f	Community Development Mean	Community Development SD	Agriculture f	Agriculture Mean	Agriculture SD	NEAs f	NEAs Mean
Other Media [b]														
Wh. Am. Clientele	9	4.33	.71	3	4.00	.00	1	4.00	.00	9	3.89	.78	7	2.71
Ethn. Min. Clientele	0	.00	.00	0	.00	.00	1	5.00	.00	0	.00	.00	2	4.50
Instructional Methods Use														
Lecture														
Wh. Am. Clientele	29	3.76	.79	16	3.50	.63	3	3.67	.58	46	3.85	.70	35	3.86
Ethn. Min. Clientele	2	4.50	.71	5	2.40	.55	2	2.50	.71	4	3.75	1.50	25	3.40
Experiential/Hands-on														
Wh. Am. Clientele	30	3.83	.59	16	4.31	.60	3	4.00	1.00	46	3.52	.75	40	4.70
Ethn. Min. Clientele	2	4.00	1.41	5	4.60	.55	2	4.50	.71	4	3.75	.96	26	4.69
Independent Learning														
Wh. Am. Clientele	30	2.83	.83	15	2.87	.74	3	3.00	1.73	46	2.35	.88	38	3.13
Ethn. Min. Clientele	2	3.00	.00	5	3.60	.89	2	3.00	.00	4	2.50	1.29	24	3.17
Group Learning														
Wh. Am. Clientele	30	3.70	.88	15	4.07	.59	3	4.67	.58	46	3.17	.77	40	4.03
Ethn. Min. Clientele	2	4.00	1.41	5	4.60	.55	2	4.00	.00	4	3.75	1.50	27	4.19
Computer Assisted Instruction														
Wh. Am. Clientele	30	1.57	.68	15	1.67	.82	3	2.67	1.53	45	2.07	.94	35	1.00
Ethn. Min. Clientele	2	1.00	.00	5	1.40	.89	2	1.50	.71	4	1.50	.58	26	1.00
Role Playing														
Wh. Am. Clientele	30	2.87	.82	16	3.00	1.10	3	3.33	1.16	46	2.11	.85	38	2.11
Ethn. Min. Clientele	2	1.50	.71	5	2.60	1.14	2	2.00	1.41	4	2.50	1.92	28	2.46

Area of Responsibility: Extension Agents (Family Living, 4-H/Youth Development, Community Development, Agriculture); NEAs.

Table 2. Continued.

Methods of Instruction [a]	Area of Responsibility													
	Extension Agents													
	Family Living			4-H/Youth Development			Community Development			Agriculture			NEAs	
	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean
Other Instr. Methods [c]														
Wh. Am. Clientele	4	3.75	.96	2	4.00	.00	0	.00	.00	3	3.67	.58	1	1.00
Ethn. Min. Clientele	0	.00	.00	0	.00	.00	2	3.50	.71	0	.00	.00	0	.00

Scale: 1= never; 2= rarely; 3= sometimes; 4= usually; 5= consistently

[a]wh.= white American clientele; ethn.= ethnic minority clientele; instr.= instructional

[b]includes: overhead transparencies, flip charts, television, radio, newspaper, blackboard, posters, use of real objects, practice activity/workshop (e.g., food preparation), lecture, demonstrations, newsletter, movies, personally visuals, and repeat instruction

[c]includes: clientele learn through teaching, demonstration (e.g., concepts of educator or clientele showing other clien tours, music drama/storytelling, puppets, farm visits, one on one instruction, overheads, hands-on activity, instruction

Table 3. Effectiveness of Methods of Instruction as Rated by Extension Educators Working With Ethnically Diverse Clientele.

Methods of Instruction [a]	Area of Responsibility														
	Extension Agents														
	Family Living			4-H/Youth Development			Community Development			Agriculture			NEAs		
	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean	S
Media Effectiveness															
Slide/Audio Tape Presentation															
Wh. Am. Clientele	28	3.18	.91	16	3.13	1.03	16	4.33	.58	3	3.43	.93	30	3.03	1
Ethn. Min. Clientele	2	3.00	.00	3	3.33	.58	3	3.00	.00	1	3.75	1.26	19	2.74	1
Computer Assisted Program															
Wh. Am. Clientele	17	3.12	1.05	12	2.92	1.00	3	4.33	.58	38	3.26	1.03	12	1.17	
Ethn. Min. Clientele	0	.00	.00	2	3.00	1.41	1	2.00	.00	3	1.67	.58	11	1.46	1
Videotape															
Wh. Am. Clientele	27	3.89	.70	16	3.69	.87	3	4.00	1.00	45	3.73	.72	31	3.77	
Ethn. Min. Clientele	2	3.50	.71	5	4.00	.00	2	3.50	.71	4	4.00	.82	19	3.63	1
Audiotape															
Wh. Am. Clientele	23	2.61	1.08	15	2.47	1.06	3	3.33	1.53	37	2.43	1.04	20	2.40	1
Ethn. Min. Clientele	1	1.00	.00	3	2.68	1.53	1	1.00	.00	4	3.00	1.41	12	2.08	1
Printed Material															
Wh. Am. Clientele	28	4.07	.77	16	3.63	.81	3	4.33	1.16	45	4.02	.72	35	4.43	
Ethn. Min. Clientele	2	3.50	.71	5	3.80	.84	2	4.00	.00	4	4.25	.50	26	4.27	1
Slide Presentation															
Wh. Am. Clientele	27	3.26	.81	15	3.33	1.05	3	4.33	.58	46	3.96	.60	21	2.95	
Ethn. Min. Clientele	2	3.00	1.41	5	3.80	.45	2	3.50	.71	4	4.00	.82	17	2.47	1
Satellite															
Wh. Am. Clientele	27	3.15	.82	12	3.25	.62	3	3.67	1.16	41	3.76	.92	12	2.75	1
Ethn. Min. Clientele	1	1.00	.00	1	1.00	.00	0	.00	.00	3	2.33	1.53	13	2.08	1

Table 3. Continued.

Methods of Instruction [a]	Area of Responsibility: Extension Agents — Family Living f	Mean	SD	4-H/Youth Development f	Mean	SD	Community Development f	Mean	SD	Agriculture f	Mean	SD	NEAs f	Mean	SD
Other Media[b]															
Wh. Am. Clientele	9	4.11	.78	3	4.67	.58	1	4.00	.00	9	4.11	.93	4	3.75	1
Ethn. Min. Clientele	0	.00	.00	0	.00	.00	1	4.00	.00	0	.00	.00	2	4.50	
Instructional Methods Effectiveness															
Lecture															
Wh. Am. Clientele	27	3.44	.89	16	3.38	.89	3	4.00	1.00	45	3.53	.82	32	3.81	1
Ethn. Min. Clientele	2	3.50	.71	5	2.60	.55	2	2.00	1.41	4	4.00	.82	21	4.00	1
Experiential/Hands-on															
Wh. Am. Clientele	28	4.36	.62	16	5.00	.00	3	4.67	.58	46	4.57	.58	39	4.74	
Ethn. Min. Clientele	2	4.50	.71	5	4.80	.45	2	4.50	.71	4	3.75	.50	26	4.73	
Independent Learning															
Wh. Am. Clientele	27	3.41	.84	14	3.00	1.04	3	4.00	1.00	42	3.41	.86	36	3.36	1
Ethn. Min. Clientele	2	3.00	.00	5	3.80	.84	2	4.00	.00	3	3.67	.58	22	3.73	
Group Learning															
Wh. Am. Clientele	28	3.89	.50	15	4.13	.64	3	4.67	.58	46	3.89	.67	39	4.00	
Ethn. Min. Clientele	2	4.00	.00	5	4.60	.55	2	4.00	.00	4	3.75	.96	25	4.32	
Computer Assisted Instruction															
Wh. Am. Clientele	20	2.50	1.00	12	3.17	.94	3	3.67	.58	38	3.18	1.09	12	1.17	
Ethn. Min. Clientele	2	1.00	.00	2	2.00	1.41	2	2.00	1.41	3	2.00	1.00	13	1.54	
Role Playing															
Wh. Am. Clientele	29	3.55	.95	14	3.93	.73	3	4.33	.58	40	3.23	1.03	29	2.83	
Ethn. Min. Clientele	2	3.00	.00	4	3.50	1.29	1	4.00	.00	3	3.00	1.73	21	3.24	

Table 3. Continued.

Methods of Instruction [a]	Family Living			4-H/Youth Development			Community Development			Agriculture			NEAs	
	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean	SD	f	Mean
Other Instr. Methods[c]														
Wh. Am. Clientele	4	4.25	.96	2	4.00	.00	0	.00	.00	3	4.33	.58	1	3.00
Ethn. Min. Clientele	0	.00	.00	0	.00	.00	2	4.50	.71	0	.00	.00	0	.00

Area of Responsibility: Extension Agents (Family Living, 4-H/Youth Development, Community Development, Agriculture); NEAs

Scale: 1= not effective; 2= somewhat effective; 3= moderately effective; 4= effective; 5= very effective

[a]wh.= white American clientele; ethn.= ethnic minority clientele; instr.= instructional

[b]includes: overhead transparencies, flip chart used in the field, television, radio, newspaper, blackboard, posters, use objects, hands-on practice activity, lecture, demonstrations, newsletter, movies, personally developed visu instruction

[c]includes: overheads, clientele learn through teaching, demonstrations (e.g., concepts of educator or clientele showin clients), tours, music drama/storytelling, puppets, farm visits, one on one instruction, hands-on activity, an instruction

As for the effectiveness of media, slide/audio tape presentations and computer assisted programs were 'moderately effective' for extension educators in working with ethnically diverse clientele according to their ratings. In working with ethnically diverse clientele, media such as, videotapes, printed material, and other media were rated as 'effective' by extension educators.

Group learning used by extension educators was rated to as 'effective'. A 'very effective' instructional method used by extension educators in working with ethnically diverse clientele is experiential/hands-on methods.

Implications

This study has provided baseline information on extension educators working with ethnically diverse clientele in Pennsylvania. Findings indicate that there were similar and fairly high composited ratings in how extension educators perceived instructional behaviors while working with ethnically diverse clientele. Findings also suggest that traditional media and methods most used and effective by extension educators relative to working with ethnic minority clientele are fairly high in rating and similar to traditional clientele extension educators assists. The lack of advanced technological media and methods used (e.g., satellite and computer assisted instruction) might be related to the lack of media accessibility, availability, and financial resources in the counties throughout the Commonwealth of Pennsylvania.

Although there were similarities in instructional behaviors and perceptions of extension educators working with ethnically diverse clientele, the results from this study can be beneficial to the Cooperative Extension System through its continuous support of outreach programs to diverse communities throughout Pennsylvania to effectively reach underrepresented audiences. The development of effective educational programs and instructional strategies in maintaining clientele's interest in the program may enhance the relationship between the educator and the learner, as well as cause extension educators to be more knowledgeable of cultural differences other than one's own in order to accomodate the diverse needs of ethnic minority audiences.

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A PROFILE OF PENN STATE COOPERATIVE EXTENSION EDUCATORS WORKING WITH DIVERSE CLIENTELE IN PENNSYLVANIA

Robert A. Martin
Iowa State University

The researchers have presented an interesting snapshot of some of the instructor and instructional characteristics involved in working with diverse populations in the Pennsylvania Extension system. I believe we can learn some important lessons from this study.

The title of the paper was a bit confusing as I went through it because it appeared that a part of the paper focused on characteristics and another part focused on instructional methods. More literature review focused on diversity issues related to instructional methods could have strengthened the paper and helped guide the reader to understand how these issues connect.

The procedures for this study appear to be sound, however the paper reflects a very brief description of those procedures. Why was a 50% sample selected? What do nutrition education advisers do and with whom? How are they trained and what is their background? Are these people professionals, para-professionals or volunteers? This information would be helpful in putting the study and its results into context.

Please explain the rationale for recoding the five-point scale. While the tables presented were interesting and useful, it would have helped to had more explanation. While you did present an implications section in the paper, it would have helped to have presented a section on conclusions and another section on recommendations. What do you recommend that we do with this information that was collected?

I would recommend that the authors carefully proof read the document for printing and grammatical errors. In addition, please check the reference list. I am sure that I.M. Gonzalez would be surprised that his doctoral dissertation is considered to be a master's thesis by these authors.

Finally, it was interesting to note that a "very effective" instructional method used by extension educators working with ethnically diverse clientele is experiential/hands-on methods. Are we surprised by this? I think not. I hope the authors continue their efforts to research the needs related to diversity.

DEFINING INTERNATIONALIZATION FOR EXTENSION

Barbara G. Ludwig R. Kirby Barrick

"An international dimension is basic to effective Extension programs. Not secondary. Not a luxury. Not an after thought. Not an add on. But basic."

Patton, 1984

Introduction

Extension systems across the country have been challenged to integrate international perspectives into programs and assist staff and clientele in developing global competency. Yet when Poston and O'Rouke (1991) studied the attitudes of Extension service directors toward globalization, 80% of the directors indicated their state had achieved either a low level or had not achieved any level of globalization.

A review of literature indicated that internationalization is frequently viewed in general, rather amorphous terms that are difficult for some to understand and comprehend (Henson, Noel, Gillrad-Byers, Ingle, 1990). Arum and Van de Water (1992) in their book Bridges to the Future: Strategies for Internationalizing Higher Education supported this view. In article after article, report after report, and at conference after conference the terms used to characterize the international dimension of education vary tremendously.

Broad, but often ambiguous goal statements are frequently used related to internationalization of Extension (ES-USDA, 1989; Ingle, 1990; King & Martin, 1991). Some ideas have been formulated for internationalizing (Somersan, 1992; Henson, Noel, Gillrad-Byers, Ingle, 1991; ES-USDA, 1989; Knox, 1987; York, 1984; Patton, 1984), but there has been little emphasis on implementation by Extension systems across the country (Rosson & Sanders, 1991; Poston & O'Rourke, 1991; Andrews & Lambur, 1986). Few studies have been conducted related to internationalization of the Extension component of the land-grant university system. None defined internationalizing in terms of objectively verifiable indicators of success. A need to examine and improve the understanding of internationalizing of a state university Extension system became apparent through a review of literature. If the characteristics of an internationalized Extension system could be identified, then an organization might focus available resources to create changes needed to achieve internationalization.

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Kaufman (1982, 1992) suggested putting problems into the context of what is and what should be when dealing with organizations. The Organizational Elements Model (OEM) developed by Kaufman (1982, 1992) provided a framework for the study. Kaufman's model used a holistic framework in looking at organizations and what those organizations use, do and deliver as well as the impact on clients and society in general. The current study was limited to examining organizational efforts and organizational results.

Purpose

The purpose of the study was to identify the characteristics of an internationalized state university Extension system.

Methodology

The study used a three-round, modified Delphi technique to explore and describe the characteristics of an internationalized state Extension system. Delphi, a group process, utilized individual written responses to three researcher developed instruments as opposed to bringing individuals together for oral discussion. The process was further characterized by multiple iterations or feedback designed to accomplish convergence of opinion. Participant's anonymity was maintained during the three rounds of the study.

The Delphi Panel members were purposefully selected following a nomination process. A total of 15 individuals, well known and respected for their contributions to Extension or land-grant colleges or universities in the area of internationalization, were identified. The participants selected by the review panel met at least three of the criteria established for selection. The criteria were: (1) national/international reputation; (2) familiarity with the topic; (3) has conducted research, written or lectured on the topic; (4) was considered to have a deep interest in the problem and important knowledge or experience to share.

The Delphi Panel was asked to identify the degree to which they believed each item on the instrument contributed to the internationalization of a state university Extension system. A seven point Likert-type scale was used with 0 indicating "no importance" and 6 indicating "critical importance". Delphi Panel members were asked to support their opinion with a rationale. Space was also provided for panel members to add new statements. Delphi Panel responses were incorporated in successive instruments.

The initial instrument contained 39 position statements derived from the literature and structured interviews with international experts. Face and content validity of the initial instrument were assured through the use of a content validity panel. Given the nature of the Delphi technique, additional types of validity and reliability estimates were not appropriate for the instrument (Hughes, 1993; Dalkey, Rourke, Lewis and Snyder, 1972). During Round II, based on suggestions from the Delphi Panel, 12 new items were added and nine items were reworded. The instruments used in the second and third rounds contained items on which a predetermined level of consensus was not achieved during the previous round.

The Delphi instruments were mailed to the Delphi Panel using regular U.S. mail or air mail to international locations. The mailed packet consisted of the instrument, an individually addressed cover letter and a self-addressed stamped return envelope. A variety of techniques were used to ensure maintenance of interest and participation in the study. Descriptive statistics were calculated for each round. The computer program SPSS was used for data analysis. For each round, items on which consensus was reached were identified. Consensus on an item was considered to have been reached when 80% of the ratings fell within two categories on a seven-point scale. Following Round III, statistics of central tendency and variability were calculated for all items on which consensus had been reached. The mean was used to describe the level of importance of the item to an internationalized state Extension system as determined by consensus of the Delphi Panel.

Results

The results of the study represent the collective opinion of the experts participating in the Delphi Panel at a single point in time and cannot be construed to be representative of any other population or situation. Fourteen of the 15 participants responded to each round, a 93% response rate. Fifty-one items were considered during the three rounds of the Delphi. Consensus was achieved on 38 items which were identified as having moderately high importance to critical importance for the internationalization of a state university Extension system. Table I reports the items where consensus was reached. Consensus was not achieved on thirteen items after three rounds. Comments made by the Delphi Panel during each round and reported anonymously provided additional information to describe the ratings and clarify issues. Three hundred and sixteen comments were received.

Following Kaufman's model (1982, 1992), the results were categorized as Organizational Efforts and Organizational Results. Organizational efforts were comprised of inputs and processes. Inputs were identified as the existing starting conditions effecting organizational activities and processes as the means, methods and procedures necessary for managing inputs. Organizational results were comprised of products and outputs. Products were defined as the internal results accomplished through the application of inputs and processes; outputs were the products the organization delivered to external clients.

By consensus of the Delphi Panel, the most critical characteristic of a state university extension system which had internationalized was the output or end product of clientele who developed a fundamental understanding of global and national interdependence. Educational programming efforts having high importance to internationalization included programs that help clientele understand complex worldwide issues, programs that train local business persons for participation in international markets and interdisciplinary international experiences for key leaders. The Delphi Panel placed high importance on targeting commodity groups for public policy education on global decision making and rural clientele for education on the international marketplace.

Critical Elements
Five critical elements were identified by the Delphi Panel as being present in an internationalized state university Extension system:

- Clientele develop a fundamental understanding of global and national interdependence.
- Extension educational programs within the U.S. stress the impact of international economic forces on agricultural markets.
- Extension educators incorporate international perspectives into on-going activities.
- Extension faculty/agents recognize the relationship between basic international issues and the Extension mission.
- Personnel evaluation systems recognize international efforts.

The absence of any one of these critical elements would mean that the Extension system could not be considered to be internationalized. An internationalized state university Extension system would exhibit other important characteristics as described in Table I. Not all the important characteristics identified by the Delphi Panel need to be present for the Extension system to be considered to be internationalized, but many are likely to be evident. Each important characteristic provides a building block, process or programming goal which will enable the Extension system to develop and maintain the five critical elements identified.

Conclusions and Implications

The study brought greater clarity and focus to the definition of internationalization of an Extension system. Internationalization was not seen as a fourth dimension: teaching, research, service and international efforts. Instead, successful internationalization efforts were identified as integrating global perspectives into the basic mission and mandate of Extension. Using the definition of university internationalization developed by Henson and Noel (1989) as a starting point, a three-part definition is proposed for discussion and debate. The definition is based on results of the current study and reflects the five critical elements identified.

> Internationalization of Extension is the incorporation of international dimensions, content and considerations into Extension teaching, research, and service to enhance their relevance in an increasingly interdependent world.
>
> Participation in Extension educational activities assist clientele to develop a fundamental understanding of global interdependence and international economic forces as they relate to the issue areas within Extension's mission.

Institutional commitment is evidenced by the development of a structure and capacity to support staff development and reward accomplishments.

Poston and O'Rourke (1991) reported 80% of Extension directors indicated their state had achieved either a low level or had not achieved any level of globalization. For these Extension systems, internationalization will represent a significant organizational change. Identification of characteristics essential to an internationalized Extension system can assist Extension leaders and university administrators to identify and focus available resources where the greatest impact or change can be realized. A clear sense of direction, strong leadership in internationalizing and enthusiasm from leaders of the organization will help to ensure concerted and sustained action. Policy and resource decisions such as the incorporation of fiscal support into the ongoing Extension budget and placing a person "in change" of internationalization to support and coordinate Extension program and activities, are necessary implementation strategies. Assessment must focus on the outcomes achieved. Organizational change is a slow and often discontinuous process in a complex organization. Ongoing assessment of the progress being made will be necessary.

Targeting groups

Extension educators have the responsibility to help clientele develop a better understanding of the complexity of global issues. Clientele education can be accomplished through programs within the U.S. that stress the impact of international economic forces on agricultural markets and by Extension educators incorporating international perspectives and the concept of global/local interdependencies into on-going educational activities. Issues that might be initially targeted include: human health, the environment, diversity, renewable resources, and the agricultural market. A Delphi Panel member commented: "Extension typically tries to be responsive to local needs. But few people recognize a need for international education. This is where international education needs leadership from Extension programmers who can see a need that may be invisible to the general population".

Extension may have a unique role to play in helping traditional rural and agricultural clientele to recognize the need for education on international issues. Key leaders should be targeted for interdisciplinary international experiences. Business owners, rural and urban clientele can benefit from programming related to the international marketplace. Commodity groups could be targeted for public policy education on global decision making.

Mission and International Issues

By consensus, the Delphi Panel identified the critical importance of faculty/agent recognition of the relationship between basic international issues and the Extension mission. These issues would include, but not be limited to: knowledge of international agriculture, commitment to human development, the significance of the debate on "privatization" and the experiences of Extension services in seeking new ways of funding services. Incorporation of international dimensions into domestic programs to prepare

students and citizens to be active participants in society and the economy was emphasized by panel members. An opinion expressed by a panel member was "one of the major problems with the successful internationalization of Cooperative Extension is lack of recognition that international content, activities, etc., are an integral part of what clientele need. Instead the development assistance mentality prevails which continues to identify within Extension, international as something separate and different from what faculty are supposed to do ... Faculty need to know and learn about the potentials of international programs and activities to enhance the quality, relevance and impact of their programs and responsibilities."

Self Development

Staff development opportunities will be necessary. Faculty/agents have a responsibility for their own professional growth and development. Inquisitive approaches might include: independent study, reading journals from other nations, formal course work or language training, participating in international conferences and hosting foreign academics. While international experiences for faculty, agents and administrators were not viewed as critical characteristics of an internationalized Extension system, opportunities to work and pursue international assignments for both junior and senior faculty and agents were viewed by the Delphi Panel as having high importance. County agents, with or without faculty appointments, were singled out for these types of experiences by some panel members because of the domestic isolation a county agent may experience.

Reward Systems

Peer recognition was viewed as being an integral element of any reward system developed to recognize internationalization efforts by faculty/agents. Extension leaders need to work with promotion and tenure committees at the local, department and college level to define international expectations. A fear of career "derailments" for junior faculty caused by participation in international assignments was viewed by panel members as a potential barrier to internationalization which administration and faculty promotion and tenure committees will need to address.

One outcome of the current study was the generation of additional questions and avenues for research. Research in the area of internationalization of Extension has been limited and it is hoped that the results of the current study have raised additional questions. Suggestions for further study are illustrative of the types of problems yet to be addressed. Replication of the current study is suggested. Other issues to be explored include: Can the factor(s) which stimulated an uninvolved Extension system to change and begin the process of becoming internationalized be identified? What are the societal impacts of an internationalized state Extension system? What characteristics do state Extension systems which by reputation are considered internationalized exhibit? How do these characteristics compare with the five identified by the current study?

In closing, a comment made by one of the Delphi Panel members is appropriate. The panel member indicated "Internationalization should not be viewed as a fourth dimension: teaching research service and international. Instead successful internationalization efforts will integrate global perspectives into the basic mission and mandate of Extension".

Table I
Characteristics Having Importance to Extension Internationalization

Item	Mean	SD	Category
Clientele develop a fundamental understanding of global and national interdependence.	5.85	.38	R
Extension educational programs within in the U.S. stress the impact of international economic forces on agricultural markets.	5.69	.86	R
Extension educators incorporate international perspectives into on-going educational activities.	5.54	.66	R
Extension faculty/agents recognize the relationships between basic international issues (e.g. knowledge of international agriculture, commitment to human development, significance of privatization)and the Extension mission.	5.54	.66	E
Personnel evaluation systems recognize international efforts.	5.50	.76	E
Key leaders participate in interdisciplinary international experiences.	5.36	.74	R
Sensitivity to diversity issues by Extension clientele is enhanced.	5.36	.63	R
Reward structure recognizes internationalization in its system of rewards. These include merit adjustments, tenure, promotion, and peer recognition.	5.31	.63	E
Financial support for internationalizing activities is available.	5.21	.43	E
Administrators clearly communicate support for internationalization.	5.14	.66	E
A person(s) is identified to provide leadership to internationalizing efforts.	5.14	.53	E
International experiences are provided for county agents who do not have faculty status.	5.08	.64	E
Policy and operating procedures facilitate international program efforts.	5.07	.62	E
The organization culture expects international activity.	5.07	.62	E
Extension educators assist communities in building a sense of responsibility for wise use of natural resources in the context of global trends.	5.07	.62	R
Faculty increase their expertise by interacting with faculty and scholars from other cultures.	5.07	.47	E
Human and physical resources are allocated to support the integration of international activities in the overall institution effort.	5.07	.47	E
Opportunities for international experiences are provided for administrators.	5.00	.55	E
The central mission of the Extension system includes a commitment to international education.	5.00	.55	E

Table I (continued)
Characteristics Having Importance to Extension Internationalization

Item	Mean	SD	Category
Professional improvement activities increase activities increase knowledge of global issues.	4.93	.47	E
Extension is involved with international development activities.	4.93	.92	E
Local business persons are trained for participation in international markets.	4.93	.62	R
Specific groups (i.e. commodity groups) are targeted for public policy education on global decision-making.	4.86	.66	R
The organization's best junior faculty/agents are identified to participate in overseas assignments.	4.86	.36	E
Administrators engage in experience which will internationalize their own professional lives.	4.86	.53	E
Regular encouragement/accommodation of visitation by scholars from other countries occurs.	4.86	.66	E
Proposals for international work are developed and funded.	4.77	.44	E
The organization's best senior faculty/agents are identified to participate in overseas assignments.	4.64	.63	E
Exchange programs with extension organizations in other countries are institutionalized.	4.64	.74	E
Rural clientele are targeted for educational programming related to the current international marketplace.	4.64	.74	R
Educational programs planned by Extension help clientele secure a better understanding of complex worldwide issues.	4.57	.76	R
Extension educational programs offered to 4-H members help develop international awareness.	4.57	.76	R
Educational programs increase participant's understanding of other cultures.	4.57	.76	R
A committee(s) is established to guide internationalization efforts.	4.57	.65	E

Table I (continued)
Characteristics Having Importance to Extension Internationalization

Item	Mean	SD	Category
Exchange programs with extension organizations in other countries are planned and conducted on an on-going basis.	4.50	.65	E
Training programs are provided for foreign immigrants living in the United States.	4.50	.52	R
Urban clientele are targeted for educational programming related to the current international marketplace.	4.50	.65	R
Extension clientele interact with visiting scholars and students to become more globally aware.	4.31	.75	R

Scale: 0 = No Importance; 1 = Slight Importance; 2 = Limited Importance; 3 = Moderate Importance; 4 = Moderately High Importance; 5 = High Importance; 6 = Critical Importance
Categories: E = Organizational Effort; R = Organizational Result
Note: Round 1: N = 14; Round 2: N = 13; Round 3: N = 14

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DEFINING INTERNATIONALIZATION FOR EXTENSION

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The authors have focused on a very important topic as efforts are continually being made to add global perspectives to all institutional programs. The procedures identified and explained in the paper appeared to be well defined and accurate. They also seemed appropriate for the purpose of this study. It would be helpful to have more sharply described the participants on the Delphi Panel. The criteria were very good, but what type of person served on the panel? Were they Extension professionals, professors, etc. "The authors were careful to limit the discussion of the research results to the experts providing the information and not passing these views off as "representative of any other population or situation." It would be helpful, again, to know more about these "experts".

The use of Kaufman's model (organizational Elements Model) was quite useful in this situation and adds credibility to the results. The paper was well written and easy to read.

Some authors on issues of internationalization of educational institutions would take issue with the finding in this study that says that "experience was not viewed as critical" as an indicator of an internationalized Extension system. The question is "without experience, will real change ever happen?"

The authors have raised some important questions relative to the internationalization process. Where do we go from here? Are educational institutions ready to deal with this issue or are they content with the rhetoric? If it is true what Patton (1984) says about the international dimension being "basic" why is it taking so long to infuse this concept into our Extension programs?

I encourage the researchers to continue their research efforts in this area of inquiry.

AGENT TURNOVER IN OHIO STATE UNIVERSITY EXTENSION

Laith M. Rousan   Janet L. Henderson

Introduction/Theoretical Framework

Turnover in organizations has been the subject of much research and in the building of theories since the 1900s (Mowday, 1981). Organizational turnover studies contain data from many countries, describe different organizations, and examine many types of occupations.

Employee turnover in organizations is a behavior of interest to many professionals, including personnel researchers, behavioral scientists, and management practitioners (Mobley, Griffeth, Hand, & Meglino, 1979). Employee turnover can be defined as, "the cessation of membership in an organization by an individual who received monetary compensation from the organization" (Mobley, 1982, p. 10). Turnover must first be associated with the cessation of separation from an organization, not with the issues of accession, transfer, or other internal movement within an organization. This general definition of turnover applies to all private and public organizations: manufacturing, service, or government, and the definition is applicable to any type of employee-organization relationship which includes part-time, full-time, hourly, or salary arrangements.

Two types of turnover exist. Voluntary separations are employee initiated. Involuntary separations are normally organization initiated, but death or mandatory retirement requirements can also become a part of an involuntary separation. People leave organizations for many reasons. Employees may be asked to leave due to unsatisfactory performance. Sometimes, the management may feel certain employees do not match the organization's goals and objectives. Other times, people leave on their own accord in hopes of finding a better job (Roseman, 1981).

The causes of turnover in organizations are generally attributed to four classes of determinants (Mobley, 1982). The first determinant is comprised of external factors, such as the availability of jobs and unemployment levels. Organizational factors like supervisory style, pay, job content, reward system, and work environment comprise the second determinant. Individual factors make up the last two classes of determinants; they are related to turnover in two ways; first, individual non-work-related factors, such as another person's career move or family considerations and individual work-related factors, such as a lack of job autonomy or unchallenging or uninteresting work (Mobley, 1982).

Employee turnover is important to individuals, organizations, and society. Turnover, on personal level can have positive as well as negative consequences. A job change can allow an employee to move away from a stressful situation and into a different

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job that is more in line with his/her career objectives. Alternatively, though, turnover can have negative implications for an individual. He/she can lose benefits, disrupt the family's social support, and be disillusioned by a job that did not turn out to be as good as previously imagined. Turnover also has positive and negative consequences for the people who remain within the organization. Turnover may negatively affect the attitudes of the employees who remain. Turnover by itself may stimulate additional turnover by causing a decline in confidence and by highlighting the fact that alternative jobs may be available. Also, morale may be decreased because of the missing social support that the previous employee had provided. On the positive side, however, turnover allows for movement into new positions and opportunities for promotion.

Turnover for society, in general, has both disadvantages and advantages. Turnover is associated with the ability to move into new industries and organizations--movement that is vital for economic development. However, if turnover is excessive, productivity, growth, and orderly development could be depressed (Mobley, 1982).

The cost elements of turnover can be divided into two categories: tangible and intangible. The major tangible costs of turnover can be divided into the costs of recruitment, selection, orientation and training, and separation (Roseman, 1981). Intangible costs, on the other hand, are difficult to measure, but nonetheless have considerable financial impact on the organization. Intangible costs include the disruption of morale, the breakdown of work teams, increased conflicts, and lack of rapport with customers. These intangible costs hurt and disrupt the organization and indirectly create economic costs (Roseman, 1981).

On the other hand, though, employee turnover can have positive benefits to the organization. Poor performers can be displaced, promotion opportunities are created, and new people with new ideas are able to enter the organization (Mobley, 1982).

As in any organization, Ohio State University Extension (OSUE) can be affected by employee turnover. The impact of turnover is especially apparent in educational organizations like Extension, where the bulk of the organizational production system is dependent upon its employees (Clark, 1981). County Extension agents play an important role in introducing and developing educational programs through OSU Extension; the county level is where most citizens directly benefit from Extension programs. Extension agents develop and adapt programs to assist local people in identifying and solving problems. The most effective programs are developed after the professional grasps an understanding of the needs and resources of the local community.

When county Extension agents voluntarily leave their positions, an interruption in the local Extension programming is likely to occur. Even if the position is filled quickly, the replacement agent will need time to become familiar with the local situation to be effective. Agent turnover often times results in disrupted programming efforts while the new agent is being selected and undergoes an acclimation period to the local situation.

Besides the reduction of organizational effectiveness, resources are also used in selecting and training new Extension personnel. Administrative effort is necessary for proper recruitment, selection, and training of replacement agents. When financial resources are used for dealing with the consequences of turnover, those costs reduce the amount of available resources to accomplish the primary mission of the organization-- the delivery of educational programs (Clark, 1981).

Between January 1, 1990 and December 31, 1994, sixty-seven county agents voluntarily left OSU Extension. This study was designed to investigate the reasons for county agent turnover and how these reasons might be classified according to three categories of determinants: a)organizational, b) individual work-related factors, and c) individual non-work-related factors.

Purpose and Research Objectives

The purpose of this study was to determine the reasons why county agents voluntarily left OSU Extension. The following objectives were developed to guide the study:

1. describe county agents who voluntarily left OSU Extension between January 1, 1990 and December 31, 1994 on the following characteristics at the time of turnover: a) age, b) gender, c) race, d) marital status, e) involvement in a committed relationship, f) number of children, g) educational level, h) degree area, I) faculty vs. non-faculty status, j) tenure vs. non-tenure, k) performance rating, l) multi vs. single county, m) district county, n) years in OSU Extension, o) first career choice, p) intention/length of time thought about leaving to actual leaving, q) number of jobs after leaving, r) current employment status, s) description of current job, and t) salary.

2. determine the percentage of county agents who voluntarily left OSU Extension between January 1, 1990 and December 31, 1994 due to organizational, individual work-related, and individual non-work-related factors.

The organizational factors investigated in the study were: a) no opportunity for advancement, b) too much work, c) task repetitiveness, d) inadequate office space, e) low pay, f) inadequate benefits package, g) conflict with co-workers, h) lack of recognition for a job well done, I) too many requirements for advancement, j) lack of job security, and k) changing administrative policies.

The individual work-related factors addressed in the study were: a) uninteresting work, b) lack of job autonomy, c) job did not match expectations, d) no opportunities to be creative, e) involvement in the decision-making process, f) abilities did not match the job requirements, g) too many late meetings, h) conflict with values, I) other priorities in life, and j) not qualified for the job.

The individual non-work-related factors addressed in the study were: a) conflicts with other responsibilities, b) interpersonal relationships taking precedence over work, c) attracted to money elsewhere, d) other job alternatives, e) another person's career move, and f) educational opportunities.

Methodology

A descriptive design was used in this study. The population of the study consisted of all OSU Extension county agents who voluntarily left the organization between January 1, 1990 and December 31, 1994. Sixty-seven agents made up the total census population of this study.

The research instrument was a mail questionnaire that consisted of four sections. The first three sections focused on organizational, individual work-related, and individual non-work-related factors. Part I of the instrument dealt with organizational factors.

Twenty statements were designed to collect data representing organizational reasons why the agents left OSU Extension. Part II of the instrument focused on individual work-related factors. Sixteen statements comprised this portion of the instrument to identify work-related factors that might have been instrumental in the voluntary turnover of the county agents. Part III was composed of 12 statements to identify the personal or non-work-related reasons why agents left the organization. Part IV consisted of six questions designed to collect data on the personal and work characteristics of the agents when they were employed by OSU Extension.

Each of the items in the three sections were rated on a scale from one to five. If the former agent circled the number 1, then he/she was indicating that the statement definitely did not describe a reason why he/she left OSU Extension. On the other end of the scale, a rating of five indicated that the statement definitely described a reason why the respondent left OSU Extension. The final section of the instrument gave the former agents an opportunity to list the main reason they left OSU Extension. Space was also provided for agents to write additional comments on reasons why they left OSU Extension.

Content validity of the instrument was established by a panel of experts. The following points were examined by the panelists: item content and clarity, wording, length of the instrument, format, and overall appearance. In addition, the instrument was field tested by seven Extension agents who were presently working in OSU Extension.

For reliability purposes, the instrument was pilot tested by surveying agents currently employed by OSU Extension who had left another organization prior to coming to OSU Extension (n=18). Test re-test procedures were used to determine the reliability for Parts I, II, and III of the instrument. When perfect matches were considered, the percent agreement for the two administrations of the pilot instrument had an overall average of 74%. When matches within one number were considered, the percent agreement for the two administrations of the pilot instrument averaged 94%.

Some data were collected from the personnel files of OSU Extension, rather than from respondents, in an attempt to reduce measurement error. This second instrument was a data gathering form. The instrument collected data on selected personal and professional characteristics available in the personnel files. The data gathering form consisted of two sections. The first section identified personal characteristics of the previous agents: marital status, date of birth, educational level, degree area, race, and gender. The second section dealt with professional characteristics of the former agents and included: performance rating, tenure standing, multi vs. single county assignment, program area, educational level, number of years in OSU Extension, county/district, and salary.

Data were collected by mail questionnaire and personnel records. To confirm the correct addresses of the participants, a postcard was sent to the 67 former agents on December 31, 1994. The questionnaire packet was mailed to all subjects on January 6, 1995. The final deadline for data collection was on February 9, 1995. Sixty-one of the total 67 questionnaires were returned (91%). The six non-respondents were compared with the respondents on selected demographic characteristics (i.e., age, salary, and years in OSU Extension). No statistically significant differences were found between respondents and non-respondents.

Summary of Findings

Objective 1: To describe county agents who voluntarily left OSU Extension on personal and professional characteristics. This information is summarized in Table 1.

Table 1

Characteristics of Agents at Time of Turnover (n=61)

Personal & Professional Characteristics	
The average age	32 Years
Females	66%
Caucasian	90%
Married	64%
Had no children	62%
Involved in a committed relationship	79%
Master's degree holders	57%
Majoring in Home Economics	24%
Non-faculty status	54%
Not tenured	98%
4-H/Youth program area	49%
Performance ratings	Medium
Northwest (24%) and Northeast (23%) districts	47%
Number of years working at OSU Extension	3.5 Years
OSU Extension as first career choice	57%
Working in a single county	74%
Length of time thought about leaving to actual leaving	9 Months
Currently employed	92%
Working at one job after leaving	70%
Currently working as teachers	27%
Average salary	$ 24,790

Objective 2: To determine the percentage of county agents who voluntarily left OSU Extension due to organizational, individual work-related, and individual non-work-related factors.

The organizational factors that received the highest number of responses in the "Definitely" and "Great Extent" categories, as reasons why agents left the organization, included insufficient pay for the amount of work performed, too many work

responsibilities, too many requirements for advancement, and a lack of recognition for a job well done.

The organizational factors ranked "Definitely does not describe a reason why they voluntarily left OSU Extension" included an early retirement package, a lack of in-service training opportunities, and an inadequate benefits package.

Individual work-related factors that received the highest number of responses in the "Definitely" and "Great Extent" categories included other priorities in life, too many late night meetings, and the values of the organization and personal values being in conflict.

Being under-qualified for the position, uninteresting work, not enough responsibility, and unchallenging work were among the most frequently rated categories in the "Definitely does not describe a reason why they voluntarily left OSU Extension."

The individual non-work related factors that received the highest number of responses in the "Definitely" and "Great Extent" categories included receiving another job offer, family obligations, being attracted to more money elsewhere, work conflicting with personal responsibilities, and not having enough time for developing and/or maintaining personal relationships.

In the "Definitely does not describe a reason why they voluntarily left OSU Extension" response selection, the most selected responses were inadequate educational opportunities for the agents or other members of their families.

The responses to the open-ended question "What is the main reason why you left OSU Extension?" included all three factors of voluntary turnover addressed in this study. The most common reason stated for leaving the organization was due to a career change or another job offer which is an individual non-work-related factor. Excessive time and job requirements (including evening and weekend obligations) was the second most commonly stated reason, which is individual work-related in nature. Family responsibilities, an individual non-work related factor, followed as the next most frequently cited reason for turnover. Lack of a competitive salary, an organizational factor, was also cited as a reason for leaving the organization.

Additional comments about why agents left OSU Extension also illustrated that all three of the factors of voluntary turnover were instrumental in the former agents' decisions to leave OSU Extension. Excessive time and job requirements, individual work-related factors, were the most common reasons for leaving the organization, followed by family responsibilities, a non-work-related factor, and changing/unclear policies and politics, which is an organizational factor. Money, an organizational factor, was the next most commonly shared comment.

Conclusions/Implications

Based upon the findings of the study, the researcher concludes that agents who voluntarily leave OSU Extension are most likely to be Caucasian females, in their early thirties holding a Master's degree who are married with no children. Agents who voluntarily leave the organization are also more likely to be in a non-tenure track position in a single county working in the 4-H program area. Upon leaving the organization, former agents are likely to obtain a public school teaching position.

The findings of the study are concurrent with the information found in the turnover literature. Pay is addressed in the literature as an organizational factor related to job turnover. Mobley (1982) indicated a direct relationship between pay levels and turnover rates. In this study, low pay was found to be a reason that the former agents left their positions in OSU Extension. Gavin (1990) also cited low pay and decreased benefits as leading contributors to personnel loss. Many agents indicated that by leaving OSU Extension, they were able to make more money and work less hours. The individual work-related factors of excessive time requirements and late meetings were found to be key reasons why the former agents left their former positions. Balfour and Neff (1993) indicated that overtime hours were one of the key variables contributing to voluntary turnover. Family responsibilities, an individual non-work-related factor, has been discussed in the literature on turnover. Muchinsky and Tuttle (1979) found a positive relationship between family responsibility and turnover. Turnover associated with family duties is also dictated by whether or not the employee is the primary wage earner in the family. The findings of this study show that former agents repeatedly gave family obligations and responsibilities as major reasons for leaving OSU Extension.

Demographic characteristics associated with voluntary turnover have been addressed in the literature (Mobley et. al, 1979; Muchinsky & Tuttle, 1979; Porter & Steers, 1973; Price, 1977) indicating that younger employees are more likely to leave their jobs and younger employees may have more entry-level job opportunities and fewer family responsibilities which would make their job mobility easier. In this study, the majority of the former agents who voluntarily left the organization were less than thirty years of age.

Based upon the results of this study, the researcher concludes that OSU Extension agents are voluntarily leaving the organization due to a variety of organizational individual work-related and individual non-work-related factors. The organizational factors that were most often cited by former agents included low pay, too many work responsibilities, too many requirements for advancement, and a lack of recognition for a job well done. The individual non-work-related reasons given by the former agents most frequently included another job offer, family obligations, an attraction to more money elsewhere, conflicts with personal responsibilities, and no time for personal relationships. Other priorities in life, too many late night meetings, and conflicts with values were the most prevalently cited individual work-related factors.

Recommendations

The following recommendations are based upon the findings and conclusions of the study:

1. OSU Extension administrators at the state, district, and local levels should attempt to reduce the workload and time requirements of county agents. Excessive night and weekend meetings were commonly cited as a reason for voluntary turnover among the former county agents. The amount of required meetings should be reduced and additional compensation and/or additional staff positions should be provided. If Extension administration recognized and addressed concerns of excessive work loads the agents would feel less frustrated

and less likely to voluntarily leave OSU Extension.

2. OSU Extension administrators should attempt to address issues dealing with pay. The findings of this study and the literature show that lack of a competitive salary is a reason for voluntary turnover. The former agents consistently indicated that private industry pays higher salaries for similar positions. Salaries should be adjusted to compensate the agents for the amount of work performed and should be comparable to positions in the public and private sectors.
3. Organizational policies need to remain consistent within OSU Extension. Responses often reflected concern that the organization was not "walking its talk." The organization should focus on its mission and goals and if they are not feasible within the economic and human resources of the organization, then the mission and goals should be changed to meet a more realistic focus for OSU Extension.

Recommendation for Further Study

1. OSU Extension administration should identify the needs and concerns of current Extension agents in all program areas, especially 4-H/Youth. They should address the factors discussed in this study, such as excessive work requirements and low pay. When these concerns have been identified, the organization will be able to address issues that could be possible factors in future voluntary turnover. OSU Extension can then make plans for improvement.
2. OSU Extension administration should support or conduct a similar voluntary turnover study to include all levels of Extension positions and staff. Such a study would enable OSU Extension administration to have a clearer vision of voluntary turnover within the entire organization, not only the county level. If they view turnover within the whole of the OSU Extension organization, then a consistent means of addressing voluntary turnover can be created.
3. OSU Extension administration should support or conduct a study of all OSU Extension personnel who left the organization within the last five years, either voluntarily or involuntarily, comparing the two types of turnover on personal and professional characteristics. The findings of this study will provide a clear picture of the professional and personal characteristics of individuals who leave the organization by choice and the individuals who are asked to leave.
4. OSU Extension should conduct a study to determine what is the acceptable annual turnover rate for OSU Extension and determine the actual cost of turnover per agent. This study will help OSU Extension to determine where the organization stands in terms of turnover and identify the costs of replacing a county agent.
5. OSU Extension should conduct a comparison study with an Extension organization of comparable size and mission. This study will give the organization a benchmark as well as an awareness of norms within Extension organizations.

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AGENT TURNOVER IN OHIO STATE UNIVERSITY EXTENSION

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The authors have presented an interesting paper on a very important topic. There is no doubt that turnover of employees presents special challenges to organizations. The paper is well written, well organized and easy to follow. The theoretical frame of the study presented a clear rationale for the study. The purpose and objectives of the study were clear but they seemed to be written with a great amount of detail and appeared confusing at first. Although the factors investigated were listed, there was not an explanation as to why these factors were chosen and what their connection was to the objectives. This part of the purpose statement was a bit unclear.

Who made up the panel of experts that reviewed the questionnaire? It appears that the procedures were appropriate for the study. The detail provided in the paper regarding the procedures was helpful in understanding the study.

The results of the study seemed to be presented in a very brief context. While they were interesting to read, it would have helped to have a broader explanation of the results, the table and the related information.

The authors related their findings to the literature. This was helpful and certainly commendable. Perhaps the authors should have spent more time and space on the results of the study and less time and space on recommendations.

What are the implications of this study's findings? How can this data be used to correct or at least address the problems associated with turnover?

The authors should continue their investigations into this critical area of inquiry.

FACTOR ANALYSIS OF VARIABLES RELATED TO STUDENT ATTITUDES AND PERCEPTIONS CONCERNING AGRICULTURAL MECHANICS LABORATORY SAFETY

David E. Lawver   Steven D. Fraze *

Introduction and Theoretical Framework

Accident rates and health problems associated with secondary agricultural science programs are shocking. Results of a study of agricultural science programs in Texas show that in 239 randomly selected schools, 1449 accidents had occurred (Lawver, 1992). Of the programs studied, one Texas Agricultural Science and Technology teacher reported 13 major accidents during a five-year period. Studies by Bekkum and Hoerner (1993) in Iowa and Silletto (1993) in Nebraska found similar accident rates. Bekkum and Hoerner reported means of 7.70 minor accidents and 0.66 major accidents over a five year period. In Nebraska, Silletto found a mean minor accident rate of 8.58 and a mean major accident rate of 0.75. In a study of agricultural science programs in the state of Virginia, Burke (1989) reported 954 accidents in programs surveyed for a one-year period. Gartin, Maines, and Bean (1993) in a study of West Virginia agricultural science programs, found that 89 responding teachers reported 49 accidents involving equipment commonly found in agricultural mechanics laboratories over a one year period.

The National Safety Council (NSC) (1988) reported that about 19,200 accidents occurred in vocational-industrial arts laboratories for the academic years of 1984-85 and 1985-86. Firenze and Walters (1981) suggested the number of injuries in schools would actually be much higher due to non-reporting of accidents. It is typical for accidents which do not result in property damage or loss of at least one-half day of school to go unreported. The data reported by the NSC are not categorized by educational division (vocational vs. industrial arts); thus, it is impossible to ascertain the number of injuries related to agricultural science.

Harper (1983), Westrom and Lee (1990), Miller (1990), Hard and Miller (1990), Fletcher and Johnson (1990), Bekkum and Hoerner (1993), Hilton and Bruening (1993), Gartin, Maines, and Bean (1993), Gliem, Miller, and Hard (1993) and others have addressed agricultural mechanics laboratory safety and related health risks in recent research efforts. Safety and compliance with basic safety standards has been a concern since the inception of the agricultural education programs. True efforts to enforce compliance with safety standards came from the federal government with the passage of the William-Steiger "Occupational Safety and Health Act of 1970" (OSHA Act). This law was passed to assure safe and healthful working conditions for working men and women. The Act established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health, Education, and Welfare and the Occupational Safety and Health Administration (OSHA) in the Department of Labor. The Act provided for research, education, information programs, and training in the field of occupational safety and health and authorized the enforcement of standards. However, since schools generally are not classified as a place of work or businesses and students are generally not recognized as employees, complete compliance with NIOSH and OSHA regulations in most states has been questionable. Enforcement of safety regulations is

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generally left to local school districts and state departments of education. Many agricultural science programs have seen safety standards as a nuisance and an infringement on academic freedom.

The study by Lawver (1992) shows that accident rates are excessive and that safety should be a concern in Texas Agricultural Science Laboratories. The benefit of this research is that the data collected will help to begin to understand why accident rates are so high. By examining relationships between accidents and safety attitudes and perceptions of students, we can target intervention efforts more effectively. Is the Agricultural Education profession doing all that should be done in promoting safe behaviors? What factors can be extracted from the student's safety attitudes and perceptions to help discover relationships? Safety in secondary agricultural science laboratories is an issue for students and teachers.

Purposes And Objectives

The purpose of this study was to fulfill a need for data regarding factors which comprise the attitudes and perceptions of students concerning safety in Texas agricultural mechanics laboratories. In addition, the relationships between accidents and safety attitudes and perceptions of students were investigated. Specific objectives were as follows:

1. To identify factors associated with student safety attitudes and perceptions.
2. To determine relationships between the extracted factors and incident of injury or involvement in serious accident.

Methods and Procedures

The target population for this descriptive-relational study was all Texas Agricultural Science and Technology programs for the 1992-1993 academic year and all students enrolled in secondary agricultural mechanics courses during the same period. It was anticipated there would be approximately 1000 Agricultural Science and Technology programs and 20,000 students who were enrolled in agricultural mechanics courses in Texas for 1992-1993. Due to limited resources, the researcher elected to limit the sample to 30 randomly selected programs and the students enrolled in agricultural mechanics in those programs. With intensive follow-up procedures, a return rate of 87% (n=26) was achieved. Three-hundred-seventy-eight student questionnaires were returned.

The teacher in each of the 30 programs was asked to administer the student questionnaire. The student questionnaire was designed for response on a machine readable form and consisted of four sections. Section one contained 20 Likert-type items dealing with attitudes and perceptions about general safety behaviors. Fifteen Likert-type items designed to assess students attitudes and perceptions concerning safety behavior and knowledge of their teacher and general safety condition of the agricultural mechanics laboratory made up section 2. Section 3 was designed to assess attitudes and perceptions concerning parental safety knowledge and behavior and safety conditions of the home. There were 15 Likert-type items in section 3. Section 4 consisted of 5 closed-ended questions about home town, personal involvement in serious accidents, instruction in safety, and personal involvement in accidents in the agricultural mechanics laboratory. Faculty and graduate students reviewed the instrument for face and content validity. The Cronbach's alpha reliability coefficients for sections 1, 2, and 3 were 0.70, 0.76, and 0.89 respectively.

After the 30 programs were randomly selected, each was contacted by telephone to ascertain willingness to participate in the study. One replacement was randomly selected to replace one program whose teacher was not willing to participate. The number of students eligible to complete the questionnaire was also determined with the

phone call. Packets containing student questionnaires, machine readable forms, and a stamped returned envelope were mailed. After two weeks and three weeks, non-respondents were called to remind them to complete and mail the questionnaires. A replacement package was mailed to one program. Early and late respondents were compared. No significant differences were found.

The data were analyzed using SPSS ® for the Macintosh®. Objective 1 was achieved with factor analysis using the principal components method with orthogonal rotation. According to Kim and Mueller (1978), a scree test can be used to determine the number of factors to be extracted. Items were grouped into three factors for section 1, three factors for section 2, and two factors for section 3. Items with a loading of less than .40 were eliminated. Point-biserial correlation coefficients and stepwise multiple regression were used for Objective 2. The magnitude of relationships were interpreted using Davis' (1971) conventions. An alpha level of .05 was set a priori.

Findings

Objective 1

Since the questionnaire was divided into four distinct sections, it was decided to treat each of the three individual Likert-type sections separately for the purpose of factor analysis. Section 1 dealt with attitudes and perceptions about general safety behaviors. Three factors were extracted for section 1. Upon examination of factor loadings and the items which loaded on the factors, each of the three factors were named. The factors were named as follows: Factor 1 - Student Negative Safety Attitude; Factor 2 - Student Positive Safety Attitude; and Factor 3 - Inconvenient Safety Practices. Table 1 contains the items in each factor and the loading for each. The items which loaded on Factor 1 are statements which a person might make if they held negative attitudes toward safety. Factor 2 is comprised of statements which would be typical of students who held positive safety attitudes. The two items in Factor 3 are typical statements of someone who may see the benefit of safety practices and yet think of those safety practices as a nuisance.

Section 2 of the questionnaire dealt with students perceptions of their teacher's safety behavior and the condition of the agricultural mechanics laboratory. Three factors were extracted for section 2. Upon examination of factor loadings and the items which loaded on the factors, each of the three factors were named. The factors were named as follows: Factor 4 - Teacher Safety Conscious; Factor 5 - Teacher Careless; and Factor 6 - Condition of Laboratory. Table 2 contains the items in each factor and the loading for each. The items which loaded on Factor 4 are statements that would be typical of a student who perceived their teacher to be safety conscious and skilled at operating tools and machinery in a safe manner. Factor 5 contains items which would be typical of students whose teacher was careless. The items which loaded on Factor 6 address the condition of the agricultural mechanics laboratory.

The safety behavior and safety conditions of the home were addressed in section 3 of the questionnaire. Two factors were extracted for this section. Upon examination of factor loadings and the individual items the factors were named as follows: Factor 7 - Parent Safety Conscious; and Factor 8 - Parent Careless. Table 3 contains the factors for section 3 of the questionnaire. The items which loaded on Factor 7 were statements that would be typical of students whose parents and home environment was safe. Factor 8 contained items typical of students who have parents that are careless or who live in unsafe conditions.

TABLE 1. Means, Standard Deviations, and Factor Loadings of Items Associated with Student's Personal Attitudes and Perceptions (n = 377).

Factor/ Item	Mean[a]	Std. Dev.	Factor Loading
Factor 1 - Student Negative Safety Attitude			
Safety does not interest me	1.23	1.43	.73
Safety is not my responsibility	1.00	1.39	.70
Teachers spend too much time teaching safety	1.77	1.51	.67
Safety is for beginners only	1.22	1.44	.66
Safety education is a waste of time	1.19	1.36	.62
There are too many safety rules	1.75	1.41	.60
I don't care if my fellow class mate is unsafe	0.98	1.30	.60
Safety is for schools, not businesses	1.13	1.32	.58
Safety does not benefit the student	1.07	1.33	.58
Using personal safety equipment is a waste of time	1.10	1.35	.49
Factor 2 - Student Positive Safety Attitude			
Handling chemicals in a safe manner is important	4.02	1.21	.79
Knowledge of hand and power tool safety procedures is important	3.96	1.20	.74
Knowing what to do if an emergency happens is important	4.25	1.16	.73
Safety is important	4.31	1.01	.72
Safety makes sense	4.40	1.03	.62
Safety rules are a good idea	4.08	1.34	.58
Everyone should follow safety rules	4.24	1.06	.58
Using correct agricultural mechanics safety practices is important	3.84	1.24	.57
Factor 3 - Inconvenient Safety Practices			
Safety guards make things hard to operate	1.93	1.39	.86
Safety rules make things hard to operate	1.74	1.35	.77

a 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

TABLE 2. Means, Standard Deviations, and Factor Loadings of Items Describing Student's Attitudes and Perceptions Toward Their Teacher's Safety Behavior (n = 377).

Factor/ Item	Mean[a]	Std. Dev.	Factor Loading
Factor 4 - Teacher Safety Conscious			
My teacher follows safe practices	3.90	1.21	.81
My teacher considers safety to be important	4.17	1.17	.80
My teacher puts safety first	3.91	1.18	.78
My teacher stresses safe student behavior	4.00	1.16	.78
My teacher knows how to handle materials in a safe manner	3.91	1.20	.66
My teacher knows how to operate power tools in a safe manner	4.04	1.10	.63
My teacher knows how to operate machinery in a safe manner	3.92	1.23	.57
Factor 5 - Teacher Careless			
My school laboratory is a dangerous place to work	1.54	1.57	.73
My teacher sometimes does unsafe things in the laboratory	1.61	1.10	.70
My teacher is careless	1.09	1.49	.67
My teacher knows little about safety practices	1.17	1.43	.63
My teacher teaches unsafe practices	0.98	1.28	.62
Factor 6 - Condition of Laboratory			
My school's laboratory tools are safety color coded	2.94	1.46	.79
My school's power equipment is kept in safe working condition	3.54	1.27	.66
My school's laboratory tools are sometimes in an unsafe working condition	2.01	1.45	-.59

[a] 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

TABLE 3. Means, Standard Deviations, and Factor Loadings of Items Describing Student's Attitudes and Perceptions Toward Their Parent's Safety Behavior (n = 377).

Factor/ Item	Mean[a]	Std. Dev.	Factor Loading
Factor 7 - Parent Safety Conscious			
My parents know what to do in case of an emergency	3.77	1.36	.78
My parents put safety first	3.41	1.26	.77
My parents consider safety to be important	3.75	1.26	.76
My parents follow safety practices	3.52	1.23	.75
My family's motor vehicles are in safe working condition	3.78	1.34	.69
My house is a safe place to live	3.76	1.32	.68
My parents know how to drive a care safely	3.86	1.31	.67
My parents know how to operate equipment in a safe manner	3.45	1.32	.67
My parents know how to handle dangerous substances	3.45	1.25	.52
Flammable materials around my home are stored in a safe manner	3.44	1.32	.49
Factor 8 - Parent Careless			
My parents are sometimes careless	2.43	1.36	.82
My parents don't always follow safety warnings	2.27	1.34	.78
My parents have little knowledge of safety practices	1.77	1.54	.46
The dangerous materials in my home are stored in an unsafe manner	1.80	1.51	.45

[a] 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

Objective 2

On section four of the questionnaire, students were asked about their experiences with injuries in the agricultural mechanics laboratory and involvement in serious accidents in a variety of situations. Of the 377 respondents, 50 (13.2%) indicated they had been injured in the agricultural mechanics laboratory. Nearly 54% (n = 203) had been involved in a serious accident of any kind. Twenty-nine (7.7%) indicated that they had been involved in a serious accident at school. Serious auto accidents were reported by 10.5% (n = 39); serious job related accidents were reported by 5.8% (n = 22); and serious recreational accidents were reported by 17.4% (n = 66) of the respondents. Only injury in the agricultural mechanics laboratory, involvement in any serious accident, and involvement in a serious accident at school showed statistically significant relationships with any of the extracted factors. Table 4 shows the point-biserial correlation coefficients for these associations.

TABLE 4. Point-Biserial Correlation Coefficients by Accident and Factor Scores (n = 377).

Variables	Injured in Ag.Mech. Lab.[a]	Involved in Any Serious Accident[a]	Involved in Serious Accident at School[a]
Factor 1 - Student Negative Safety Attitude	.25**	.11*	.12*
Factor 2 - Student Positive Safety Attitude	-.30**	-.10	-.17*
Factor 3 - Inconvenient Safety Practices	.14**	.12*	.03
Factor 4 - Teacher Safety Conscious	-.27**	-.13*	-.13*
Factor 5 - Teacher Careless	.27**	.22**	.14**
Factor 6 - Condition of Laboratory	-.01	-.05	-.05
Factor 7 - Parent Safety Conscious	-.23**	-.18**	-.14**
Factor 8 - Parent Careless	.15**	.19**	.17**

[a] Coded 0 = no injury or no involvement in serious accidents; 1 = injury or involvement in serious accidents.
* $p \leq .05$
** $p \leq .01$

Stepwise multiple regression analysis was used to determine the amount of variance explained by the extracted factors. For the dependent variable, "injured in the agricultural mechanics laboratory," two factors entered the multiple regression equation. Factor 2 - Student Positive Safety Attitude accounted for 10% of the variance. An additional 3% was accounted for by Factor 5 - Teacher Careless (see Table 5). As seen in Table 4, there was a negative low association between Factor 2 and incidence of injury in the agricultural mechanics laboratory. Also, there was a positive low association between the perception that the agriculture teacher was careless and the incident of injury. Students who had been injured in the agricultural mechanics laboratory tended to have less positive safety attitudes and tended to perceive that their teacher was careless.

A multiple regression equation was computed with involvement in a "serious accident at school" as the dependent variable. Table 5 shows that Factor 2 - Student Positive Attitude explained 3% of the variance. Factor 8 - Parent Careless contributed another 1% of the variance. The point-biserial correlation coefficients (Table 4) show that there was negative low association between Factor 2 and involvement in a serious accident at school and positive low association between Factor 8 and involvement in a serious accident at school. Students who indicated they had been involved in a serious accident at school tended to have less positive safety attitudes and tended to perceive their parents as being careless.

The dependent variable, involvement in "any serious accident" was examined with the final stepwise multiple regression equation. As shown in Table 5, Factor 5 - Teacher Careless explained 5% of the variance while Factor 8 - Parent Careless explained an additional 1% of the variance. Table 4 shows there were positive low associations between Factor 5 and involvement in any serious accident and between Factor 8 and involvement in any serious accident. Students who were involved in any serious accident tended to perceive that their teacher was careless and that their parents were careless.

TABLE 5. Stepwise Multiple Regression Analysis of Factors on Injury and Accident Involvement (n = 377).

Dependent Variable/ Independent Variable	R	R^2	R^2 Change	df	F
Injured in Ag Mechanics Lab					
Factor 2 - Student Positive Safety Attitude	.31	.10	.10	(1,358)	39.29*
Factor 5 - Teacher Careless	.36	.13	.03	(2,357)	26.68*
Serious Accident at School					
Factor 2 - Student Positive Safety Attitude	.16	.03	.03	(1,356)	9.20*
Factor 8 - Parent Careless	.20	.04	.01	(2,355)	7.30*
Any Serious Accident					
Factor 5 - Teacher Careless	.22	.05	.05	(1,356)	18.23*
Factor 8 - Parent Careless	.25	.06	.01	(2,355)	11.52*

* $p \leq .05$

Conclusions and Recommendations

For the three Likert-type sections of the questionnaire, eight factors were extracted using the principal-components method with orthogonal rotation. These factors appear to be distinct when examining the factor and the factor loadings. The eight factors were named: Factor 1 - Student Negative Safety Attitude; Factor 2 - Student Positive Safety Attitude; Factor 3 - Inconvenient Safety Practices; Factor 4 - Teacher Safety Conscious; Factor 5 - Teacher Careless; Factor 6 - Condition of laboratory; Factor 7 - Parent Safety Conscious; and Factor 8 - Parent Careless.

Point-biserial correlation coefficients did show low relationships between some of the extracted factors and whether or not the student had been injured or involved in serious accidents. These correlations must be interpreted cautiously because of the magnitude of the correlation. In general, students who had more positive safety attitudes were less likely to report they had been injured or involved in serious accidents. Also, students who perceive their teacher to be safety conscious were less likely to report injury or involvement in serious accidents. Conversely, those who had been injured or involved in serious accidents perceived their teacher to be careless. Students who were not injured or involved in serious accidents tended to perceive their parents as safety conscious while students who were injured tended to perceive their parents as careless.

To enhance the understanding of the relationships, multiple regression was employed to discover the amount of variance explained by the factors in combination. For each dependent variable: 1) injured in the agricultural mechanics laboratory; 2) involved in a serious accident at school; and 3) involved in any serious accident, two factors combined to explain more variance in combination than was explained by either factor independently. Good, healthy student safety attitudes were associated with less incidence of injury in the agricultural mechanics laboratory and less involvement in serious school accidents. Teacher carelessness was associated with more incidence of injury in the agricultural mechanics laboratory and more involvement in serious accidents. Parent carelessness was associated with more serious accidents at school and more total serious accidents. However, only 13% of the variance was explained with the strongest multiple regression equation. This means that 87% of the variance remains unexplained.

The safety and well being of students is a primary consideration for all teachers. Anything that can be done to protect the health and safety of students should be done. Only 13% of the variance associated with self-reported injury in the agricultural

mechanics laboratory was explained. However two factors were identified that, if addressed, may help the agricultural mechanics student avoid the pain, expense, and inconvenience of injury. Promoting positive safety attitudes for students provides a place to continue in efforts to reduce accidents. Additionally, careless teacher behaviors are problematic in themselves. Students tend to perform skills in the manner in which they are modeled. This research indicates there is a relationship, although low, between teacher carelessness and incidence of injury. Texas agricultural science teachers need more preservice and inservice education in the areas of promoting positive safety attitudes and decreasing teacher carelessness.

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FACTOR ANALYSIS OF VARIABLES RELATED TO STUDENT ATTITUDES AND PERCEPTIONS CONCERNING AGRICULTURAL MECHANICS LABORATORY SAFETY: A CRITIQUE

Carl L. Reynolds, University of Wyoming

This report documents quite well the need for continuing research in the area of safety education and practices in agricultural mechanics laboratories. Safety practices in our laboratories will likely always be a concern. It is commendable that the authors of this research report have addressed the issue of student attitudes toward laboratory safety.

The attitudinal items to which the students responded provided an interesting set of data that revealed their perceptions toward safety. The items appeared to represent a list that provided a comprehensive measure of attitudes toward this subject.

The factors identified and extracted as a result of the analysis appeared to be a plausible result. It was of interest to observe that fairly strong agreement was expressed by students that safety was important, that they perceived their teachers as being safety conscious, but that they did not agree as strongly that their parents were safety conscious.

In examining the analysis to determine relationships between factors and reported incidence of injury or accidents, it was of interest to note that "student positive attitude" explained a portion of the variance for reported injuries in the agricultural mechanics laboratory and accident at school. The "parent careless" factor explained the variance for two as well, accident at school and any serious accident. The "teacher careless" factor also appeared twice, explaining the variance for injuries in the agricultural mechanics laboratory and reports of any serious accident. However, it is important to remember that only 13 percent of the variance was explained in the negative injuries in the agricultural mechanics laboratory case. This warning was appropriately given in the paper.

Perhaps one of the most useful implications to be derived from this study is to address an obvious question. Since a comprehensive measure of student attitudes toward safety resulted in explaining such a small amount of the variation in reports of injuries or accidents, what are the missing factors that should be explored? This question should be debated and further research efforts should be identified and pursued.

SAFETY ATTITUDES OF AGRICULTURAL MECHANICS STUDENTS AND THEIR RELATIONSHIPS TO SELECTED VARIABLES

David E. Lawver   Steven D. Fraze*

Introduction and Theoretical Framework

Accident rates and health problems associated with secondary agricultural science programs are shocking. Results of a study of agricultural science programs in Texas show that in 239 randomly selected schools, 1449 accidents had occurred (Lawver, 1992). Of the programs studied, one Texas Agricultural Science and Technology teacher reported 13 major accidents during a five-year period. Studies by Bekkum and Hoerner (1993) in Iowa and Silletto (1993) in Nebraska found similar accident rates. Bekkum and Hoerner reported means of 7.70 minor accidents and 0.66 major accidents over a five year period. In Nebraska, Silletto found a mean minor accident rate of 8.58 and a mean major accident rate of 0.75 over a five year period. In a study of agricultural science programs in the state of Virginia, Burke (1989) reported 954 accidents in programs surveyed for a one-year period. Gartin, Maines, and Bean (1993) in a study of West Virginia agricultural science programs, found that 89 responding teachers reported 49 accidents involving equipment commonly found in agricultural mechanics laboratories over a one year period.

The National Safety Council (NSC) (1988) reported that about 19,200 accidents occurred in vocational-industrial arts laboratories for the academic years of 1984-85 and 1985-86. Firenze and Walters (1981) suggested the number of injuries in schools would actually be much higher due to non-reporting of accidents. It is typical for accidents which do not result in property damage or loss of at least one-half day of school to go unreported. The data reported by the NSC are not categorized by educational division (vocational vs. industrial arts); thus, it is impossible to ascertain the number of injuries related to agricultural science.

Harper (1983), Westrom and Lee (1990), Miller (1990), Hard and Miller (1990), Fletcher and Johnson (1990), Bekkum and Hoerner (1993), Hilton and Bruening (1993), Gartin, Maines, and Bean (1993), Gliem, Miller, and Hard (1993) and others have addressed agricultural mechanics laboratory safety and related health risks in recent research efforts. Safety and compliance with basic safety standards has been a concern since the inception of the agricultural education programs. True efforts to enforce compliance with safety standards came from the federal government with the passage of the William-Steiger "Occupational Safety and Health Act of 1970" (OSHA Act). This law was passed to assure safe and healthful working conditions for working men and women. The Act established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health, Education, and Welfare and the Occupational Safety and Health Administration (OSHA) in the Department of Labor. The Act provided for research, education, information programs, and training in the field of occupational safety and health and authorized the enforcement of standards. However, since schools generally are not classified as places of work or businesses and students are generally not recognized as employees, complete compliance with NIOSH and OSHA regulations in most states has been questionable. Enforcement of safety regulations is generally left to local school districts and state departments of education. Many

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agricultural science programs have seen safety standards as a nuisance and an infringement on academic freedom.

The study by Lawver (1992) shows that accident rates are excessive and that safety should be a concern in Texas Agricultural Science Laboratories. The benefit of this research is that the data collected will help to begin to understand why accident rates are so high. By examining relationships between accidents, safety attitudes and perceptions of teachers, and safety attitudes and perceptions of students, we can target intervention efforts more effectively. Is the Agricultural Education profession doing all that should be done in promoting safe behaviors? Safety in secondary agricultural science laboratories is an issue for students and teachers.

Purposes and Objectives

The purpose of this study was to fulfill a need for data regarding types and frequencies of accidents that occurred in Texas Agricultural Mechanics Laboratories. In addition, the relationships between accidents, safety attitudes and perceptions of teachers, and safety attitudes and perceptions of students with selected variables was investigated. Specific objectives were as follows:

1. To determine the types and frequencies of accidents that occurred in Texas Agricultural Mechanics Laboratories.
2. To describe the attitudes and perceptions of teachers toward: a) safety practices; b) safety of school laboratories; and c) safety knowledge.
3. To describe the attitudes and perceptions of students toward: a) safety practices; b) safety of school laboratories; and c) safety in their home environment
4. To determine relationships between students' safety attitude and selected variables.

Methods and Procedures

The target population for this descriptive-relational study was all Texas Agricultural Science and Technology programs for the 1992-1993 academic year and all students enrolled in secondary agricultural mechanics courses during the same period. It was anticipated that there would be approximately 1000 Agricultural Science and Technology programs and 20,000 students who were enrolled in agricultural mechanics courses in Texas for 1992-1993. Due to limited resources, 30 randomly selected programs and the students enrolled in agricultural mechanics in those programs. With intensive follow-up procedures, a return rate of 87% (n=26) was achieved. There were 378 student questionnaires returned.

The teacher questionnaire consisted of four sections. Section one consisted of 29 Likert-type items designed to assess attitudes and perceptions concerning safety behavior, safety knowledge, and safety practices. Section two was designed to collect general information concerning their program such as length of class period, number of students, size of laboratory, number of accidents, etc. Open-ended questions were used for section 2 Eleven yes/no items comprised section 4. The yes/no items were designed to determine teacher safety knowledge concerning specific safety behaviors. Section 4 also asked the teacher to report accidents of varying severity including the nature of the accident and body part(s) involved. Faculty and graduate students reviewed the instrument for face and content validity. The Cronbach's alpha reliability coefficient for section 1 of the questionnaire was 0.98.

The teacher in each of the 30 programs was asked to administer the student questionnaire. The student questionnaire consisted of four sections. Section one contained 20 Likert-type items dealing with attitudes and perceptions about general safety behaviors. Fifteen Likert-type items designed to assess student attitudes and perceptions

concerning safety behavior and knowledge of their teacher and general safety condition of the agricultural mechanics laboratory made up section 2. Section 3 was designed to assess attitudes and perceptions concerning parental safety knowledge and behavior and safety conditions of the home. There were 15 Likert-type items in section 3. Section 4 consisted of 5 closed-ended questions about home town, personal involvement in serious accidents, instruction in safety, and personal involvement in accidents in the agricultural mechanics laboratory. Faculty and graduate students reviewed the instrument for face and content validity. The Cronbach's alpha reliability coefficients for sections 1, 2, and 3 were 0.70, 0.76, and 0.89 respectively.

After the 30 programs were randomly selected, each was contacted by telephone to ascertain willingness to participate in the study. One replacement was randomly selected to replace one program whose teacher was not willing to participate. The number of students eligible to complete the questionnaire was also determined with the phone call. Packets containing the teacher questionnaire, student questionnaires, machine readable forms, and a stamped returned envelope were mailed. After two weeks and three weeks, non-respondents were called to remind them to complete and mail the questionnaires. A replacement package was mailed to one program. Early and late respondents were compared. No significant differences were found.

The data were analyzed using SPSS ® for the Macintosh®. Descriptive statistics such as measures of central tendency and frequencies were used to achieve Objectives one, two, and three. Correlation coefficients were used for Objective four. The magnitude of relationships were interpreted using Davis' conventions. An alpha level of .05 was set a priori.

Findings

Objective 1

There were 26 agricultural science teachers representing 26 programs who responded to the teacher version of the questionnaire. Teachers were asked to report the number of accidents that had occurred in their agricultural mechanics laboratory during the 1990-91 and 1991-92 school years. They were further asked to indicate the type of accident based upon the medical attention that was provided. Five types of accidents were possible as defined by this study: 1) injuries requiring only first-aid treatment in the lab; 2) injuries requiring a visit to the school nurse; 3) injuries requiring treatment in physician's office or emergency room; 4) permanent types of injuries (e.g. amputations, paralysis, etc.); and 5) fatalities. No permanent injuries or fatalities were reported. Injuries requiring only first-aid were the most predominately reported with 60 occurrences. As seen in Table 1, there were, on the average, 2.31 occurrences of this type of injury per agricultural mechanics laboratory over the two year period in question. There were as many as 15 occurrences reported by one teacher. Only an average of 0.19 injuries requiring doctor or emergency room treatment were reported per laboratory.

***TABLE 1. Severity and mean frequency of accidents reported by Texas secondary agricultural mechanics teachers for 1990-91 and 1991-1992 school years* (n=26).**

Type of Accident	Mean	Range
First Aid in Lab	2.31	0-15
First Aid by School Nurse	0.69	0-5
Physician's Office or Emergency Room	0.19	0-1
Permanent Injury	0.00	0
Fatality	0.00	0

The respondents were also asked to indicate the nature of the reported injuries. Teachers had a number of options ranging from "surface cut/scratch" to "asphyxiation." Figure 1 shows that burns were the most commonly occurring injury (50%, n=34). Surface cuts and scratches were the next most common injury (26%, n=18). The category "other" received 13 (19%) responses. Several respondents indicated that these injuries were splinters that had been received while woodworking.

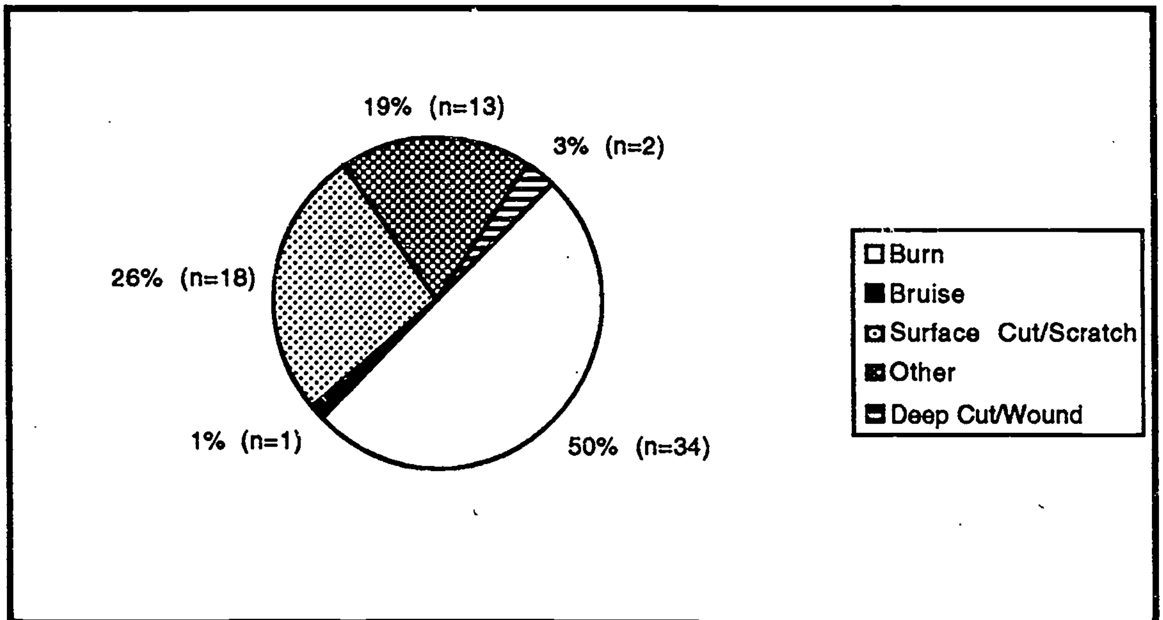

FIGURE 1. Types of injuries.

The body part injured was also of interest in this study. As seen in Figure 2 the majority of injuries involved fingers (72%, n=38). The next most common body part was the eye (15%, n=8) followed by the arm and hand (8%, n=4). There were no reported injuries to the trunk and only one injury to the lower extremity (foot) (2%, n=1).

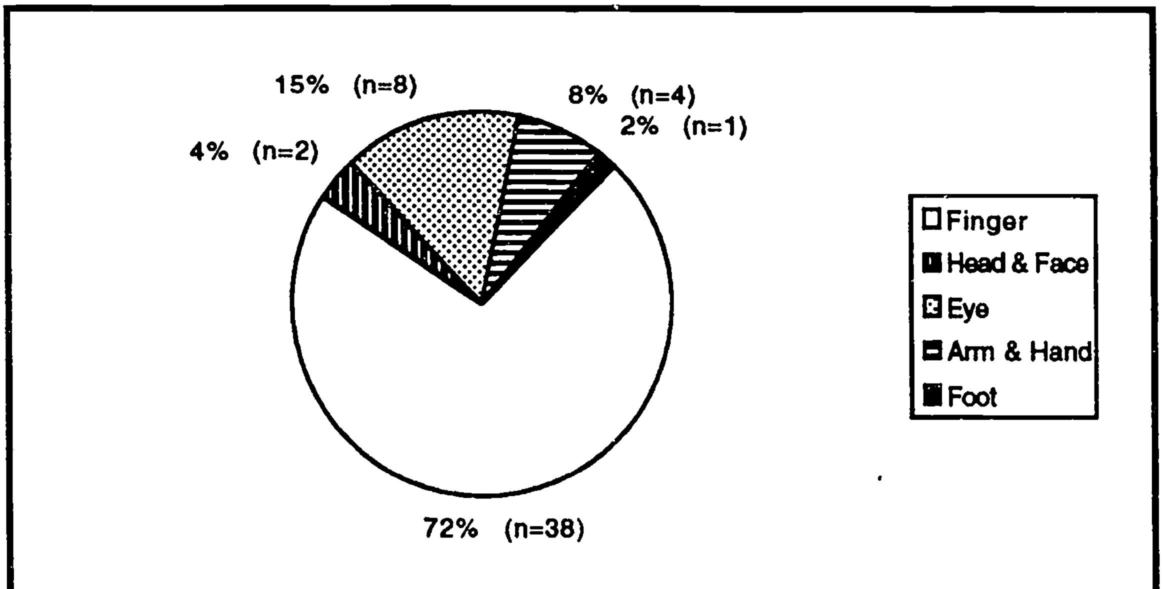

FIGURE 2. Body part injured.

Objective 2

The second objective of this study was to describe teacher's attitudes and perceptions toward safety practices, laboratory safety, and safety knowledge. The teachers were to respond to 29 Likert-type items. The descriptive statistics reported for this section of the questionnaire were based on the following scale: 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree. In general, there was relatively high agreement with items that describe what are considered to be positive safety attitudes and practices and relatively high disagreement with items that describe negative safety attitudes and practices. However, certain practices which are thought to be important by safety experts receive relatively low agreement. Table 2 shows that the item "It is important to administer safety exams" received a mean score of 3.64. This can be interpreted that, on the average, the respondents only "agreed" to "strongly agreed" with that item. This same group "very strongly agreed" (mean = 4.92) with the statement, "I consider safety to be important." Another apparent inconsistency was found with the statement, "Safety demonstrations on laboratory equipment are important." The respondents only "strongly agreed" (mean = 4.08) with this statement. Other disturbing attitudes and perceptions dealt with color coding of laboratory tools (mean = 3.24) and equipment (mean = 2.88), posting safety rules and procedures (mean = 3.16), and safety guards (mean = 2.40).

Objective 3

The 26 responding agriculture teachers administered the student version of the questionnaire to 377 secondary agricultural science students who where enrolled in an agricultural mechanics course. Table 3 shows the rank order listing of the 30 Likert-type items that were intended to provide a measure of the student's personal attitudes and perceptions toward safety. The students show relatively high agreement with the statements reflecting positive safety attitudes and behaviors. However, on the statements reflecting negative safety attitudes and behaviors, there were a few items on which the students did not disagree strongly. For instance, the students only "disagreed" (mean 1.93) with the statement "safety guards make things hard to operate. Another statement, "teachers spend too much time teaching safety" only received "disagreement" (mean = 1.77). The negative attitude, "I don't care if my fellow class mate is unsafe" was the lowest ranking item (mean = 0.98) meaning the respondent "strongly disagreed" with the statement. The students also strongly disagreed (mean = 1.00) with the negative statement "safety is not my responsibility."

The second section of the student questionnaire asked the students' perception of their teacher's safety behavior and the condition of the agricultural mechanics laboratory. The students "strongly disagreed" (mean = 0.98) that their agricultural mechanics teacher "teaches unsafe practices" (Table 4). Conversely, the students "strongly agreed" (mean = 4.17) that their agricultural mechanics teacher "considers safety to be important."

TABLE 2. Rank order listing items describing teacher attitudes and perceptions toward safety practices, laboratory safety, and safety knowledge (n = 26).

Item	Mean[a]	Std. Dev.
I consider safety to be important	4.92	0.28
It is important to know how to operate laboratory equipment in a safe manner	4.88	0.33
I think student safe behavior is of the utmost importance	4.84	0.37
It is important to know how to operate a table saw in a safe manner	4.84	0.37
It is important to safely handle all materials I use in the laboratory	4.80	0.50
It is important to require students to wear safety glasses	4.80	0.41
It is important to keep power equipment in safe working order	4.76	0.52
I believe safety should be emphasized foremost in laboratory practices	4.72	0.46
I am competent in my knowledge of safety practices	4.56	0.58
It is important to teach electrical safety	4.52	0.65
Enforcing all safety rules and regulations for my program is important	4.52	0.71
It is important to follow recommended ventilation requirements for laboratories	4.32	0.75
Safety devices on equipment should be major factor in the decision to purchase	4.24	0.83
It is important to follow recommended safe lighting levels in the laboratory	4.16	0.99
I generally follow safe practices	4.08	0.86
Safety demonstrations on laboratory equipment are important	4.08	0.91
I should know the Texas safety laws that impact my laboratory	3.96	0.94
Requiring student certification on laboratory equipment is important	3.96	0.98
It is important to follow recommended safe noise levels in the laboratory	3.92	1.00
It is important to administer safety exams	3.64	1.08
Safety decals on laboratory equipment help to prevent accidents	3.32	1.11
Sometimes I am less careful than I should be	3.28	1.02
Knowing how to safety color code laboratory tools is important	3.24	1.27
Written shop safety rules/procedures at each work station help prevent accidents	3.16	1.18
Safety color coding of laboratory equipment prevents accidents	2.88	1.36
Safety guards make things difficult to operate	2.40	0.87
Many times I might teach unsafe practices by example	2.24	1.45
My laboratory tools are sometimes in unsafe operating condition	2.04	1.31
My school laboratory is a hazardous place to work	1.16	1.11

[a] 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

TABLE 3. Rank order listing of items describing student's attitudes and perceptions toward safety **(n = 377).**

Item	Mean[a]	Std. Dev.
Safety makes sense	4.40	1.03
Safety is important	4.31	1.01
Knowing what to do if an emergency happens is important	4.25	1.16
Everyone should follow safety rules	4.24	1.06
Safety rules are a good idea	4.08	1.34
Handling chemicals in a safe manner is important	4.02	1.21
Knowledge of hand and power tool safety procedures is important	3.96	1.20
Using correct agricultural mechanics safety practices is important	3.84	1.24
Safety guards make things hard to operate	1.93	1.39
Teachers spend too much time teaching safety	1.77	1.51
There are too many safety rules	1.75	1.41
Safety rules make things hard to operate	1.74	1.35
Safety does not interest me	1.23	1.43
Safety is for beginners only	1.22	1.44
Safety education is a waste of time	1.19	1.36
Safety is for schools, not businesses	1.13	1.32
Using personal safety equipment is a waste of time	1.10	1.35
Safety does not benefit the student	1.07	1.33
Safety is not my responsibility	1.00	1.39
I don't care if my fellow class mate is unsafe	0.98	1.30

[a] 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

The third section of the student questionnaire dealt with student's perceptions of their parents' safety attitude and the condition of their home environment concerning safety. The students tended to agree with positive statements describing their parent's safety attitude and the condition of their home environment and to disagree with negative statements. In general, however, the mean scores indicated that the agreement and disagreement tended to be not as strong as was achieved on the previous two sections of the questionnaire. Table 5 shows that on the statement, "my parents are sometimes careless," the mean (2.43) fell near the middle of the scale indicating neither agreement nor disagreement. The highest ranking positive statement, "my parents know how to drive a car safety" had a mean score of 3.86.

Objective 4

A student safety attitude score was computed by recoding the negatively worded statements. The sum was used to find the score for each student. This student safety attitude score was then used to find relationships with various variables. Table 6 shows those relationships. For the first relationship, the mean student safety attitude score for each school was computed. This mean student safety attitude score by school was compared with the teacher safety attitude score by school. A Pearson product-moment correlation coefficient of .16 was found. This relationship was not statistically significant and showed only a low association. Substantial association was found with three of the selected variables. Student perception of teacher safety attitude (r = .65), student

perception of total parent safety score (r = .54), and student perception of parent's safety knowledge (r = .50) were all statistically significant at the .01 level. Moderate associations were found with student perception of parent's safety attitude (r = .49) and student perception of the home safety environment (r = .45).

TABLE 4. Rank order listing of items describing student's perceptions toward their teacher's safety behavior and laboratory conditions **(n = 377).**

Item	Mean[a]	Std. Dev.
My Agricultural Mechanics Teacher · · · ·		
considers safety to be important	4.17	1.17
stresses safe student behavior	4.00	1.16
knows how to operate power tools in a safe manner	4.04	1.10
follows safe practices	3.90	1.21
puts safety first	3.91	1.18
knows how to handle materials in a safe manner	3.91	1.20
knows how operate machinery in a safe manner	3.92	1.23
sometimes does unsafe things in the laboratory	1.61	1.10
knows little about safety practices	1.17	1.43
is careless	1.09	1.49
teaches unsafe practices	0.98	1.28
My school's laboratory · · · ·		
power equipment is kept in safe working condition	3.54	1.27
tools are safety color coded	2.94	1.46
tools are sometimes in an unsafe working condition	2.01	1.45
is a dangerous place to work	1.54	1.57

[a] 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

Section four of the student questionnaire asked respondents to indicate whether or not they had ever had an injury in the agricultural mechanics laboratory. They were also asked to indicate whether they had ever had involvement in a serious accident of any kind. Fifty student respondents (13.2%) indicated that they had been injured in the agricultural mechanics laboratory. One-hundred-seventy-four (46.1%) indicated that they had never been involved in a serious accident of any kind. Table 4 show the association of having been injured in the agricultural mechanics laboratory or having been involved in a serious accident. The point-biserial correlation coefficient for "student injury in agricultural mechanics laboratory" (r = .28) shows low positive association. Students who had been injured tended to have better student safety attitude scores than those who had not been injured.

TABLE 5. Rank order listing of items describing student's attitudes and perceptions toward their parent's safety behavior and home environment.

Item	Mean[a]	Std. Dev.
My parents · · · ·		
know how to drive a car safely	3.86	1.31
know what to do in case of an emergency	3.77	1.36
consider safety to be important	3.75	1.26
know how to operate equipment in a safe manner	3.45	1.32
know how to handle dangerous substances	3.45	1.25
follow safety practices	3.52	1.23
put safety first	3.41	1.26
are sometimes careless	2.43	1.36
don't always follow safety warnings	2.27	1.34
have little knowledge of safety practices	1.77	1.54
My house is a safe place to live	3.76	1.32
My family's motor vehicles are in safe working condition	3.78	1.34
Flammable materials around my home are stored in a safe manner	3.44	1.32
Emergency phone numbers are kept by the telephone	3.19	1.52
Dangerous materials in my home are stored in an unsafe manner	1.80	1.51

[a] 0 = Very Strongly Disagree; 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree; 5 = Very Strongly Agree.

TABLE 6. Relationship of Student Safety Attitude to Selected Variables.

Variable	r	N
Teacher Safety Attitude[a]	.16	26
Student Perception of Teacher Safety Attitude[a]	.65**	377
Student Injury in Agricultural Mechanics Laboratory[b]	.28**	377
Student Involved in Serious Accident[b]	.14**	377
Student Involved in Serious Auto Accident[b]	.06*	377
Student Involved in Serious Job Accident[b]	-.05*	377
Student Involved in Serious Recreation Accident[b]	.05*	377
Student Involved in Serious School Accident[b]	.14**	377
Student Involved in Serious Other Accident[b]	.02	377
Student Perception of Total Parent Safety Score[a]	.54**	377
Student Perception of Parent's Safety Knowledge[a]	.50**	377
Student Perception of Parent's Safety Attitude[a]	.49**	377
Student Perception of Home Safety Environment[a]	.45**	377

* $p \leq .05$

**$p \leq .01$

[a] Pearson product-moment correlation coefficient

[b] Point biserial correlation coefficient

Conclusions and Recommendations

It was concluded that the majority of injuries occurring in Texas agricultural mechanics laboratories are minor and are treated in the laboratory. Recognizing the limitations of low sample size and the problems with asking teachers to self report accidents, cautious generalizations may be made to the rest of the agricultural mechanics laboratories in the state. If the mean occurrence rate for accidents necessitating doctor's office or emergency room visits for the responding sample is 0.19 per school then as many as 190 such accidents could have occurred in Texas during the 1990-91 and 1991-92 school years. Although no permanent injuries were reported, it is very likely that such injuries did occur. For instance, a student teacher reported an injury involving a power miter box saw where the loss of use of several fingers was the result. This particular agricultural science program was not part of the random sample. It was further concluded that most injuries occurred to the finger and eyes and that most injuries were the result of burns with the next most common injury being surface cuts and scratches.

It can be easily argued that any accident rate in the agricultural mechanics laboratory is excessive. However, accidents are going to occur. Efforts should be directed at minimizing the number of accidents occurring in agricultural mechanics laboratories. Since the primary sites of injuries appears to be fingers and eyes and the primary injury tends to be burns and surface cuts or scratches, current practices need to be altered to better protect the student. There is room for improvement.

In general, the teachers who responded to this study had healthy attitudes and perceptions toward safety practices, laboratory safety, and safety knowledge with few exceptions. The respondents strongly agreed to very strongly agreed that safety is important and must be addressed in the instructional program along with the use of safety spectacles and other personal protective devices. Certain recommended safety practices were not as highly ranked. For instance, most, if not all, teacher education programs for agricultural education highly recommend the use of safety demonstrations to teach the safe operation of tools and equipment in the agricultural mechanics laboratory. When the items were rank ordered, this practice appeared well down the list. Other recommended safety practices received relatively low ratings. Items such as the use of safety exams, safety decals, safety color coding, and posting of operating rules and regulations appeared at the bottom of the positively word safety practices. Do these practices make a difference in accident rates? If they do make a difference, efforts should be targeted toward universal usage. Given that the health and welfare of students is at stake, it should be assumed that these practices do make a difference until proven otherwise.

It was concluded that the 377 students who participated in this study had healthy attitudes and perceptions concerning safety in the agricultural mechanics laboratory. They did tend to indicate that safety guards on equipment is inconvenient because of their response to the item concerning the statement "safety guards make things hard to operate." Also indicated was a belief that there are too many safety rules and that teachers spend too much time teaching safety. Teachers should strive to keep safety guards installed and to make sure that when teaching safety that students understand the necessity.

It was further concluded that students perceive their agricultural science teacher to have positive safety attitudes. The students did perceive, however, that their teacher sometimes did unsafe things in the laboratory. Students also indicated that they perceive the laboratory to have some deficiencies in the areas of color coding and tools which are in unsafe working condition. Teachers need to understand that they are under constant observation by their students. Although students may recognize a particular activity is unsafe, they may be inclined to do the same activity because that behavior was modeled by the teacher. Furthermore, it is problematic when the teacher models unsafe behavior that is not recognized by the student as being unsafe. For the most part, teachers

understand the risks associated with a particular practice. Due to inexperience, students may not have the same understanding.

Furthermore, students perceived their parents to have positive safety attitudes and their home to be a safe environment. However, they did indicate that their parents were sometimes careless and that they did not always follow safety warnings. In general, the student's safety attitude score and the perceived safety attitude of the teacher exceeded that of the parents and home environment.

The relationship between teacher safety attitude and student safety attitude was low. Conversely, there was a substantial association between student safety attitude and the student's perception of the teacher's safety attitude. Students who tended to perceive the teacher to have a positive safety attitude tended to have higher student safety attitude. More careful examination of this relationship needs to take place to understand the nature of this association and how this association might affect accident rates. Also, students who reported having been injured in the agricultural mechanics laboratory tended to have higher student safety attitude scores. Could it be that the injury sharpened the safety attitude of the student? This association also needs further study before any conclusions can be drawn about the cause and affect relationship.

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SAFETY ATTITUDES OF AGRICULTURAL MECHANICS STUDENTS AND THEIR RELATIONSHIPS TO SELECTED VARIABLES: A CRITIQUE

Carl L. Reynolds, University of Wyoming

Safety practices in agricultural education mechanics laboratories continue to thrive as a viable concern for researchers. The report presented by Drs.' Lawver and Fraze most adequately documents the need to continue the concern. Also, the suggestion that many accidents in schools go unreported is a plausible suggestion as well. The numerous research cited in this report is an example of the magnitude of the legitimate concern for continuing research efforts in this area.

It was alarming to note the number of eye injuries being reported in the Texas study. Since most states have mandatory eyeware protection legislation for school laboratories, it suggests that a serious adoption of proactive/enforcement exists. This data suggests an attitudinal behavior problem within the profession that needs to be resolved.

The conclusions and recommendations section of the report deserve special mention. First, the authors are to be commended on the amount of space devoted to this section. My only recommendation would be to add the term "Implications" to the subheading.

Key points made in the discussion include (1) a discrepancy in the emphasis placed on safety education practices taught in teacher education institutions compared with teacher's ratings of importance, (2) student perceptions of teachers sometimes modeling unsafe practices and safety deficient laboratory facilities, and (3) relationship between students' perceived safety attitude of their teacher and their safety attitude. It was also of interest to note that students who reported injuries tended to have higher safety attitude scores.

The results lead to an obvious question for debate. With all of the effort that has been put forth to research this topic, do we need to examine the methods by which safety education is taught to future teachers, current teachers, and in the agricultural education curricula within the public schools?

MAGNETIC FIELD EXPOSURES IN AGRICULTURAL SCIENCE LABORATORIES

Dr. Glen M. Miller

Introduction

Scientists are concerned about the effects of electromagnetic fields on humans. This concern developed as an outgrowth of research on childhood disease in the Denver, Colorado area. Dr. Nancy Wertheimer found a pattern of cancer in Denver that seemed to correlate with living under high-voltage power lines. These lines do produce higher-than average electromagnetic fields (Wertheimer, N., Leeper, E.,1979). Working with Dr. Leeper, Wertheimer, a physicist, determined that the children living in houses exposed to high level magnetic fields were twice as likely to develop leukemia as those in areas with low magnetic fields.

This finding has triggered a large volume of research and much litigation. Dr. M. Granger Morgan, Head of the Department of Engineering and Public Policy and Professor of Electrical and Computer Engineering at Carnegie Mellon University, has prepared several brochures which summarize findings and make suggestions for appropriate actions. Morgan (1989) reports that three kinds of studies have been done in this area. They are; (1) laboratory studies which expose single cells, groups of cells, or organs to magnetic fields under a variety of conditions and attempt to identify effects; (2) laboratory studies that expose animals or humans to magnetic fields and measure effects in body function, chemistry, disease, or behavior; and (3) epidemiological studies of various human populations which look for an association between exposure to 60 hertz electrical fields and various diseases. Morgan (1993) summarized several studies in table format. Figure 1 relates the research dealing with the cancer risk to children from residential exposure to magnetic fields. Figure 2 relates adult cancers to exposure to power frequency magnetic fields.

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Comparison of some epidemiological results.

This plot shows results for seven epidemiological studies looking at possible associations between residential exposure to power line magnetic fields and childhood cancer.

1. Wertheimer and Leeper, 1979, Denver, CO, HCC/LCC.
2. A. Meyers and co-workers, Leeds, U.K. >1 mG.
3. L. Tomenius, Sweden >3 mG.
4. D. Savitz and co-workers, Denver, CO >2.5mG.
5. S. London and co-workers, Los Angeles, CA >VHCC.
6. M. Feychting and A. Ahlbom, Sweden >2 mG
7. Olsen and co-workers, Denmark >2.5 mG.

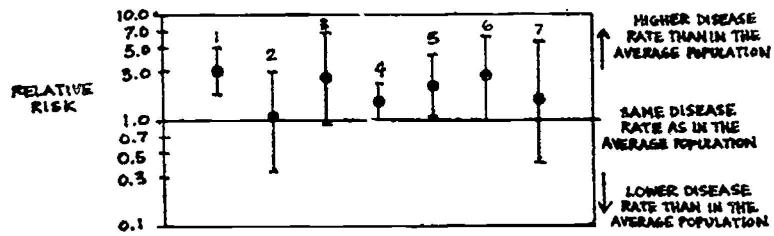

Figure 1 (Morgan 1993)

This plot shows results for six epidemiological studies looking at possible associations between exposure to power frequency magnetic fields and adult cancers.

1. Wertheimer and Leeper, Denver, CO, HCC.
2. Coleman et al. <50 m.
3. McDowall and co-workers, U.K. <50 m.
4. Stevens and co-workers >1.06 mG.
5. Severson et al. HCC.
6. Floderus and co-workers, Swedish occupational study CLL, ≥ 2.9 mG.

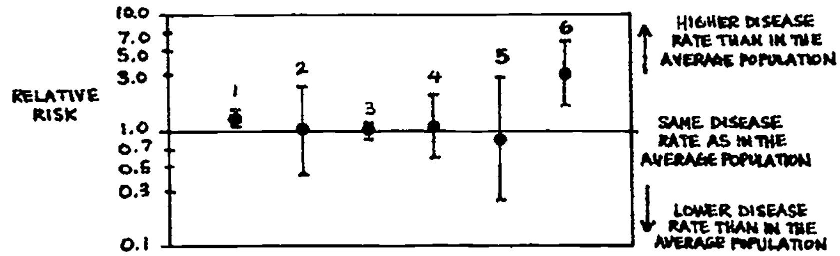

Figure 2 (Morgan 1993)

Are the statistical associations real? Are there other environmental factors that could explain the increase in cancer among certain groups? Are the numbers of subjects large enough to draw reliable conclusions? New studies are in progress. What should be the response of the education community? What are the exposures of teachers and students in vocational education laboratories?

The source of magnetic fields is the electric power used in homes and schools. The standard power in the U.S. is alternating current (AC) which reverses direction 60 times a second (60 Hz, hertz). Whenever current flows through a conductor or is present in a conductor, fields of electrical charge and magnetism are generated around the wire. These are electromagnetic fields. Without these fields, transformers and motors would not work.

The strength of these fields varies with the volume and pressure of the electricity involved (amperage and voltage) and with the distance from the source when the strengths of the fields are measured. The magnetic fields generated will pass through most materials without being affected, while electric fields are affected by materials that are conductors. A line of trees could block the electric field from a power line but do nothing to block magnetic fields.

Vocational education laboratories are well equipped with electrical devices using alternating current. Almost all hand and power tools found in vocational education laboratories are powered with 60 cycle alternating currents of various voltages. Arc welders are used extensively and, in some facilities, utility transformers are located inside laboratories to improve cooling.

Purpose and Objectives

In the past year, much concern has developed regarding human exposure to electric and magnetic fields (EMF). The unproven accusation is that exposure to magnetic and electric fields can result in harm to humans and animals. Often the education community is the last to respond to health concerns in the environment. Much of the equipment in the agricultural science laboratory does generate some magnitude of magnetic fields.

The third quarter issue of the Stabilizer, a publication of the Lincoln Electric Corporation published for welders, contained an article on Welding, EMF, and Pacemakers (Staff 1993). It is the recommendation of Lincoln Electric that exposures to EMF be minimized. Their primary concern is for workers who are arc welding. Measurements of EMF must be taken in agricultural science laboratories and recommendations developed for facilities design and strategies to minimize student and teacher exposure.

Research was reviewed on An In Vitro System for Testing the Effects of Electromagnetic Influences on Mammalian Embryos being conducted at Iowa State University (Pineda and Dooley, 1990). While the research is ongoing, several problems have been encountered with the incubators. The incubator's electrical system generated magnetic fields that interfered with the experiment. Shielding efforts have been only partially successful. In an effort to develop a base of knowledge of the exposures to magnetic fields in vocational education laboratories, data need to be collected which will document the exposure to teachers and students using common power equipment.

Objective

1. To measure electrically generated magnetic fields of selected tools and equipment in an agricultural science laboratory and make recommendations for equipment use, placement, and facility design to minimize exposure.

Procedure

As a first step in developing techniques and procedures for the measurements of magnet fields in agricultural science laboratories, measurements of magnetic fields on selected tools and equipment were conducted at a university agricultural mechanics laboratory as a preliminary study to test strategies for a broad data collection in public schools. This facility provided a broad range of agricultural science equipment.

Tools, equipment, and environmental systems were operated and magnetic fields measured. A model 4060 ELF Meter by the F.W. Bell Company was used to measure extremely low frequency alternating current magnetic fields at 60 hertz. This meter had a range from one miligauss (mG) to 9.99 Gauss (G). Measurements were taken at the source of the magnetic field and at selected intervals from the source. Measurements of the magnetic fields of hand tools were taken while the tool was clamped in a wooden clamp and suspended above a wooden work table. Measurements were taken every 90 degrees around the tool housing on portable tools and in all positions in the operator's zone with stationary tools. Measurements were taken at the front and rear of the tool as well. Distances varied for each measurement starting with direct contact against the case followed by a 6-inch distance, 12-inch distance, and an 18-inch distance. Each portable tool had a minimum of 24 measurements taken at varying distances. The manufacturer's descriptive data were collected from each tool.

Results

The following tables provide the measurements gathered on various power tools and equipment in the agricultural mechanics laboratory. Background readings were not detectable in all cases. Tables include the description of the tool and measurements around the tool at all pre- determined distances.

Table one reports the magnetic fields detected on nineteen common hand tools (a partial table presented). Few surprises were detected in the measurements. The strongest exposures were detected in direct contact with the tool. The highest single reading was off the scale of the meter at 10+ Gauss(G). The tool in question was a jigsaw with a 4.5 amp capacity. More common high readings were found on angle head grinders and large drills with readings above 4.0(G).

Generally, the exposure was higher if the amperage of the tools was higher. Two drills by Craftsman were tested. These drills appeared identical with the exception that one had an all metal case with an equipment ground and the other was a double insulated drill with a plastic case. The double insulated drill had lower field readings than the drill with the all metal case.

The illustration below shows the positions the measuring device was placed in to obtain measurements.

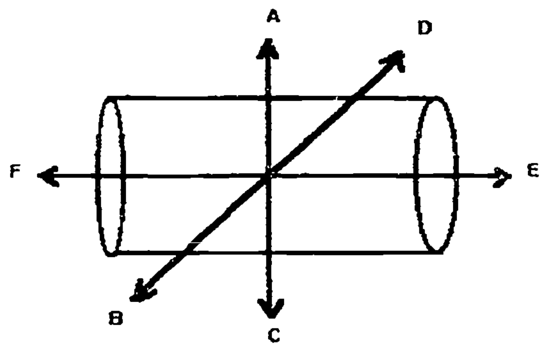

Table 1 MEASUREMENTS IN GAUSS(G) AND MILIGAUSS (mG) (partial table)

Distance	B&D Drill 3/8" VS1170 4.5Amps	B&D Drill 1/4"Hologun VSR1046 5A	B&D Drill 3/8"Hologun VSR1179 4.54A	B&D Drill 3/8" VSR 7190 3 A	B&D Drill ½ in 450RPM 6 A
0"A	1.48G	1.40	1.89	.203mG	4.21
0"B	2.39	2.90	3.02	4.01	2.38
0"C	2.62	1.31	2.33	3.40	1.23
0"D	3.04	1.55	2.40	3.75	2.03
0"E	.093	.220	.325	.368	.098
0"F	.360	.300	.406	.930	.312
6"A	.035	.050	.045	.091	.101
6"B	.020	.032	.062	1.53	.099
6"C	.050	.062	.070	1.03	.038
6"D	.048	.064	.087	1.20	.066
6"E	.006	.023	.030	.032	.016
6"F	.010	.013	.027	.000	.023
12"A	.006	.010	.007	.016	.023
12"B	.001	.022	.022	.036	.006
12"C	.009	.009	.012	.019	.010
12"D	.006	.024	.023	.035	.010
12"E	.001	.003	.007	.007	.003
12"F	.002	.005	.005	.010	.005

When evaluating stationary tools, measurements were taken in the operator's zone, directly in front of the tool. Generally, the larger induction motor tools demonstrated weaker magnetic fields than the brush motor power tools held by hand. The highest exposure was 680mG with the exposure dropping off to 59mG at an 18" spacing.

Table 2 MEASUREMENTS IN MILIGAUSS (mG) AND GAUSS (G) EXPOSURE IN THE OPERATOR ZONE

TOOL DESCRIPTION	b*	Hand Contact	6"	12"	18"
DeWalt 3HP 36-18 Amps Model GA 51 14"R/A saw	0	.906mG	.366	.080	.032
Milwaukee Chop Saw 14" Cat No. 6170 15 Amps	0	.103	.004	.001	.000

*background from dust recovery system

Table 3 lists the measurements taken on common arc welding equipment. A large capacity SMAW and a small SMAW machine were tested as well as a GMAW machine. SMAW is the industry abbreviation for stick metal arc welding and GMAW is the industry term for gas metal arc welding. Clearly, as Lincoln pointed out in their newsletter, arc welders are potential sources of magnetic fields but not significantly higher than hand-held power tools. It is also clear that placing the cables together will reduce the magnitude of the magnetic field.

Table 3 MEASUREMENTS IN MILIGAUSS(mG) AND GAUSS(G) GMAW AND SMAW WELDERS

Tool Description	Top	Front	Mid S/C/G	Mid S/C/E	Mid Comb.	Electrode	Ground
Miller Thunderbolt Arc Welder @75 Amps230 Volts	1.28G	.036mg	4.10	4.05	1.86	4.02	2.40
Lincoln Idealarc 250 @100Amps 230 Volts	.508	.304	4.33	4.27	1.84	4.27	2.10
Ltech GMAW DC constant voltage @low	.100	1.01	NA	NA	NA	.983	.638

Note: Mid S/C/G = Mid point of cable with cables separated, ground cable measurement.
Mid S/C/E = Mid point of cable with cables separated, electrode cable measurement.
Mid COMB = Cables combined at mid point.
Electrode measurement taken at insulated handle. Ground measurement taken at ground clamp.

Conclusions

Strong magnetic fields do exist in power tools and equipment commonly used in agricultural education laboratories. These fields do compare to measurements taken in studies conducted by other researchers. Standing directly under a 115-kilovolt power distribution line run 65 feet above the ground will expose a person to 30 miligauss. A 230-kilovolt line mounted 85 feet above the ground will expose a person to 58 miligauss and a 500-kilovolt power line run 135 feet above the ground will expose a person to 87 miligauss. Some of the studies found statistically significant relationships between magnetic fields and childhood cancer at measurements as low as two miligauss. The Associated Press reported on May 12, 1992 that scientists have discovered the possible linkage.

> Scientists say they have discovered microscopic magnets in the human brain that might explain the possible link between cancer and electromagnetic fields from household appliances. The magnets are crystals of the iron mineral magnetite. They are strongly magnetic and come in two sizes, one-millionth and 10 millionths of an inch wide.

The research is continuing and the issue is extremely complex. The immediate impact on vocational education laboratories should be to pursue the conservative approach in reducing student and teacher exposure to magnetic fields where possible and practical.

Recommendations

Some practical steps can be taken immediately to reduce student and teacher exposure to magnetic fields. The most basic step is to place a distance between students/teachers and the source of magnetic fields. A space of just 18 inches will dramatically reduce the exposure. Instructional facilities should be arranged with adequate space to insure students are not forced to stand in close contact with welders and motors that are operating. Ceiling height needs to be adequate to insure fluorescent lighting is well above the student's head and prolonged unnecessary running of power tools should be avoided. The Lincoln Electric Stabilizer volume 62 number 3 published in September of 1993, had some very specific suggestions for arc welding. They were:

1. *Route electrodes and work cables together. Secure them with tape if possible.*
2. *Never coil the electrode lead around your body.*
3. *Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should be on your right side.*
4. *Connect the work cable to the work as close as possible to the area being welded.*
5. *Do not work next to the welding power source.*

The measurement of magnetic fields in vocational education laboratories needs to be

expanded to examine other facilities. Entrance panels and transformers need to be measured and equipment used in biotechnology and horticulture must be added to future studies. It is important to be aware of the sources and magnitude of student and teacher exposure to magnetic fields. This knowledge will allow steps to be takes to minimize exposures so student and teacher health will be protected in case the magnetic fields are found to be harmful.

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MAGNETIC FIELD EXPOSURES IN AGRICULTURAL SCIENCE LABORATORIES: A CRITIQUE

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It was refreshing for a change to review a research report in which a majority of citations were outside the profession. It is a healthy indicator to note that colleagues draw from the expertise of the scientific community outside of the profession. For that effort, the author is to be commended.

As the citizens of this nation become more knowledgeable concerning environmental safety hazards, this research effort is an example of a proactive response to a research need. We may recall that a flurry of research efforts were initiated as a response to the public's concern for living near high tension electrical transmission lines. In this particular case, the author has initiated an effort prior to waiting for the complaints.

Once again, the profession is presented with a research report that will serve as a benchmark. Dr. Miller's initial efforts have identified the fact that strong magnetic field exposure is a hazard that exists not only in our agricultural education laboratories but in our workplaces and homes as well. It was of special interest that common portable power tools produced questionable magnetic field levels, items that most of us use.

It was of special interest to read in the report the practical management steps to take that would reduce magnetic field levels in our agricultural mechanics laboratories. Even though the research efforts to fully answer questions about the extent of this hazard is not complete, the recommendations are practical, easy to implement, and appear to be easily acceptable by our instructors.

The recommendations for future research are also a valuable contribution. Since the cause-effect of this hazard is still in question and being researched, and since the link to cancer is evident, it is prudent that the profession continues in a proactive role and works toward identifying all potentially hazardous sources and recommends ways of reducing those potentially hazardous exposures.

EXPERTS' PERCEPTIONS OF THE AGRICULTURAL MECHANIZATION COMPONENT OF TEACHER EDUCATION

Joe G. Harper Philip Buriak James W. Hilton

Introduction

Agricultural mechanization and agricultural education programs have a long tradition of cooperation and integration. Agricultural mechanization demonstrated significant growth and was the driving force of agricultural development during the middle part of this century (Cochrane, 1993). Agricultural education experienced similar growth and development during the same period of time. However, during the last twenty years both programs have diminished in scope and are now undergoing significant change. As change occurs, the question as to whether these programs will, or should, continue to cooperate, and to what level, must be asked.

Agricultural mechanization and agricultural education have a strong tradition of cooperation. Both disciplines evolved over the same relative period of time. The American Society of Agricultural Engineers (ASAE) has supported the agricultural mechanization phases of teacher education in agriculture for more than fifty years. During that period of time, a committee (which has served under several titles) has documented support through a report which has become known as "Report V". The present ASAE Report V (American Society of Agricultural Engineers, 1978) was drafted and adopted by the ASAE Education and Research Committee (A-214) "Instruction in Agricultural Mechanization". This report was based on a survey of selected teacher educators conducted by Roland Espenschied and presented as ASAE Technical Report No. 78-5010 (Espenschied, 1978).

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Purpose and Objectives

The purpose of this investigation was to determine the opinions of experts in agricultural teacher education who know and understand the agricultural engineering technology/mechanization component of teacher education and secondary and post-secondary programs in agricultural education. Experts were asked questions concerning future directions, objectives, and scope of the technology/mechanization component of agricultural education programs. The specific objectives of this investigation were to:

1. Determine expert opinion concerning the future directions of agricultural engineering technology/mechanization teacher education activities.
2. Provide guidelines and suggest future directions concerning the agricultural engineering technology/mechanization component of teacher education and secondary and post secondary programs of agricultural education.

Methods and Procedures

A modified Delphi technique, developed by the Rand Corporation, was used to collect expert opinion. The Delphi technique is a method of eliciting and refining group opinions in the absence of a knowledge base. The procedure is based on iterative and controlled feedback interactions (Dalkey, 1969; Helmer, 1967; Linstone and Turoff, 1975; Phi Delta Kappa, 1984). The opinions of experts are collected regarding an issue; their responses may be guided by a series of open ended questions. Upon receipt of their opinions, a second questionnaire is prepared from the combined responses of the experts. All members of the expert study group are next asked to rate their level of agreement with each response to the initial questions. Those opinions where the experts agree or strongly agree with the importance of a statement represent high end consensus regarding the statement.

A panel of experts was utilized to identify study participants, and conceive the nature and scope of the Delphi Round one questions. The first step was to identify a series of open-ended questions for the investigation. A series of questions was developed by the sub-committee. The open-ended research questions were:

1. To what extent should agricultural education programs in the public schools be providing instruction related to the application of engineering technologies and mechanization?
2. To what extent should agricultural education programs in the public schools be providing instruction related to the application of engineering technologies and mechanization areas of specialization?
3. To what extent should there exist relationships between what is taught in the post-secondary engineering and technology levels of instruction and the secondary level of instruction of agricultural education?

4. What is the role of agricultural engineering technologies and mechanization in future agricultural education teacher preparation programs?
5. What kinds of information or expertise should agricultural engineering technology and mechanization programs be providing agricultural teacher education programs in the future?

The team of fifteen expert study participants was selected who were familiar with agricultural engineering technology, mechanization and agricultural education. Process reliability of a Delphi investigation is a function of group size. When the number of participants is thirteen, the process reliability exceeds 0.80 (Dalkey, 1969).

The Round 1 instrument (questions) were sent to the invited experts. Opinions in the broadest sense were collected. Round 1 responses were converged and incorporated into a Round 2 instrument. The researchers did not edit the content for the Round 2 instrument. The second round instrument was adapted to a six point Likert type scale allowing the participants to rate the statements: one (1) represented strongly disagree: six (6) represented strongly agree. Those items from the round two instrument which had an average Likert value of less than 5.00, or those items where less than 80% of the experts indicated a score less than 5.00, were eliminated from the results. This selection criteria insured high end consensus by the experts. In other words, only the statements having a high level of agreement by the experts were reported as findings. For the inverse items, a Likert value of greater than 3.00 was used to eliminate items.

Findings and Results

Fifteen experts were identified as study participants. Thirteen experts responded to the round one questions and to the round two instrument. A process reliability of greater than 0.80 was achieved. Fifty items were generated in round one; twenty-nine items met the selection criteria at the conclusion of round two.

The first research question was to determine to what extent agricultural education programs in public schools should be providing instruction related to the application of engineering technologies and mechanization, including the applications of structures and environment, soil and water management, power and machinery, food processing, electrical power and processing, agricultural construction and maintenance, and information technologies and systems engineering technologies and mechanization areas of specialization. The experts indicated that agricultural engineering technologies are viable components of secondary agricultural education programs (see table 1). Furthermore, they agreed that agricultural mechanization education programs need to be updated and revised with greater emphasis upon innovative technologies. The application of physical science principles should be an important component of agricultural engineering technology instruction at the secondary level.

Table 1.

Expert perceptions of agricultural education programs in the public schools related to the application of engineering technologies and mechanization.

Item	Percent[a]	Mean[b]
Agricultural mechanization educational programs in the public schools must be up-dated, revised, and place greater emphasis upon innovative technologies in agriculture.	100	5.85
The application of physical science principles is an important component of agricultural engineering technology instruction at the secondary level.	92	5.77
Agricultural engineering technologies are a viable component of secondary agricultural education programs.	92	5.62
Agricultural engineering technology instruction should expand its role to include new technologies such as electronics, information technologies and systems.	92	5.46
Agricultural education programs in the public schools have a definite need for national leadership for directing instruction in the agricultural engineering technologies.	83	5.54
Generally, what is taught in the local schools should be based upon local needs assessments and state plans, however, agricultural engineering technologies are an important component of local agricultural education programs.	83	5.42
Agricultural engineering technology instruction is too advanced and challenging for secondary level instruction.	83	1.77[c]

[a] the percentage of experts which rated the item 5.0 or higher on the Likert scale.
[b] the mean Likert score for the item.
[c] an inverse Likert scale item.

The second research question was to determine to what extent a relationship should exist between instruction at the post-secondary engineering and technology level and the secondary level in agricultural education. The experts believe that there should exist articulation between secondary and post-secondary instructional programs of agricultural engineering technology/mechanization (see table 2).

Table 2.

Expert perceptions of the relationships between post-secondary engineering and technology levels of instruction and the secondary level of instruction of agricultural education.

Item	Percent[a]	Mean[b]
Articulation should exist between secondary and post-secondary instructional programs of agricultural engineering technologies.	92	5.54
There should be a close working relationship between secondary and post-secondary teachers, perhaps Tech-Prep programs should accomplish this relationship.	83	5.23

[a] the percentage of experts which rated the item 5.0 or higher on the Likert scale.
[b] the mean Likert score for the item.

The third question addressed the role of agricultural engineering technologies and mechanization in future agricultural education teacher preparation programs. The experts questioned were in agreement that agricultural engineering technologies/mechanization continue to be a viable component of agricultural teacher education programs (see table 3).

Table 3.

Expert perceptions of the role of agricultural engineering technologies and mechanization in future agricultural education teacher preparation programs.

Item	Percent[a]	Mean[b]
The traditional joint appointment positions with agricultural education and agricultural engineering and/or mechanization should be continued with additional relationships developed with agricultural education and other programs.	100	5.23
The agricultural engineering technology competencies must remain a part of the professional preparation of agricultural education teachers.	92	5.61
Agricultural engineering technologies are a viable component of teacher education programs for public school instruction.	92	5.46

[a] the percentage of experts which rated the item 5.0 or higher on the Likert scale.
[b] the mean Likert score for the item.

Research question four was designed to determine the perceived roles in providing leadership for agricultural engineering and mechanization technologies for agricultural education programs. According to these experts, there appears to be need for leadership in agricultural engineering technology/mechanization component of teacher education professional development (see table 4). Also, greater cooperation between ASAE, The American Association of Agricultural Educators (AAAE) and the National Agricultural Mechanics Committee (NAMC: a committee formed as an offshoot of the National FFA Agricultural Mechanization Contest Committee) was suggested to provide leadership in promoting and establishing criteria for instruction in agricultural engineering technologies/mechanization at the secondary level.

Table 4.

Expert perceptions of the role of ASAE in providing leadership for agricultural engineering and mechanization technologies for agricultural education programs.

Item	Percent[a]	Mean[b]
AAAE, NAMC, and ASAE should work together to promote agricultural engineering technologies in agricultural education programs.	92	5.92
ASAE should take a leadership role to inform and disseminate information about agricultural engineering technology programs.	92	5.77
There is a great need for leadership in agricultural engineering technology teacher education professional development.	92	5.77
ASAE should provide direction for curriculum development for the agricultural engineering technologies.	83	5.17
Agricultural engineering technologies are much broader in scope than presented by current ASAE Report V.	83	5.00

[a] the percentage of experts which rated the item 5.0 or higher on the Likert scale.
[b] the mean Likert score for the item.

There appears to be a need for information in teacher education programs concerning agricultural engineering technologies. The information should not only include competency lists, but also, be directed towards applied physics and innovative technologies.

Table 5.

Expert perceptions of the kinds of information or expertise agricultural engineering technology and mechanization programs should provide agricultural teacher education programs in the future.

Item	Percent[a]	Mean[b]
Agricultural engineering technology and mechanization programs should provide instruction related to laboratory instruction of applied skills.	100	5.62
Agricultural engineering technology and mechanization programs should provide instruction related to applied physics.	92	5.69
There is a definite need for documentation for teacher education programs concerning the agricultural engineering technologies competencies agricultural teachers need to teach in the public schools.	92	5.54
Agricultural engineering technology and mechanization programs should prioritize the competencies needed for agriculture teacher education professional development.	92	5.23
Agricultural engineering technology and mechanization programs should be providing comprehensive programs of instruction, service, and research.	83	5.31
Agricultural engineering programs should be providing information and expertise relative to:		
Aquaculture	83	5.31
Horticulture	100	5.23
Applied Physics	100	5.85
Bioengineering	83	5.46

[a] the percentage of experts which rated the item 5.0 or higher on the Likert scale.
[b] the mean Likert score for the item.

Conclusions and Recommendations

The first objective of this investigation was to determine expert opinion concerning the future directions of agricultural engineering technology/mechanization teacher education activities. The current instruction is based primarily upon competency lists outlined under each of the traditional division headings of agricultural engineering. This format was useful in the past, but today's emphasis on science-based agricultural education and the push towards education both "in" and "about" agriculture has made the competency format less useful. Couple this with the reduction in engineering technology/mechanization credit requirements for certification to teach agriculture and it is obvious that competency based guidelines are too extensive and cannot be met by prospective teachers of agriculture. This investigation indicates that future instruction should be principle driven, rather than competency driven. We must answer the questions; What scientific principles underpin the various agricultural engineering technologies and mechanization?; and How can agricultural applications bring these principles to life for students in programs of agricultural education as well as students in the sciences?, at the elementary, secondary and postsecondary levels of instruction?

The second objective was to provide guidelines and suggest future directions concerning the agricultural engineering technology/mechanization component of teacher education and secondary and post secondary programs of agricultural education. The results and findings of this investigation indicate a strong need for leadership and cooperation for agricultural engineering technology/ mechanization and management education in public schools. Efforts need to be made to enhance agricultural engineering technology/mechanization and management education and make recommendations for all of public school education, not just secondary vocational agriculture.

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EXPERT'S PERCEPTION OF THE AGRICULTURAL MECHANIZATION COMPONENT OF TEACHER EDUCATION: A CRITIQUE

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Within the last decade, the impetus to change the curriculum delivered in secondary agricultural education has become one of the most predominant driving forces within the profession. The apparent result of this driving force has been to emphasize the agricultural science and principles approach as opposed to the occupational analysis/competency approach. It is commendable that the authors of this paper focused their objectives on the agricultural mechanization component which, in the change process, has been diminished at the teacher preparation level.

I am convinced that the Delphi technique as applied in this study produced valid results from those experts surveyed. The results are plausible and expected. For this effort in implementing appropriate procedures, the authors are also to be commended.

In terms of establishing researchable goals for agricultural mechanization experts and agricultural educators, this study provides a benchmark that will prove to be valuable. We should be pursuing questions such as, "How should the agricultural mechanization curriculum be revised in public school programs?" and "What preparation is needed in teacher education that will insure competence in beginning agricultural education teachers?" Other questions raised by the results of the study are, "To what degree should skill/competency development be emphasized as opposed to development of scientific principles competencies. What is the appropriate balance between these two that will result in the learner's ability to be an effective problem solver and to transfer learning to new situations in which technology has changed?" These and other questions that may be extracted and recorded are examples of the value of this research effort.

It is hoped that one point made in the conclusions/recommendations is not misunderstood, that "...future instruction should be principle driven, rather than competency driven." It is feared that there may be those in the profession who would interpret that this recommendation means that the laboratory component should be reduced. A response by the researchers on the implications of this point would be helpful.

All of us in the profession should take note of this report and begin to formulate questions and seek answers.

CAREER DECISION-MAKING PROCESSES OF MINORITY YOUTH IN ONE RURAL MISSISSIPPI DELTA COMMUNITY

George W. Wardlow Donna L. Graham Freddie L. Scott*

Introduction

During the past decade, a trend has emerged that has been a source of concern for professionals in the sciences and technologies of agriculture: fewer minorities are selecting careers in these fields. In the fall of 1991, a total enrollment of minorities in colleges of agriculture in the United States accounted for only 7.4 percent of the total undergraduate enrollment (Texas A&M University, 1992).

There is little question that minorities are under represented in professional roles in the agricultural sciences and technologies. Agricultural professionals who have worked with rural minority youth have noted that these youth seem to be less interested in careers in agriculture than are non-minority youth. However, there is a paucity of data to substantiate this observation. Studies by Marshall (1989), Metzger (1985) and Valverde (1980), which explored the under representation of minorities and women in professional and administrative jobs in education, suggest that stereotyping, discrimination, constraints imposed by self and family, low career aspirations, lack of confidence and initiative, and lack of sponsors are causes for low participation by these groups.

Some evidence suggests that minorities experience significant barriers which may be covert and which may restrict their preparation for and entry into professional roles. These barriers may be both cultural and institutional. Nichols, et al. (1993) concluded that Hispanic students perceive more overall barriers to participation in higher education and that, "They differ particularly on barriers related to family and cultural factors...." Boykin (1986) posited that minorities must cope within three social streams. There is a "mainstream" or majority culture in which all groups interact, including Whites. There is a separate minority culture to which all minority groups contribute and interact. Additionally, each individual minority group has its own distinct culture of actions, reactions, and experiences which interacts with the majority culture with varying degrees of success.

Longstreet (1978) suggested that ethnic groups are unique according to several aspects: verbal and nonverbal communication, orientation modes, social value patterns, and intellectual modes; and corroborated this finding in observations of minority and non-minority students in classroom settings. Parker and Lord (1993) concluded that little is known about the familial, educational, and societal support systems that have contributed to the successes of African-American men.

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Lack of consideration and pursuit of professional careers in agriculture among minorities may be the result of social and cultural barriers. A study of agriscience students in Texas high schools found that minority students "... had more negative attitudes toward agriculture and agriculture occupations" (Talbert & Larke, 1992). However, negative attitudes toward agriculture as a source of possible professional careers is not unique among minorities. A study of Idaho high school students' perceptions of agriculture determined that students had "a very inadequate perception of what constitutes the industry of agriculture. The students perceive agriculture as farming and ranching only" (Orthel, et al., 1989). Idaho high school students in the study "have a pervasively negative opinion of pursuing a career in agriculture."

The numbers of minorities who pursue professional careers in agriculture may be increased by developing an understanding of the underlying social and cultural causes for the apparent lack of interest or participation in these professional roles. This project sought to develop an understanding of the career-related decision making processes used by minority youth in a predominantly Black community in the rural Mississippi delta region of the Southeastern United States.

Purpose and Objectives

This report is part of a larger study which seeks to develop an understanding of the social and cultural issues which affect the career-related decision making patterns of rural minority youth. The purpose of the study reported herein was to identify perceptions about professional careers, especially those related to agriculture, held by minority youth from a rural community in the Mississippi River delta region of the Southeastern United States. The following objectives were used to guide the study:

1. To identify perceptions about professional careers held by minority youth.
2. To identify perceptions about higher education held by minority youth.
3. To identify perceptions about agriculture - related careers held by minority youth.
4. To identify sources of information used by minority youth in career planning.
5. To identify key influencers in career planning by minority youth.
6. To identify factors which are perceived as inhibitors to the pursuit of a professional career by minority youth.

Methods and Procedures

The larger study utilized both positivistic (quantitative) and naturalistic (interpretive-hermeneutic) modes of inquiry. This report is from the interpretive findings of one of the sites in the study. Interpretive studies require the use of accepted procedures. Daines (in Hultgren and Coomer, 1989) describes the purpose of hermeneutic interpretive inquiry as "... to expose or display 'what is' in a descriptive fashion, generally using observable indicators to build a case for 'if-then' logic and explanations." She contends that it is "... the researcher's responsibility to learn, to examine, to interpret, to make sense of, and to develop an empathic or even spiritual communication with an appreciation of that which is being studied."

Interpretive-hermeneutic procedures were operationalized in this study in the following steps.

1. the identification of a **community** purposively selected for desired attributes,
2. the collection of **anecdotal observational data** from the community,
3. the collection of **anecdotal interview data** from subjects in the community,
4. the organization of the data into **coherent themes** to explain the phenomena under study, and
5. the selection of **data to illustrate the themes** as findings within the context of the community under study.

In interpretive studies, the researchers act as primary data collection instruments. Daines noted that "... one's perceptions, interpretations, plans, attitudes, feelings, values, and constructions of thought or concepts are central to one's experiences in the social world, and are therefore important to consider in developing understanding." Thus, some understanding of the researchers is important to the reader of the research report. Three researchers participated in the study. One was Black, two were Caucasian. One was a female. One researcher grew up in the geographic region under study and in a similar cultural group, had some understandings of the larger cultural background of the subjects, and had worked as an agricultural professional in the region. The second researcher had grown up near the region in which the community existed, and had worked as an agriculturally-related professional within the region. The third researcher had no personal background or professional experience in the region or in the cultural group under study, but had conducted several similar studies.

The **community** selected for the study had a 55.9 percent minority population, which is the highest proportion of minorities in any community in Arkansas. A key minority leader in the community was identified as a contact. This individual was explained the objectives of the project and solicited for his support and participation. He served as the contact through which the project researchers obtained entry into the social and cultural aspects of the minority community.

The target population for the study consisted of high school age minority youth in this community in the rural Mississippi River delta region of Arkansas. The accessible population consisted of high school age youth in the public school in that community. The student population consisted of a total of 633 students, of which 70 percent were minority youth and 30 percent were non-minority youth.

In order to obtain **anecdotal interview data**, focus group interviews (Krueger, 1988) were conducted with groups of high school students from the community. The focus group approach is particularly appropriate for the exploration of complex issues associated with human motivations. Through the systematic consideration of various perspectives which arise from focus groups, one can gain insight into the complexity of motivations (Morgan and Krueger, 1993). An analysis of the related literature provided the basis for the development of an interview protocol by which to collect data. Eleven focus group interviews were conducted with approximately 12 subjects in each group, for a total of 132 subjects. The group interviews were conducted at the high school by the researchers. Additionally, individual interviews were conducted with approximately 16 subjects.

Observational data were collected and notes were taken for economic, social

and cultural conditions within the community. The interviews were audio-taped and the tapes were transcribed. The interview transcripts and the observation notes were studied for the presence of **recurring themes**. These ideas and their interrelationships were examined for patterns based upon how and where words and actions were used within the context under study.

Results

The following results are consensus opinions and perceptions held by youth in the community under study. It should be noted that in some cases not all youth agreed. However, the inclusion of any findings in this report indicates a very strong agreement among the subjects.

Perceptions of Professional Careers and Higher Education

Higher education was seen by minority youth in this community as a "way out" -- a way out of a future life of low wages, a way out of a life of working for someone else, and a way out of the community. Higher education was also seen as a way to access professional careers. The youth in this study believed that little opportunity existed in the community for them to make good wages and to be successful as professionals. This perception was influenced by key adults in their lives.

Many of the youth interviewed indicated a strong interest in careers which they felt were accessible only with some higher education. Many indicated an interest in careers which required a four-year degree or more. Some felt that college was necessary to achieve a specific career objective, while others expressed thoughts that just having a college degree was a worthy aspiration, regardless of whether it prepared them for a specific career. Students voiced the perception that parents placed a great value on higher education as a means to achieve success, which resulted in some anxiety among students. However, students appeared to have adopted this value system.

When students were asked to identify factors they considered in deciding which college to attend, several factors were quickly offered. Many student responses related to the perceived high costs associated with college, while others were associated with program quality. Some students wanted to be as far from their home community as possible. Some wanted to be close to their families. Being able to see one's family regularly, the prestige of the college, and the size of the college -- some like it small, others like it large -- were each considerations voiced by several students.

One senior with self-assured anticipation stated, "I'm the first in my family to go to college." One student expressed some anxiety resulting from parental pressure for her to go to college,

> I would be highly embarrassed if I didn't go to college.
> My parents would make me. I probably wouldn't have
> any other choice but to go.

When asked, "But do you want to go (to college)?" She responded emphatically,

"Yes! I want to get out of the house!"

Another student voiced the parental value placed on education as a vehicle to achieve success,

> Yes, parents push you. You know, to further your education because they don't want you to do like they did, because some didn't go to college. That's why they want you to be more than what they were. And when you compare a person who went to college and a person that just finished high school, you compare and you can see the difference.

When asked why he planned to go to college, one student responded,

> Because I want to further my education. I know when I go to college, you know, get a certain degree or whatever, I know that I can get a better job than just getting right out of high school trying to get a job. .... I want to be more than just a McDonald's type of worker. I want to be recognized.

Students were asked to complete the sentence, "You see college as a way to...." Typical responses included, "To free yourself from all of this (way of life)," and "To improve yourself."

When asked what kinds of factors they considered when trying to decide which college to attend, students responded with a variety of concerns.

> The money. (cost of attending college)
>
> Scholarships (available).
>
> (To get the) best education.
>
> The career field (I'm interested in).
>
> (One should) try to determine how graduating from (a particular) college is going to (best prepare you for a specific career).

Some wanted to be as far from their home community as possible. Some wanted to be close to their families. Representative comments included, "The location of the college," and "The distance away from home...."

Perceptions of Agriculture

The youth in this study held negative perceptions about the possibility of professional careers in agriculture. Their comments were indicative of their narrow perception of agriculture as farming, such as working with "pigs" and "dirt." They associated agriculture with low skill, low wage labor intensive jobs. When asked what they felt about careers in agriculture, representative responses included,

> Don't know anything about it.

Farming.

... fields, tractors ....

Well, I just don't want to mess with dirt and all that stuff, cause that's all I know about it.

I know they plant trees and work with dirt and all that.

My (family member) worked on a farm... he worked with cotton and all that. I don't think I would like doing that. Because it's boring. All they do is sit there. Maybe if I knew more about it.

I don't have anything to say about agriculture because it's a boring subject.

I can't relate to it. I relate it to the soil, you know, being dirty and all that stuff. Smelling like plants and all that stuff.

When asked about the possibility of enrolling in a high school agriculture course, students indicated a general lack of interest in agriculture as a professional course of study. It should be noted that the school had, what the researchers believed to be, an agricultural education program which was typical of the State in terms of technical content and program organization. One student commented, "It doesn't seem like something I would be interested in." Other student comments included,

... the first thing they (parents) are going to say is 'boring.' (My) folks have been doing it for so long. Being in the South, too, I don't want to be doing the same stuff my folks have been doing....

You know, because people don't talk about it .... a lot of people don't just sit up and talk about agriculture. That's why I know nothing about it.

"I want something that's going to take me places."

When asked if they could name someone who worked in agriculture, student responses were indicative of their narrow perception of agriculture as farming, such as working with "pigs" and "dirt." Many indicated that a family member had worked in agriculture in some form of unskilled labor. Several students responded with comments like, "My daddy used to work on a farm," "My daddy used to work on a farm too, but he (doesn't any) more."

Sources of Information About Careers

When asked to identify sources of information about careers, students responded with several school-based sources. Others identified family members and career professionals as important sources of information. Typical responses included,

> Well, you got to do research, such as going to the library and checking out different books.
>
> By looking in magazines, career magazines, reading books.
>
> Talk to counselors.
>
> Talk to somebody in that field.
>
> Get information for different colleges. Going to career days....
>
> Your family. I guess, being the youngest, I can talk to my brother and sister, and then my parents.
>
> My mom works in a hospital....
>
> All of the people coming to school to talk about the medical profession. They talk about how much money they are making, and all that.

Key Influencers in Making Career Planning Choices

Minority youth indicated several influencers that were key in their career planning decisions. The types of courses taken in high school and their personal interests were influential in their career planning. Individuals who were influential included their parents, the school counselor and teachers, and professionals with whom they had contact. It should be noted that the school arranged for professionals to visit the school on a regular basis. Many students indicated that financial security was a key influencer in their career choice. It was observed that the school had an extensive set of career planning and college recruitment materials. A whole room was set aside as a resource room and was filled with career and college information. The counselors were very active in assisting students in finding information about careers and higher education.

Youth were asked, "What are some things that influenced you to be interested in (your chosen) career fields?" They responded with comments such as,

> I guess how good you are in those fields. It depends on how good you are in math or chemistry, science, something like that.

... it depends on how good you are with people.

I chose my career because I love math....

Parents encouraged youth to go to college and pursue a professional career. "My dad makes deals. 'I'll get you a car if you go.' " Study participants were asked, "Who has been most influential in helping you make a decision about careers?"

My dad.

My mom.

My family and my brothers and my sisters.

My dad has influenced me. He wanted me to be a doctor. He told me to check out these books and started giving me homework on it, on those books and stuff.

People in the community. Like Rodney Slater (U.S. Secretary of Transportation), he's in the White House right now. He graduated from this school.

Some of the teachers.

Many students indicated that financial security was a key influencer in their career choice. "All of us are looking for careers in order to make money, you know."

Inhibitors to Pursuit of Professional Careers

Students were asked to identify things that they believed would inhibit the pursuit of their career choice. The consensus concerns focused on factors which would prevent their attending and from completing the college of their choice. Increasing academic standards for admission at most colleges, and differences in admission standards between colleges, were seen as inhibitors. Some felt that increasing admission standards might prevent their admittance to the college of their choice and thus prevent them from attaining career success. They may have to choose a less prestigious college, or may have to choose a two year college or vocational school rather than a four year college.

Not completing college was seen as another inhibitor. Expected reasons for not finishing included a lack of focus in their academic studies -- articulated as "too much partying." A lack of financial resources to complete college was also seen as an inhibitor. Students articulated this as concern over the high cost of tuition and fees. Peer pressure not to attend college was not a problem.

Conclusions, Implications and Recommendations

High school students in this predominantly Black community viewed higher education as a means to achieve professional careers. Many had aspirations of professional careers as a vehicle to gain access to what they felt would be a better life than could be attained in a rural community. Very few had aspirations of remaining in or returning to the community. This has potentially devastatingly negative implications for the community if youth who are able to achieve professional careers do not return to contribute personally and professionally to their home community.

It is recommended that school personnel should provide some focus on professional careers which are available within their community and region to prevent a "brain drain" of the most academically able students from their community. If opportunities for professional careers do not currently exist in the community, consideration could be given to emphasizing entrepreneurship as a means of creating opportunities.

The youth held perceptions of agriculture which were generally negative. They characterized agriculture as hard work, long hours, requiring unskilled labor and earning low wages. As an observation, one might conclude that their perceptions were the result of their limited experiences with agriculture in their community. Agriculture in this community is largely production agriculture based on cotton, rice and soybean production, with the associated processing jobs such as cotton ginning. They have had little exposure to the professional business and science careers in agriculture.

It is recommended that agriculture professionals should make a concerted effort to cooperate with school officials in gaining access to students to provide them with information about professional careers. These professionals should portray professional careers in agriculture in a positive light.

Students in this community attain information about careers largely from school-based personnel. Other sources of information include career professionals, career days, family, and written information. The school personnel provide written information on careers and opportunities in higher education. They arrange for career professionals to visit the school.

It would appear that school personnel have a significant influence on the career choice of youth by selecting the types of career opportunities and college choices to which students are exposed. Any personal bias held by school professionals for or against particular opportunities could be evident in the students' choices. It was observed by the researchers that this school had the highest proportion of students attempting higher education in the State. This may indicate a preference for professional careers which require a college degree at a proportion that is higher than would be expected. Further, many of the students expressed to the researchers particular interests in careers in the medical professions. Students indicated that medical professionals routinely participated in school visits and career days.

Given the apparent power of influence by school officials on the perceptions of career opportunities available for youth, if the goal is to encourage interest in professional careers in agriculture, then it is recommended that agriculture professionals such as agriculture scientists routinely participate in school visits. The

effect of this may be to positively alter the perception of agricultural careers held by youth.

It is further recommended that colleges and universities with programs which prepare professionals for agriculture careers cooperate with schools to provide information about professional careers in agriculture. This may include regular visits to schools by college personnel who are in wide variety of agricultural areas of study. It may also include the production of high quality media which positively portray the wider range of opportunities of professional careers in the agrisciences and technologies. Additionally, colleges and university personnel should provide experiences in agriculture outside the community such as mentoring programs for minority students.

Students indicated that parents or other family members were the most significant influencer on their choice of careers. Professionals who visited the school, their counselor, and other school officials were also significant. The youth reported that their parents expressed a desire for their children to have a better way of life than they had. Visits by professionals and the availability of high quality media, as recommended above, could alter the negative perceptions about agriculture held by parents.

Several factors were identified by the youth as important considerations in determining if and where they would attend college. These included the availability of financial resources, location of the college relative to their home, and a sense of achieving the best education to meet their career goals. Inhibitors to achieving educational and career goals were identified as the costs associated with college, and academic criteria for admission to and completion of their college program.

Many minority youth in this study had aspirations for higher education to achieve professional careers. However, few of the youth in this study expressed interest in professional careers associated with agriculture. Professionals in agriculture and university agriculture programs should be proactive in better informing minority youth of the opportunities in professional careers in agriculture. In an article entitled "Attracting youth to agriculture," Russell (1993) posited that colleges of agriculture must become more aggressive in recruiting all students,

> It behooves Colleges of Agriculture and all of their teaching, research, and Extension units and administrative offices to raise youth development to a college-wide concern and future commitment. The historic commitment of Colleges of Agriculture to structure their teaching and research around major farm commodities now needs to be redirected to focus on the development of youth as the major human resource required for a viable agricultural industry in the coming years.

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CAREER DECISION-MAKING PROCESSES OF MINORITY YOUTH IN ONE MISSISSIPPI DELTA COMMUNITY AND BARRIERS TO PROFESSIONAL CAREERS AS PERCEIVED BY MINORITY PROFESSIONALS IN AGRICULTURE

A Discussion By
James P. Key, Oklahoma State University

I chose to discuss these two papers together since they are from the same research study and complement each other. The introduction and theoretical framework sections were very similar and were well developed to give the theoretical background, literature base and prior research defining the problem of under-representation of minorities in professional roles in agricultural sciences and technologies. The references cited reflected a thorough search of the literature in the last 10 years. The purpose and objectives of both reports were parallel and well designed to address the problem, with the first reflecting minority youths' perceptions and the latter minority adult agriculture professionals' perceptions. The methods and procedures were essentially the same with the first paper targeting the minority youth in the community and the second the minority professionals in agriculture. The interpretive design was thoroughly planned with built-in checks for researcher bias through representative backgrounds and minorities included as researchers. The use of anecdotal data from taped focus group and individual interviews provided a sound basis for trustworthy information when combined with observational data on economic, social and cultural conditions in the community. The educational and societal importance of this research is extremely great. Sources of information to help understand why this problem is occurring and possible ways to address it are greatly needed, both from the agricultural and societal standpoints.

One reason for discussing these two papers together is that some of the information in one really sheds some light on questions arising from the other. For instance, the second paper is titled "Barriers", when it really addresses the "Career Decision Making Processes" (title of the first paper) from the perspective of adult agricultural professionals. The study of barriers is only one of the five objectives addressed in the second paper. Also, a recommendation in the first paper was "...agriculture professionals should make a concerted effort to...provide them (students) with information about professional careers." This recommendation was based on information provided in the second paper, but not the first, "In nearly all of the cases the significant influencers were other professionals in agriculture to whom they had been exposed either in high school or early college." This appeared to me to be the most important finding and accompanying recommendation of the entire study, and they were in two different papers. If the most significant influencers of minority youth who returned as agricultural professionals were the agriculture professionals they were exposed to in high school and college, then all possible ways to expose high school and college minority youth to minority agricultural professionals need to be explored! Together, the two papers provided an excellent view of the career decision making processes of minority youths from the perspectives of the youths

themselves and also from minority agricultural professionals. Alone, they presented somewhat fragmented views. I will grant, however, that in two papers, there was more space to present the findings, conclusions and recommendations derived from the two groups than there would have been in one.

Some statements were made with no real basis in either paper. For example the statement from the first paper, "Peer pressure not to attend college was not a problem," was not supported by any additional statements or other evidence in either paper. Also, in the second paper, no information was given about how many minority agriculture professionals were interviewed. This was a qualitative study, but it is still important to know how many professionals were being used to arrive at consensus perceptions. In addition, it was not clear whether the larger study included more than one community or not. The first paper indicated it was from one of the sites in the study. The second paper simply said one rural community was identified. Also, no limitation was stated about the generalizability of the findings, conclusions and recommendations of this study. Although qualitative research generally does not attempt to generalize, a statement to that effect might help clarify the issue.

Again, these two papers provided an excellent view of the career decision making processes of minority youth from the perspectives of the youth themselves and also from minority agricultural professionals who returned to rural communities. Together they present the primary influences on minority youth in career decision making and the inhibitors and barriers to the pursuit of professional agricultural careers. The key appears to be positive minority professional ro'e models. Students tend to follow older peers who have had positive experiences. Both papers indicated that minority students need maximum exposure to agricultural professionals to help alleviate the under-representation. Both papers also indicated that the inhibitors and barriers need to reduced or eliminated to encourage minority youth to enter agricultural professions and remain there.

Both of these papers were extremely well written and the overall study was excellently designed. They contributed greatly to helping solve a most important problem in agricultural education and our society. More research of this caliber and nature needs to be done in this profession.

BARRIERS TO PROFESSIONAL CAREERS AS PERCEIVED BY MINORITY PROFESSIONALS IN AGRICULTURE

George W. Wardlow Donna L. Graham Freddie L. Scott*

Introduction and Theoretical Framework

> "Believe me, the agriculture department at the University was by no means a dream come true." -- minority agriculture professional on his experience at an 1862 Land-Grant University.

There is little question that minorities are under represented in professional roles in the agricultural sciences and technologies. Studies by Marshall (1989), Metzger (1985) and Valverde (1980), which explored minorities and women in professional roles, suggest that stereotyping, discrimination, constraints imposed by self and family, low career aspirations, lack of confidence and initiative, and lack of sponsors are causes for under representation by these groups in professional roles.

Some evidence suggests that minorities experience significant covert cultural and institutional barriers which may restrict their preparation and entry into professional roles. Boykin (1986) posited that minorities must cope within three social streams. There is a "mainstream" or majority culture in which all groups interact, including Whites, and a separate minority culture to which all minority groups contribute and interact. Additionally, each minority group has its own distinct culture of actions, reactions, and experiences which interacts with the majority culture with varying degrees of success. Longstreet (1978) suggested that ethnic groups are unique according to several aspects including: verbal and nonverbal communication, orientation modes, social value patterns, and intellectual modes.

In Career Patterns in Education (1982) Ortiz noted that minorities are often placed in special programs which are designed to mediate cultural differences and aid their infusion into the majority culture. She determined that (1) minorities placed in special programs did not interface with the organization in the same manner as did white professionals, (2) the socializing agents of most minorities were minorities themselves, (3) minorities were socialized to interact with their respective racial/ethnic communities as opposed to the organization itself, and (4) being confined to special projects constrained their movement within the larger organization.

Goodstein (1994) argued for multicultural curricular as the first step in creating optimal climates for learning involves presenting academic content that enables students to perceive that their particular experiences and perspectives are recognized and valued. Kallio (1995) reported that social environment of campus life

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was among the most important of six factors which affect the selection of a graduate school. According to Tan (1994), a second most important factor influencing the decision to attend college for African Americans was to satisfy family expectations. According to Kuo and Hauser (1995), family background accounts for at least half the variance in educational attainment among Black and White men. Family background includes all family, school, or neighborhood characteristics, including the social, economic, psychological, or biological

Wakelee-Lynch, cited in Parker and Lord (1993), noted an abundance of negative articles about Black males and that little attention has been given to what is positive and productive about successful, legally employed African-American men. They concluded that little is known about the familial, educational, and societal support systems that have contributed to their successes. Citing Conner they concluded that the more the development and qualities of these positive role models is understood, the greater the chances that growth-enhancing guidelines can be developed to replicate such experiences for younger African-American men.

Minority professionals were less likely to be exposed to agricultural careers while they were in high school. A study of agriscience students in Texas high schools found that minority students "... perceived more barriers to enrolling (in agriculture courses) and had more negative attitudes toward agriculture and agriculture occupations" (Talbert & Larke, 1992). The number of minorities in these career roles may be increased by developing an understanding of the underlying social and cultural causes for the apparent lack of interest or participation in these professional roles. This project sought to develop an understanding of the barriers to the pursuit of professional careers as perceived by minority professionals in agriculture from one rural Mississippi Delta community.

Purpose and Objectives

The purpose of this study was to identify and describe barriers encountered by agricultural professionals and to develop an understanding of their perceptions about the decision making processes of minority youth, especially those related to those related to professional careers in agriculture. The following objectives were used to guide the study:

1. To describe perceptions of agriculture held by minority agriculture professionals.
2. To identify influencers in career decision-making processes of minority agricultural professionals.
3. To identify barriers encountered by minority professionals in pursuing careers.
4. To identify influencers in minority youth career decision-making, as perceived by adult minority professionals in agriculture.
5. To identify concerns for minority youth in the pursuit of agriculture professions, as perceived by adult minority professions in agriculture.

Methods and Procedures

This study utilized the naturalistic (interpretive-hermeneutic) mode of inquiry. Interpretive studies require the use of accepted procedures (Daines in Hultgren & Coomer, 1989). Daines describes the purpose of hermeneutic interpretive inquiry as "... to expose or display 'what is' in a descriptive fashion, generally using observable indicators to build a case for 'if-then' logic and explanations." She contends that it is "... the researcher's responsibility to learn, to examine, to interpret, to make sense of, and to develop an empathic or even spiritual communication with an appreciation of that which is being studied."

Interpretive-hermeneutic procedures were operationalized in this study in the following steps. The procedures used in this study were:

1. the identification of a community purposively selected for desired attributes,
2. the collection of anecdotal observational data from the community,
3. the collection of anecdotal interview data from subjects in the community,
4. the organization of the data into coherent themes to explain the phenomena under study, and
5. the selection of data to illustrate the themes as findings within the context of the community under study.

In interpretive studies, the researchers act as primary data collection instruments. Thus, some understanding of the researchers is important to the reader of the research report. Three researchers participated in the study. One was Black, two were Caucasian. One was a female. One researcher grew up in the geographic region under study and in a similar cultural group, had some understandings of the larger cultural background of the subjects, and had worked as an agricultural professional in the region. The second researcher had grown up near the region in which the community existed, and had worked as an agriculturally-related professional within the region. The third researcher had no personal background or professional experience in the region or in the cultural group under study, but had conducted several similar studies.

One rural community in the Mississippi River delta region of Arkansas with a significant minority population was identified. A key minority professional in agriculture in the community was identified. This individual was explained the objectives of the project and solicited for his support and participation. He served as the contact through which the project researchers obtained entry into the social and cultural aspects of the minority community.

The target population for the study consisted of minority professionals in agriculture in the community. The accessible population consisted of adult professionals in agriculture in the community. Representatives included professionals from such agencies as: ASCS, Forestry Service, Cooperative Extension Service, FmHA, University Research Station, and the public school system.

In order to obtain anecdotal data, a focus group interview (Krueger, 1988) was conducted with the subjects. An analysis of the related literature provided the basis for the development of an interview protocol by which to collect interpretive data from the subjects. Observation notes were taken of economic, social and cultural conditions within the community. The interview was audio-taped and the tape was

transcribed. The interview transcript and the observation notes were studied for the presence of recurring themes. These ideas and their interrelationships were examined for patterns based upon how and where words and actions were used within the context under study. The results are representative responses and perceptions held by the subjects.

Findings

Perceptions of Agriculture

Minority agricultural professionals were asked to describe the perceptions of agriculture that they held as youth. Most had held negative perceptions that were the result of laborious experiences in agriculture from their childhood. They characterized agriculture as farming, hard work, and of little opportunity to provide a career. While each currently held different perceptions of agriculture, they attributed their early perceptions to their experiences in production agriculture.

Their perceptions were described with phrases such as, "chopping cotton," "hard work," and "agriculture was farming." Another minority agriculture professional suggested that opportunities in production agriculture were limited and that opportunities in professional careers in agriculture were non-existent.

> What our people, Black people, knew about production agriculture, that meant hard work. Unless (the) parents had farms or a sizeable land, and most didn't, it meant seeking another career.

One agriculture professional explained that he grew up on a farm and expected to pursue any career other than agriculture. However opportunities for higher education changed his career plans.

> I was raised up on a farm. .... Believe me, agri(culture) was the last thing on my mind (while in high school). My major (in college) was going to be history. .... I was going to get as far away from the farm as possible. But, when I got over to the school (college), ... I didn't have enough money to attend school. The agri(culture) department, my brother went through that, they offered me a scholarship. Well, it was either that, accept the scholarship, or go back to the farm. I chose the scholarship to the ag(riculture) department. The rest is history. That's why I'm where I am today.

In describing his perceptions of agriculture held in high school, one noted,

> I thought I knew about agriculture, but once you got into college, you found out ag was not all about chopping cotton and picking up stuff, milking cows, and feeding hogs. It was totally different from what I had learned on the farm. .... When I first came to work with the extension service, I said, "Boy, if I had known people were doing this for a living in agriculture, I would have

done left the farm." This is the easiest job I've ever had.

Influencers in Career Decision-Making Processes of Agriculture Professionals

With some exceptions, few of the minority professionals interviewed had intended on pursuing agriculture as a professional career while they were in high school. Each noted significant influencers in their career decision. Some noted that exposure to agriculture professionals in high school had a delayed, but positive, influence on a choice they made later in college to pursue agriculture as a career. In nearly all of the cases the significant influencers were other professionals in agriculture to whom they had been exposed either in high school or early in college. Community based professionals in agriculture, such as a high school agriculture teacher or an agriculture extension agent, were identified as important influencers.

> I made my mind up in high school. I noticed that the ag teacher... had the respect of the students and most all of the teachers. They made more money because they worked longer. .... I chose agriculture when I got into college because (an agriculture professor) talked me into it. And I chose to go into education because that year there was about 10 of us going into education. Most of my friends in agriculture were majoring in education. .... I chose that because of the people ... and an ag teacher in high school.

Another noted that, "Teachers are a great influence on kids. Kids can pattern their lives after good teachers."

Many noted that they were influenced to pursue agriculture careers in high school. Several said that agriculture professionals came to speak to students while they were in high school. "A guy came to speak to us at school. Ever since the tenth grade I knew I wanted to go in agronomy. From that time since, I've known what I was going to do."

Barriers Encountered by Minority Professionals in Pursing Careers

Each of the subjects interviewed indicated that they had encountered barriers to their pursuit of a professional career in agriculture. They perceived many of these barriers to be based on race. Nearly all who had studied agriculture at a majority-White college reported encountering race-related bias in college classes. Nearly all reported encountering race-related bias in their professional organizations and/or the institution with which they were presently employed. One voiced the belief that there were positions for Whites and other positions for minorities.

Minority professionals described a general feeling of cultural isolation and specific examples of being treated differently than the majority students when they were in college.

> I went to a predominantly White university, so it was definitely some isolation that occurred there. I had one

instructor who, once he found out who I was (Black), I had made the highest score (previously in class), ... I had a very difficult time making a "C" after that.

If you come from Lee County where you are the majority (Black), all of a sudden you go to being the minority (in a predominately White college), that is culture shock.

A different professional described a similar situation that he encountered in college.

> You walk in the classroom and the teacher tells you, point blank, "You are going to make a 'C'." It makes no difference... you can make straight one hundreds on the tests, and they're going to find something wrong with your paper....

Still another professional described his experience in a college class.

> I can tell you one better than that. When I started class, the teacher looked up at me and said, "I see two D's and a possible F." I looked around the room and there wasn't but two minorities in there and I realized who he was talking about.

A participant described his experiences with instructors in university classrooms.

> ... they talk to the other side of the room and never talk to your side. The way they never ask you a question and assume you don't know the answer. You may know the answer, but they don't even give you the chance to give the answer. You really can't put on paper what people are doing to you, but you can feel it if you are in that class.

A minority professional relayed an instance of past direct bias in his pursuit of a career opportunity.

> I was working on my Master's degree. I went up (to the predominantly Black university in the state). On the wall, they had openings for five (high school agriculture teacher) positions in the state. I (then) go to (the predominantly White university), there was openings for 38 agriculture education teachers on the wall. So, I called the instructor (at the Black institution) and asked, "Why are there only five positions on the wall there and here there are 38 (at the White institution)?" I was told, "This was the only five position that we were told about."So, I ... asked my state supervisor why is this so because I was told he was in charge of sending out the positions. He said that they (State staff) knew what superintendents and what schools wanted (which) particular people, race of people. So, they only send the positions (for Blacks to schools in predominantly Black

areas).

An extension professional indicated that similar bias had occurred in his institution. He noted that there was at least the perception that there were certain positions in certain counties which were reserved for minority individuals. "If you notice certain areas of the state, all of the Black extension people are located in one area."

These professionals indicated that while overt practices of bias may no longer exist in their organizations, past practices have affected attitudes about the organizations which will endure into the future. Additionally, practices of bias which limit mobility in professional roles may continue in more covert fashion.

Perceptions of Influencers of Youth Career Decision-Making

The majority of participants studied did not believe that youth know what career they want to pursue by the time they graduate from high school. They did believe that students are influenced by adults with whom they come in contact, but that influence may not lead to an immediate decision.

> You look at these plants, they shut down...and then you look at the person who has gone to high school... works at the telephone company. They're doing pretty good. It's kind of hard to look four years down the road and the amount of commitment that you are going to have to make (to finish a college degree). How am I going to get out to start at $45,000?

According to these participants, minority youth tend to follow the experiences of successful older youth from the community. They discussed a "pipe line effect" in which students will pursue specific studies at specific institutions if older peers have had positive experiences in those institutions. Negative experiences can affect that pattern in a negative way.

> Once you have students go into an area (institution or major), they come back home and tell you how well they are doing... and talk to the students. This also influences students to go into that particular area.

The subjects in this study believed that it was important for students to see agriculture as providing good economic opportunity for a career, and that the general level of awareness about agricultural opportunities must be raised by providing more exposure of youth to successful agricultural professionals. Teachers were identified as a great influence and the need for minority agriculture teachers in high school was voiced. These adults felt that students need role models and that minority agriculture professionals should be available to serve as role models. The participants discussed the perception that, compared to the time of their youth, there appeared to be fewer minorities in professional roles in agricultural education and extension to serve as role models for youth.

> ... way back a long time ago, we had separate 4-H clubs. We had separate vocational ag programs. And, we had more role models to relate to. And now, we have just a few.

This practice of segregated programs was ended several decades ago. As the programs were combined and both agriculture teacher and extension agent positions were eliminated. According to participants, the minority professionals were the ones who lost their positions in these combined programs. One participant explained, "When I first started teaching agriculture, we had 45 Black agriculture instructors. Today we have 14." He continued, "If you want students to go into agriculture, you must have some teachers that they look up to in order to get them interested in it." Another participant explained the concept,

> For example, a Black student and a White student are in a class with a Black teacher and a White teacher. More than likely, (each) student will go to their particular race of teacher for advice as far as going into a career. So, if (the student doesn't) have anyone in the field, then that means (he/she is) going to sit up there and wonder, "Should I ask him about going into an area, and would he really tell me the truth?"

Several noted that agricultural education in high school was once a required subject for all male youths in many schools, but this was no longer the case. They felt that this reduced the proportion of youth who would be exposed to agriculture.

<u>Concerns for Minority Youth to Pursuing Professionals Careers in Agriculture</u>

Each of the subjects in the study had encountered bias in their professional careers. All subjects agreed that this was a concern that they held for minority youth who may wish to follow in their career paths. An additional concern was for the increasing economic costs associated with pursuing a college degree.

The subjects felt that there was a lack of commitment by central administrators in agencies (such as the Extension Service and the Universities) who employ minority agriculture professionals to have these minority professionals (as well as non-minority professionals) serve as speakers and resource persons to youth on the opportunities in agriculture.

Several of the minority participants expressed concerns arising from the implementation of equal employment opportunity guidelines. They discussed the feeling that minimum quotas for minority hires in organizations become maximum quotas. Additionally, they expressed the concern that Blacks may be held at certain professional levels to maintain numbers. One participant believed that his agency had a state quota for minorities in staff chairman roles.

> The magic number is three. It seems to work that way because once you leave a minority staff chair, they replace that person with another minority staff chairman. But, they are not making any other positions available for you. So I think they do as a minimum... I think there is a limit and that is a barrier.

Conclusions

"Students have to be taught early in life that they are going to be living in a culturally diverse world." -- -- minority agriculture professional.

Adult agricultural professionals in this predominantly Black community had held negative perceptions of agriculture in their youth, viewing it as hard work with little opportunity for a professional career. For these professionals, significant individuals were key influencers in their decision to pursue agriculture as a profession. For some, it was not just one individual, but the influence was cumulative and their decision was not reached until they were into their collegiate studies.

These adults had encountered race-based barriers in their collegiate studies or in their professional careers. Each maintained concern for minority youth who might wish to pursue careers in agriculture and, thus, may face similar barriers and cultural isolation in their studies and careers. These adults do not believe that most youth have decided on a career while in high school, but they do believe that exposure to career professionals while in high school has an effect on career decisions. They also believe that students tend to follow the academic paths of their older peers and are more likely to attend the same colleges and pursue similar studies.

The lack of minority professionals in agriculture who can serve as role models was seen as a significant barrier to encouraging minority youth to pursue agriculture careers. It was noted that agencies that employ minority professionals apparently lack the commitment to use them to encourage youth to pursue careers in agriculture. Minority youth need a broader perspective of agricultural careers and understand the economic opportunities in these career choices.. It is recommended that University and Extension programs use minorities in the recruitment of minority students in agriculture. College recruiters should work with local teachers and counselors to raise the level of awareness of careers in agriculture. It is also recommended that further study be conducted to identify the barriers regarding the promotion and placement of minority personnel.

Departments of Agricultural and Extension Education should attempt to remove hidden biases and prejudice in the collegiate programs. It is recommended that an awareness of cultural diversity should be a component of the pre-service teaching program and extension education program. It is further recommended that additional study with minority professionals be conducted to describe and understand the cultural issues that exist so that programs can be developed to mediate these barriers.

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MENTORING ACTIVITIES OF WOMEN GRADUATES IN AGRICULTURAL EDUCATION AT THE PENNSYLVANIA STATE UNIVERSITY

MeeCee Baker and Connie D. Baggett*

Introduction

"Who cannot give good counsel? 'tis cheap, it costs them nothing."
Robert Burton 1577-1640

The origin of the term mentor can be traced to The Odyssey, one of Homer's works written thousands of years ago and translated by Rouse (1937). In the story, King Ulysses leaves his son, Telemachus, in the care of an old and trusted friend named Mentor. Mentor teaches Telemachus the ways of the world and introduces him to other rulers.

Since Homer's time, the term mentor is applied to one who acts as an advisor, counseling an advisee to positions of advancement. An array of roles exist for mentors, both female and male, ranging from protector to coach, guide to door opener, and teacher to counselor. It is the role of the mentor to accomplish something for the mentee either by teaching the mentee something or counseling her/him in what to do. The goal of the mentor is to lead the mentee to autonomy (Bey & Holmes, 1990)(See Table 1).

Table 1. A Sampler of Mentor Roles Drawn from the Literature

Mentor Role	Reference
Trusted guide	Homer's Odyssey
Teacher, sponsor, host, counselor, supporter, guru, advisor	Levinson, 1978
Teacher coach, trainer, positive role model, developer of talent, opener of doors, protector, sponsor, successful leader	Schein, 1978
Traditional mentor, supportive boss, organizational sponsor, professional mentor, patron, invisible godparent	Phillips-Jones, 1982
Guide, supporter, challenger	Daloz, 1983
Teacher, counselor, guide, supporter protector, promoter, sponsor Confidant (in addition to Schein's 1978 roles)	Zey, 1984
	Gehrke & Kay, 1984
Master teacher, teacher advisor, teacher specialist, teacher researcher-linker, consultant	Bird, 1985
Colleague teacher, helping teacher, peer teacher, support teacher	Borko, 1986
Teacher, sponsor, encourager, counselor, befriender	Anderson & Shannon, 1988

Source: (Bey & Holmes, 1990, p.7)

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Mentoring appears to function differently when the potential mentee is female. Moore's work (1982) done in the field of higher education documented the observation of men and women with equal abilities, motivation, and desire ending up in different positions with men as leaders and women in secondary roles. Collins (1983) concurred that male mentors teach different skills to female mentees than male mentees. Leadership and risk-taking skills are being taught to males, while male mentors mainly support and encourage female mentees. Moore (1982) claimed that men also have received extra help from the old boys' network, which, upon inspection, shows one or two older boys, mentors, who really do the helping (p. 3).

Admission to this inner circle is possible without a mentor, but no one can expect to enter without being endorsed by other influential people. A mentor can significantly speed the mentee's ascent by permitting quick advancement through early identification. Moore (1982) challenged women not to wait for a mentor, but to share the power, know-how, and contacts they have acquired, thus counteracting the imbalance created from the different skills mentored by men to male and female mentees. In essence, women should form their own network. Then, women will become mentors so that not only men will "guard the door."

This guarding of the door is apparent in the field of agricultural education. Issues have been raised by educators in Pennsylvania and across the country concerning the lack of female teachers of agriculture and the subsequent lack of female mentors for female students. During the time period from the 1980-81 school year to the 1990-91 school year, the percentage of females teaching agriculture in Pennsylvania high schools averaged less than nine percent of the total group (Department of Agricultural and Extension Education, 1980-1991, The Pennsylvania State University, Pennsylvania Department of Education, 1992). On a national level, the percentage of women teaching agricultural education at the secondary level is 5.1 percent (Howe, 1992). In addition to

Table 2. Agriculture Teachers in Pennsylvania Schools (K-12) by Gender and Academic Year.

Academic	Females		Males		
Year	N	%	N	%	Total
1980-81	23	6.3	341	93.7	364
1981-82	24	6.6	336	93.4	360
1982-83	26	7.5	322	92.5	348
1983-84	23	6.7	320	93.3	343
1984-85	27	8.2	304	91.8	331
1985-86	32	9.8	294	90.2	326
1986-87	27	8.6	286	91.4	313
1987-88	33	11.2	262	88.8	295
1988-89	29	9.6	273	90.4	302
1989-90	29	9.5	274	90.5	303
1990-91	29	10.4	249	89.6	273
Averages	27.5	8.5	296.5	91.5	323.9

the relatively low number of female agriculture teachers in Pennsylvania (See Table 2), the apparent attrition rate is also disconcerting. During the 1980-81 school year, there were 23 women teaching agriculture in Pennsylvania secondary schools. In 1990-91, only six, or 26 percent of these women remained in the agriculture teaching profession. Also in 1980-81, there were 341 men teaching agriculture in Pennsylvania secondary schools. One hundred fifty-nine, or 42 percent, were still teaching agriculture in 1990-91 (Department of Agricultural and Extension Education, 1980-1991, The Pennsylvania State University). These figures did not take into account retirements or program closures. The attrition of women from the profession poses the problem of not allowing women to advance far enough into their careers to serve as mentors to younger women wishing to succeed in the profession of teaching agriculture (Baxter & Hoover, 1992).

The scarcity of females available to mentor among those teaching agricultural education in Pennsylvania could explain why the percentage of women enrolling in the agricultural education curriculum at Penn State has shown a declining trend (See Table 3). During the time period from 1980-91, Penn State was the only institution in Pennsylvania offering a B.S. degree program in agricultural education. The numbers and percentages of female and male students receiving teaching certificates are difficult to trace.

Table 3. Earned Baccalaureate Degrees in Agricultural Education by Gender and Year.

	Females		Males		
Year	N	%	N	%	Total
1980	11	30.6	25	69.4	36
1981	5	16.7	26	83.3	30
1982	10	35.7	18	64.3	28
1983	8	40.0	12	60.0	20
1984	2	33.3	4	66.7	6
1985	6	35.3	11	64.7	17
1986	2	22.2	7	77.8	9
1987	7	50.0	7	50.0	14
1988	0	0.0	15	100.0	15
1989	0	0.0	5	100.0	5
1990	1	11.1	8	88.9	9
1991	2	20.0	8	80.0	10
1992	1	20.0	4	80.0	5
Total	55	36.7	150	63.3	205

Questions remain in Pennsylvania, and across the country, as to why women don't enter the profession of teaching agricultural education, and whether those who entered had mentors who guided them in their choice.

Objectives of the Study

The primary objective of the study was to describe the mentoring activities and career paths of women with B.S. degrees in agricultural education from Penn State. Specific research questions were:

1. What are the career paths of the graduates?
2. What are the demographic and educational characteristics of the graduates?
3. Who, if anyone, were their mentors?
4. What are the characteristics of the mentor(s)?
5. What is/are the relationship(s) of the mentor to the mentee?
6. What type(s) of mentoring activities occurred?

Methods and Procedures

The design of the study consisted of a descriptive survey with information collected from women earning B.S. degrees from The Pennsylvania State University. Data were used to describe mentoring activities and career paths of the participants. The population for the study was the 80 living female graduates, excluding the author, from all the classes up to and including 1992 earning B.S. degrees in agricultural education from The Pennsylvania State University.

Instrumentation

Accordingly, a survey using a modified Dillman (1978) data collection method was developed for telephone use. As recommended by Light et al. (1990), careful consideration was used in the construction and ordering of the questions so they were appropriate for use over the telephone. The interview schedule contains 23 questions . The questions were framed from research found through the review of literature (Collins 1993; Jeruchim & Shapiro 1992; Napier, 1989; Torrance 1984) and the author's experience in agricultural education. Four experts were selected to review the pre-contact call script, and interview schedule. There suggestions were incorporated into the final instrument. The telephone interview schedule was pilot tested with three women. Problems that occurred during pilot testing were corrected. There were 79 living female graduates of Penn State with B.S. degrees earned in agricultural education and were interviewed. Sixty-three graduates (79.7 percent) agreed to participate in the study.

After completion of the interviews, an assistant reviewed the data recorded on the instrument schedules to ensure legibility of the handwriting. The instruments were then assigned a number and placed into one of three participant groups: Current Agriculture Teachers (group 1), Former Agriculture Teachers (group 2), Non Agriculture Teachers (group 3). Descriptive statistics including distribution frequencies, percentages and means were used in analyzing the data. The qualitative comments were examined by using Miles and Huberman's (1984) bin approach. Categories were developed by the researcher by grouping like answers of the qualitative comments into bins. All data requiring quantitative data analysis techniques were coded and processed using SPSS.

Findings

Women who graduated with a B.S. degree in agricultural education from Penn State tended to follow a teaching career path, although several taught in disciplines other than agriculture. Also, slightly more than half of the women in the current study have completed additional certifications or degrees. Most graduates were reared in rural areas but fewer than one-third enrolled in agriculture classes in high school. Demographically, the mean age of all graduates was 35.5 years and 77.8 percent were married. Less than one-half had children, and more women who were currently teaching agriculture reported having no children. Furthermore, more current agriculture teachers held membership in 4-H and FFA, and had been enrolled in agriculture classes in high school.

Table 4. First Position of Female Agricultural Education Graduates by Participant Group.

Position	Group 1		Group 2		Group 3		Total	
	N	%	N	%	N	%	N	%
Adult/Youth Worker	0	0.0	0	0.0	1	5.0	1	1.8
Consultant	1	7.7	1	4.2	3	15.0	5	8.9
Farmer	0	0.0	0	0.0	5	25.0	5	8.9
Homemaker	1	7.7	1	4.2	1	5.0	3	3.6
Manager	0	0.0	0	0.0	1	5.0	1	1.8
Peace Corps Volunteer	0	0.0	1	4.2	0	0.0	1	1.8
Researcher	1	7.7	0	0.0	0	0.0	1	1.8
Supervisor	0	0.0	0	0.0	2	10.0	2	3.6
Teacher	10	76.9	21	87.5	5	25.0	36	64.3
Technician	0	0.0	0	0.0	1	5.0	1	1.8
Total	13	100.0	24	100.0	19	100.0	56	98.3

Note: Percentages may not equal 100% due to rounding.
Note: Group 1 refers to Current Agriculture Teachers.
Group 2 refers to Former Agriculture Teachers.
Group 3 refers to Non Agriculture Teachers.

Table 5. Relationship Between Female Agricultural Education Graduates and Their Mentors by Participant Group.

Participant Group	High School Teacher		College Instructor/ Advisor		Relative		Person in Profession		Other		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Before Graduation												
Group 1	7	41.2	6	35.3	1	5.8	0	0.0	3	17.6	17	99.9
Group 2	10	52.6	5	26.3	0	0.0	1	5.3	3	15.8	19	100.0
Group 3	6	28.6	7	33.3	3	14.3	0	0.0	5	23.8	21	100.0
Total	23	40.1	18	31.6	4	7.0	1	1.7	11	19.3	57	99.8
After Graduation												
Group 1	3	27.3	3	27.3	0	0.0	5	45.4	0	0.0	11	100.0
Group 2	4	15.4	8	30.8	0	0.0	5	19.2	9	34.6	26	100.0
Group 3	0	0.0	2	11.1	0	0.0	10	55.6	6	33.3	18	100.0
Total	7	12.7	13	23.6	0	0.0	20	36.4	15	27.3	55	100.0

Note: Percentages may not equal 100% due to rounding.

Note: Group 1 refers to Current Agriculture Teachers.
Group 2 refers to Former Agriculture Teachers.
Group 3 refers to Non Agriculture Teachers.

As reported in Table 5, 28 (41.8 percent) of the mentors who influenced the participants to enroll in agricultural education at Penn State were college advisors, while 23 of the other mentors who advised the participants after their graduation were people in the profession (n=20 or 36.4 percent) or others (n=15 or 27.3 percent).

A majority of women (57.0 percent) reported having mentors who influenced their decision to enroll in agricultural education at Penn State. Twenty-seven percent of these mentors continued to assist the women after graduation. Also, 54.0 percent of the women said they had other mentors who helped them after their graduation. Current agriculture teachers reported having more mentors both before and after graduation than women not currently teaching agriculture. Although 63.5 percent of all the participants claimed to serve as mentors to others, only 53.3 percent of those current agriculture teachers reported themselves as mentors to others.

Most mentors were men, although graduates reported more female mentors following graduation. Most mentors who influenced participants to enroll in agricultural education at Penn State were high school or college teachers or advisors. Career guidance was the most frequently given mentoring activity prior to graduation for current agriculture teachers. Role modeling was the most often cited pre-graduation mentoring activity by women who were former agriculture teachers, and women who never taught agriculture said that cheer leading was their most frequent pre-graduation mentoring activity.

Many of the pre-graduation mentors continued to assist their mentee after graduation. The most frequently reported post-graduation mentoring activities by these initial mentors were as follows: "introductions to key people" for those current agriculture teachers, "help in job search" and "encouragement to join professional organizations" for former agriculture teachers, and "help in job search" for those women who never taught agriculture.

Table 6. Frequency and Types of Mentoring Activities Between Mentors and Mentees by Three Groups of Female Agricultural Education Graduates.

Activities	Group 1 #	Group 1 %	Group 2 #	Group 2 %	Group 3 #	Group 3 %	Total #	Total %
Activities of mentors before graduation								
Cheerleading	3	20.0	7	46.7	5	33.3	15	100.0
Coaching	2	18.2	6	54.5	3	27.3	11	100.0
Role modeling	5	26.3	13	68.4	1	5.3	19	100.0
Career guidance	8	34.8	11	47.9	4	17.4	23	100.0
Other activities	0	0.0	1	20.0	4	80.0	5	100.0
Additional activities continued after graduation								
Help in job search	1	8.3	6	50.0	5	41.7	12	100.0
Introductions to key people	3	25.0	5	41.7	4	33.3	12	100.0
Encouragement to join professional organizations	1	14.3	6	85.7	0	0.0	7	100.0
Other activities	2	33.3	3	50.0	1	16.7	6	100.0
Activities of new mentors after graduation								
Cheerleading	3	20.0	8	53.3	4	26.7	15	100.0
Coaching	4	33.3	4	33.3	4	33.3	12	99.9
Role modeling	4	23.5	4	23.5	9	52.9	17	99.9
Career guidance	3	21.4	5	35.7	6	42.9	14	100.0
Help in job search	1	8.3	6	50.0	5	41.7	12	100.0
Introduction to key people	2	18.2	5	45.5	4	36.4	11	100.1
Encouragement to join professional organizations	1	14.3	6	85.7	0	0.0	7	100.0
Other activities	6	22.2	11	40.7	10	37.0	27	99.9

Note: Percentages may not equal 100% due to rounding

Note: Group 1 refers to Current Agriculture Teachers
Group 2 refers to Former Agriculture Teachers
Group 3 refers to Non Agriculture Teachers

Most post-graduation mentors were either people in the profession or "others". Moreover, more women who taught agriculture and left and those who never taught agriculture reported that their relationships with post-graduation mentors continue.

For the mentors who influenced the participants to enroll in agricultural education at Penn State, the most frequently mentioned activity was career guidance (23). The response given the second most frequently was role modeling (19) and the third was cheerleading (15). The most frequently mentioned activity in Group One was career guidance (8); Group Two, role modeling (13); and Group Three, cheerleading (5). All of these mentoring relationships tended to be long term, lasting more than one year, and most still remain intact (See Table 6). Some mentors have evolved into peers or friends, and four graduates have married their mentors.

In general, women entered the major of agricultural education because of their desire to teach or work with young people and their interest in agriculture. Many left the profession because they could not get hired in permanent positions. Those who continued to teach agriculture did so because of job satisfaction and their interest in students. This study suggests the lack of female role models and the subsequent women available to serve as mentors in agricultural education, has made it difficult for women to enter and advance in the agricultural education profession.

Conclusions

As a result of these findings, the researcher developed the following conclusions.

1. Women in agricultural education entered the major because of their desire to teach and their interest in agriculture.
2. Many women leave the profession of teaching agriculture because of lack of permanent positions.
3. Women who persist in teaching agriculture do so because of job satisfaction and their interest in students.
4. Women graduates in agricultural education usually follow a teaching career path even if it is in other disciplines.
5. Women who chose the agricultural education major tend to be from rural areas.
6. Career guidance are lacking for women in agricultural education.
7. Female role models are scarce in agricultural education.

Educational Implications

Universities with teacher education programs in agricultural education or other male dominated disciplines should develop equally accessible programming to assist all graduates in job searches and career development. Departments of Education should sponsor initiatives to attract female students and teachers into male dominated disciplines.

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MENTORING ACTIVITIES OF WOMEN GRADUATES IN AGRICULTURAL EDUCATION AT THE PENNSYLVANIA STATE UNIVERSITY

A Discussion By
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This paper demonstrated the development of a very thorough theoretical framework. Background research into the trends of females in agricultural education and teaching was done, as well as extensive literature searching on mentoring. A sound set of objectives for the study was developed. Effective methods and procedures were used to gather the data through telephone interviews from the population. The 80% response rate was very commendable. The findings adequately addressed all objectives resulting in the description of the mentoring activities and career paths of women with B.S. degrees in agricultural education from Pennsylvania State University during the 10 year period. Overall, the study and paper were very well done.

However, there were a few questions raised in the study. It was mentioned that there were 79 living graduates who were interviewed, but only 63 agreed to participate in the study. Were all 79 actually contacted but only 63 willing to give information, or were only 63 able to be contacted? This was not clear. Qualitative comments were mentioned in the procedures but not reported, unless they were the basis of one of the tables. This could be clarified. Table 5 was difficult to decipher. A title which included "mentors who influenced them to enroll in agricultural education" might have made the job less difficult. Also, some of the numbers and percentages reported in the narrative were not in the tables and were difficult to construct from the information given in the tables. The findings followed the sequence of the objectives and information was included for all objectives. The conclusions did not follow that sequence and not all objectives were addressed in the conclusions. No recommendations were given.

The under-representation of females in the agriculture teaching profession continues to be a problem. This study presented an interesting perusal of one aspect of that problem - mentoring. The educational implications section of the study presented some sound wisdom. "Universities with teacher education programs in agricultural education or other male dominated disciplines should develop equally accessible programming to assist all graduates in job searches and career development. Departments of Education should sponsor initiatives to attract female students and teacher into male dominated disciplines." One aspect which may have been omitted is the local community. Until the local community accepts and encourages the female agriculture teacher, the universities and state departments will not be able to address the problem adequately. I commend the authors of this study for a sound piece of research into an important problem.

COLLEGE FACULTY MOTIVES AND BARRIERS FOR PARTICIPATING IN INTERNATIONAL ACTIVITIES

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Introduction

Historically, land-grant colleges and universities have been obligated to participate in international activities. The Title XII Amendment of 1975 set a precedent for sponsoring foreign students, short courses, and increased involvement in international projects (Management Analysis Center, Inc., 1982). New Mexico State University (NMSU) has been internationalizing its curriculum, faculty, staff, and students for over 25 years by providing administrative leadership; faculty, staff, and student development programs; outreach services; and travel grants (Huntsberger, 1992).

Despite challenges from university administrators, many faculty remain reluctant to participate internationally. Faculty perceptions range from concerns that participation will not be considered in evaluation, promotion, and tenure decisions, to fears of job security when they return home (Jones & Crawford, 1985; Perez & Rogers, 1984; Whitaker, 1980).

Theoretical Framework

The theoretical framework for studying faculty motives for participating in international activities was derived from Murray's definitions (1938): *acquisition,*"to gain possessions and property", *conservance,*"to collect, repair, clean and, preserve things", and, *construction,* "to organize and build." *Achievement* is "to overcome obstacles," *recognition* is "to excite praise," and, *exhibition* is "to attract attention to one's person." *Infavoidance* is "to avoid failure and shame." *Dominance* is "to organize the behavior of a group," *deference* is "to willingly follow a superior," *similance* is "to identify oneself with others," *autonomy* is "to seek freedom in a new place," and, *contrarience* is "to be unique." *Blamavoidance* is "to avoid blame or punishment by inhibiting asocial impulses." *Affiliation* is "to form friendships and associations," *nurturance* is "to nourish or protect others," and, *play* is "to relax, amuse oneself, seek diversion." *Cognizance* is "to read and seek knowledge" and *exposition* is "to give information, explain, interpret, lecture." A "*fusion of needs*" (Murray, 1938, p. 86) occurs when a single action satisfies two or more motives simultaneously and can be expected to surface with qualitative motive indicators.

Motives for participating internationally can be classified as intrinsic and extrinsic in nature. A survey conducted by the Management Analysis Center, Inc. (1982) found faculty were intrinsically motivated if they were personally satisfied by assisting in the project's success (*achievement*) and by being part of the project team

(*affiliation*). Faculty were extrinsically motivated to participate if personal (and family) health and safety needs were met (*conservance*), if the assignment affected on real income (*acquisition*), and current work responsibilities were addressed when considering assignments (*blamavoidance*). Non-tenured faculty were more concerned with impact on careers and opportunities for spouses (*achievement*) than tenured faculty. Non-tenured faculty participation in Title XII assignments depended heavily on encouragement by their department head (*deference*), impact on current work, and impact on tenure (*achievement*).

The strongest extrinsic motivator for faculty to participate appears to be the university promotion and tenure policy (*achievement*). There is also a common faculty perception that an international assignment will have a detrimental effect on career (*achievement*). (Aigner, et. all., 1992; Hertford & Hartley, 1987; Jones & Crawford, 1985; Perez & Rogers, 1984; SAIC, 1990; Whiteford & Schmidt, 1989).

Whitaker (1980, p. vii) found faculty barriers to participation were all extrinsic in nature and included "(i) appointment, promotion, and tenure policy; (ii) priority on traditional funding for state and regional programs; (iii) deficient language and cross cultural skills among faculty; (iv) salary policy; and (v) organizational structure."

Purpose and Objectives

The purpose of the study was to determine College of Agriculture and Home Economics faculty motives and perceived barriers for participating in international activities. The specific objectives of the study were 1) to describe faculty by level of education; percent of time dedicated to teaching, research, extension, and administration; whether or not they were on a tenure track; if they were tenured; rank status (e.g., instructor, assistant, associate, or full professor); gender; and number of years on faculty at NMSU; 2) describe motives of faculty for participating in future international activities; 3) compare the motives of faculty who were interested vs. faculty who were not interested in participating in international activities; and 4) identify barriers to participation in international activities.

Procedures

A census of all College of Agriculture and Home Economics faculty was taken. The population included 125 teaching and research instructors and professors (full, associate, assistant, adjunct, and emeritus) who were currently affiliated with the College. The study used descriptive survey methodology. Variables measured by the intercampus mail questionnaire were (a) demographic variables, (b) faculty motives for participating in international activities, and (c) perceived barriers to participating in international activities.

Motive indicators included on the questionnaire were generated from Murray's (1938) motivational framework. Two indicators were developed to measure each of the 18 motives. Each indicator had a five-point, Likert-type sub-scale. A follow-up qualitative question on motives to participate in international activities was also asked. Barriers to participation were listed in response to a qualitative question.

A panel of experts assessed the questionnaire for content and face validity. The instrument was field tested on faculty in another college. While the three questionnaires returned provided further information on clarity and validity, they were insufficient to assess reliability; therefore, the reliability assessment was conducted post hoc. Post hoc split half and Cronbach's alpha reliability coefficients of .95 were determined for the index of motives for participating in international activities.

Data were collected during August-September 1994 following a modified Dillman procedure for mail questionnaire administration (1978). Incentives were sent with both mailings to increase response rate. A 80.8 percent response rate with a 75.2 percent usable rate (n=94) was obtained. To check for non-response bias, respondents of the first mailing (n=72) were compared with respondents to the second mailing (n=22) on gender, years on faculty, overall motivation index scores, and interest in international participation. As no significant difference was found, the results will be generalized to the whole population.

Objective 1 was analyzed using frequencies, percentages, means, and standard deviations. Objective 2 was analyzed by adding responses together for paired indicators for each motive and reporting means and standard deviations for each motive (scale = 2-10). Qualitative motive data were analyzed by categorizing responses (n=75) under one or more of Murray's (1938) 18 motives. When motive fusion was discovered (n=3), the responses were listed under both motives. Objective 3 was analyzed by separating the respondents who answered *Highly interested* to the question "How interested are you in participating in international activities as a faculty member of NMSU?" from those who answered either *Moderately*, *Slightly*, or *Not interested*, and comparing the responses motive by motive using the Kolmogorov-Smirnov two-sample test. Overall motivation between the two groups was compared using the Kolmogorov-Smirnov procedure for the summated motive index values. To keep the study-wise error rate below .05, a Bonferroni correction was used. Only groups differing on a motive at a 0.25 percent comparison-wise error rate were declared significantly different. The use of inferential statistics was based on the assumption that faculty in the census were representative of past and future faculty in the College (Oliver & Tlinkle, 1982). Objective 4 was analyzed by categorizing responses into one of 13 barrier categories. Motive fusion was observed in seven responses.

Results

Objective 1. Of the 94 respondents, 16 (18.4%) were female and 71 (81.6%) were male. Eighty-three reported a bachelor's degree, 79 reported a master's degree, and 86 reported a doctoral degree. Faculty spent 43.2 percent of their time on teaching, 4.6 percent on extension, 45.7 percent on research, and 6.3 percent on administrative duties. Seventy-seven (86.5%) faculty reported they were on a tenure track, while 12 (13.5%) reported they were not. Fifty-one (57.3%) faculty were tenured and 38 (42.7%) were not. One (1.1%) instructor, 29 (33.3%) assistant professors, 15 (17.2%) associate professors, and 42 (48.3%) full professors answered the survey. Respondent's length of employment with NMSU ranged from one month to 33.3 years, with a median of 7.3 years.

Objective 2. The researchers looked for natural breaks in the means of motive responses to assign level of motivation descriptors ranging from "not motivated" to "highly motivated" (Table 1). Respondents were highly motivated by cognizance ($\bar{x}=7.8$) and exposition ($\bar{x}=7.5$) and moderately motivated by play ($\bar{x}=7.1$), nuturance ($\bar{x}=7.0$), similance ($\bar{x}=7.0$), achievement ($\bar{x}=6.9$), affiliation ($\bar{x}=6.6$), and construction ($\bar{x}=6.1$).

Table 1
Motives for Participation in International Activities

Motive	n	($\bar{x}$)	sd	Level of Motivation
Cognizance	92	7.8	1.8	Highly motivated
Exposition	92	7.5	2.0	
Play	92	7.1	2.0	Moderately motivated
Nurturance	91	7.0	1.9	
Similance	92	7.0	2.3	
Achievement	92	6.9	1.9	
Affiliation	91	6.6	1.9	
Construction	91	6.1	2.2	
Dominance	92	5.3	2.2	Slightly motivated
Acquisition	92	5.3	2.5	
Contrarience	92	4.9	2.2	
Conservance	91	4.5	1.5	
Autonomy	92	4.4	2.2	
Recognition	92	4.1	2.1	
Exhibition	91	3.8	1.8	
Deference	91	2.9	1.4	Not motivated
Infavoidance	92	2.7	1.3	
Blamavoidance	92	2.7	1.3	
Totals	92	96.4	24.0	

From the 94 usable questionnaires returned, there were 75 separate qualitative responses to the open-ended motive question. Some participants did not respond to this question, while others wrote several comments. Cognizance again surfaced as the top motive for participation (n=37). Other motives with frequencies over five were affiliation (n=10), achievement (n=6), and conservance (n=5) (Table 2).

Table 2
Qualitative Responses-Motives for Participating in International Activities

Motive	Frequency	% (n=78)
Cognizance	37	47.4
Affiliation	10	12.8
Achievement	6	7.7
Conservance	5	6.4
Other motives	15	19.3
Items listed under motive but a barrier	5	6.4
Total	78	100.0

Objective 3. Forty-three (46.2%) faculty were highly interested in participating in international activities as a faculty member and 50 (53.8%) were either moderately, slightly, or not interested in participating in international activities in the future. The top seven motives for faculty who were highly interested were cognizance ($\bar{x}=8.98$), exposition ($\bar{x}=8.33$), similance ($\bar{x}=8.30$), play ($\bar{x}=8.14$), achievement ($\bar{x}=7.95$), nurturance ($\bar{x}=7.91$), and affiliation ($\bar{x}=7.50$). For faculty who were less than highly interested to participate, the top seven motives were cognizance ($\bar{x}=6.81$), exposition ($\bar{x}=6.70$), play ($\bar{x}=6.27$), nurturance ($\bar{x}=6.15$), achievement ($\bar{x}=5.94$), similance ($\bar{x}=5.92$), and contrarience ($\bar{x}= 5.86$). Highly motivated faculty were significantly different from less-than-highly motivated faculty on these seven motives and on the overall scale (Table 3).

Objective 4. Of the 94 usable questionnaires returned, there were 157 separate barrier responses (Table 4). Barriers cited over 10 times were lack of time (n=36), lack of reward (n=32), lack of logistical support (n=18), lack of funding (n=16), lack of language skills (n=15), family concerns (n=14), and lack of perceived opportunity (n=13).

Table 3

Motive Comparison Between Highly Interested and Those Less Than Highly Interested in Participating in International Activities

Motive	Interest	n	($\bar{x}$)	sd	D*	p
Cognizance	High	43	8.98	1.12	.5319	.0001**
	Less than high	48	6.81	1.73		
Exrosition	High	43	8.33	1.47	.2839	.0516
	Less than high	48	6.70	2.09		
Similance	High	43	8.30	1.81	.4966	.0001**
	Less than high	48	5.92	2.10		
Play	High	43	8.14	1.86	.4026	.0013**
	Less than high	48	6.27	1.91		
Achievement	High	43	7.95	1.43	.4598	.0001**
	Less than high	48	5.94	1.78		
Nurturance	High	43	7.91	1.63	.3958	.0018**
	Less than high	48	6.15	1.76		
Affiliation	High	42	7.50	1.71	.4255	.0006**
	Less than high	48	5.83	1.74		
Construction	High	42	7.00	2.06	.3720	.0041
	Less than high	48	5.29	1.97		
Dominance	High	43	6.16	2.07	.3028	.0312
	Less than high	48	4.54	2.03		
Acquisition	High	43	6.09	2.70	.3202	.0191
	Less than high	48	4.58	2.21		
Contrarience	High	43	5.86	2.28	.4195	.0007**
	Less than high	48	4.00	1.72		
Autonomy	High	43	5.23	2.45	.3338	.0128
	Less than high	48	3.77	1.78		
Recognition	High	43	4.79	2.23	.3716	.0038
	Less than high	48	3.46	1.74		
Conservance	High	42	4.69	1.52	.1547	.6567
	Less than high	48	4.33	1.60		
Exhibition	High	43	4.34	1.92	.2469	.1294
	Less than high	47	3.44	1.57		
Deference	High	42	2.90	1.48	.0774	.9993
	Less than high	48	2.98	1.28		
Infavoidance	High	43	2.79	1.46	.0770	.9993
	Less than high	48	2.63	1.16		
Blamavoidance	High	43	2.74	1.29	.0658	.9999
	Less than high	48	2.63	1.23		
Totals	High	43	109.40	19.89	.4845	.0001**
	Less than high	48	85.21	21.72		

Note. *Kolmogorov-Smirnov 2-sample test statistic.

Note. **Significantly different at the .0025 probability level.

Table 4
Barriers to Faculty Participation in International Activities

Barrier	Frequency	% (n=164)
Lack of time	36	22.0
Lack of reward	32	19.5
Lack of logistical support	18	11.0
Lack of funding	16	9.7
Lack of language skills	15	9.1
Family concerns	14	8.5
Lack of perceived opportunity	13	7.9
Fear of leaving current research	7	4.3
Felt need to work domestically	4	2.4
Do not enjoy travel	4	2.4
Gender	2	1.3
Anti-Mexican attitude	2	1.3
Safety	1	.6
Total	164	100.0

Conclusions

The following conclusions were drawn: (1) Faculty are highly motivated to participate in international activities by *intrinsic* motives while motives of lesser importance were *extrinsic*. (2) In contrast to the importance of intrinsic motives found in Objectives 2 and 3, commonly cited *barriers* to participation were mostly *extrinsic* in nature, including lack of time and reward.

Implications and Recommendations

Efforts to increase international participation among faculty should concentrate on satisfying motives and reducing barriers such as providing faculty with fulfilling and enjoyable learning experiences with opportunities to make a positive difference for people through teaching and/or development work. When considering barriers, high-impact, short-term (less than one month) international activities are ideal. Such activities should be proceeded by language training when necessary. Administrators need to provide logistical support, funding, and recognition for their faculty to remove barriers.

Further research should be considered to determine relationships between tenure and motivation for participating in international work, and between tenure and the level of interest in international work. The relationship between interest and motivation to participate should be explored in other colleges of agriculture and home economics nationwide. A study of how faculty conceptualize "international activity" should also be conducted.

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COLLEGE FACULTY MOTIVES AND BARRIERS FOR PARTICIPATING IN INTERNATIONAL ACTIVITIES

A Discussion By
James P. Key, Oklahoma State University

This study had an interesting introduction and theoretical framework, which did not become clear until later in the paper. The purpose and objectives were very well developed, giving sound direction to the study. The procedures were extremely well thought-out, covering almost any questions which might be raised concerning validity, reliability, accuracy or appropriateness. The findings, organized according to the objectives, presented detailed information fulfilling the objectives. The conclusions, implications and recommendations were presented very concisely, yet quite effectively. The references included a good variety of sources within a fifteen year period providing a sound literature base for the study.

Although this study was extremely well done, there were a few questions raised. First, the theoretical framework section hit the reader cold with definitions and lists of intrinsic and extrinsic factors, which at that point seemed to have little relevance to the study. There were no linking sentences or paragraphs explaining how these definitions and lists related to the study. The first clue came in the procedures when it was mentioned that the motive indicators included on the questionnaire came from Murray's motivational framework. No illustrations of the motive indicators used in the questionnaire were included to give the reader an idea of how the motivational framework generated the indicators. Some explanation about this would have been helpful. The combining of "moderately", "slightly" and "not interested" categories to compare with "highly interested" was a unique approach. Perhaps those expressing any interest should also be combined and compared to those who had no interest. A citation for the Bonferroni correction might be in order since it is not a very familiar approach. What was meant by the statement, "Motive fusion was observed in seven responses"? This was not clear.

This study addressed a topic of high importance for college faculty and administrators. It contributed significantly to the body of knowledge about motives and barriers to participation in international activities. A well designed and conducted study like this is to be highly commended and encouraged. The recommendations for additional study would greatly add to the knowledge base on this subject also. Perhaps these researchers will proceed with them.

AN ASSESSMENT OF THE IMPORTANCE OF AND PREPARATION IN PROFESSIONAL COMPETENCIES BY AGRICULTURAL SCIENCE TEACHERS AND THEIR IMMEDIATE SUPERVISORS

Farish Mulkey, Jr. Alvin Larke, Jr. B. Allen Talbert *

Introduction

The curriculum for teacher preparation tends to be a major area of concern for teacher educators in agriculture. There continues to be much discussion centered around the three components of the curriculum: the general education, the technical/subject matter education, and the professional education. The general education is that which prepares the individual to live and interact effectively within society (Clouse and Brown, 1982). The technical education of an agriculture teacher has been a major concern for most of the history of agricultural education (Peterson and Torrence, 1967). The technical education is designed to give teachers a certain degree of mastery of the subject matter they teach. The professional education of a prospective teacher must be a quality experience since it is designed to orient the prospective teacher with the purposes, principles, policies, and procedures in education, as well as developing the abilities which are necessary in teaching agriculture (Crunkilton and Hemp, 1982). Many contend that the teacher education curriculum should be a mixture of these three components tailored to individual and programmatic needs.

The changes occurring in agriculture and education are dynamic, and agricultural education must change if it is to survive (Herring and Norris, 1987). How does agricultural education stay relevant in changing times? One answer is the changes made by teacher training centers to prepare their graduates to teach modern agriculture using current pedagogy (Flatt, 1987). Public institutions are accountable for what they do (Drueckhammer and Key 1986), therefore they cannot make changes unilaterally. As accountability is increased, so is the need for effective evaluation (Jewell, 1989). It is important for teacher education programs to implement evaluations of their programs in order to demonstrate efforts toward improvement.

How does curriculum evaluation take place? Follow-up studies or similar evaluations are valuable for reasons of accountability, by providing evidence of effectiveness to outside audiences (McGhee and Cheek, 1989). Continual evaluation will enable programs of instruction to adapt more readily to the changing needs of the clientele of the future (Cox and Edmundson, 1989). The preparedness of graduates and their ability to perform is often associated with the curriculum they studied in college (Larke, 1982). In times when faculty must face curricular changes unique to their program, the graduates of the program are valuable resources (Trinklein and Wells, 1989). Follow-up

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studies by program completers as a form of evaluation can be beneficial to the institution that desires to improve its instructional program (Drueckhammer and Key 1986).

School district administrators play an important role in determining what a local agriculture program will emphasize (Rush and Foster, 1984). Rush and Foster stated that a key issue to the well-being of agriculture programs is the degree to which teacher educators, agriculture teachers, and school administrators come to agreement on which activities are of importance and which activities can be de-emphasized. Any evaluation of agriculture teacher preparation curriculum will be enhanced by including local administrators.

Purposes and Objectives

The purpose of this study was to assess the perceptions of Agricultural Science teachers and their immediate supervisors on the level of importance and preparation in specified professional competencies. The specific objectives of the study were to:

1. Determine perceptions of Agricultural Science teachers and their immediate supervisors toward the level of importance of specific professional competencies.
2. Determine perceptions of Agricultural Science teachers and their immediate supervisors toward the level of Agricultural Science teachers' preparation in specific professional competencies.
3. Describe demographic characteristics of Agricultural Science teachers and their immediate supervisors that might influence perceptions toward the levels of importance and preparation of specific professional competencies.

Methods and Procedures

The population of this study consisted of all practicing Agricultural Science teachers in Texas during the 1993-1994 school year, approximately 1400, and their immediate supervisors. A random sample of 304 teachers and their immediate supervisors was taken. Appropriate mail survey techniques, including three follow-ups, as outlined by Dillman (1978) were utilized which resulted in responses from 204 teachers for a response rate of 67.1% and from 132 immediate supervisors for a response rate of 43.4%. The overall response rate for the study was 55.2%.

The sample was surveyed using a mailed questionnaire developed using instruments previously used in studies identifying and measuring professional competencies of Agricultural Science teachers (Findlay, 1992; Herring, 1976; and Shippy, 1979). The format of the instrument was patterned after an instrument designed by Larke (1982) used to determine preparation and importance of competencies for agronomy graduates. The instrument consisted of two parts: Part 1 contained 10 items designed to collect demographic information and Part 2 contained 59 questions designed to measure perceptions of levels of importance and preparation in specified professional competency areas. The instrument for agricultural science teachers was worded "In your current position, how important is it that you perform this?" for measuring Importance and worded "Please indicate your level of competence in performing each of the following:" for measuring Preparation. The instrument for immediate supervisors contained the same

items, but the stubs were worded "In your position how important is it that the teacher perform this?" for Importance and worded "Please indicate the teachers' level of competence in performing each of the following:" for Preparation.

Scales for measuring constructs on professional competencies were developed using conceptual and empirical analysis. Initial constructs were developed conceptually from the literature and from previous instruments of Findlay (1992), Herring (1976), and Shippy (1979). Then, factor analysis and Cronbach's coefficient alpha were used to obtain the strongest level of internal consistency for measuring perceptions of both preparation and importance. The resulting eight scales had a range of Cronbach's alphas from .60 to .90 and contained from four to 17 items. The scales were called Planning, Teaching, Evaluation, School-Community Relations, FFA, Adult, Role, and SAE.

The Planning scale was designed to measure the ability to conduct program planning and developing various components considered necessary in conducting an agricultural science program. It contained items such as determining community needs and employment opportunities, developing program goals and objectives, and conducting student follow-up studies. This scale had a Cronbach's alpha of .79 for Preparation and .76 for Importance.

The Teaching scale measured the ability to utilize teaching methodology and to engage in instructional planning. The items in this scale represented the components of lesson planning and the various methods of teaching agriculture such as problem-solving and demonstration. The Teaching scale had a Cronbach's alpha of .90 for Preparation and .87 for Importance.

The Evaluation scale was difficult to define. It attempted to measure the ability to coordinate and document student and instructional evaluation activities. The items in this scale related to aspects of documentation, organization, and management. This scale had a Cronbach's alpha of .72 for Preparation and .66 for Importance.

The School-Community Relations scale measured the ability to work effectively within the educational and local communities. This included the ability to guide and advise students in career and educational decisions. It contained items that addressed cooperating with others, public relations, and participation in school and community activities. This scale had a Cronbach's alpha of .80 for Preparation and .77 for Importance.

The FFA scale measured the ability to coordinate an FFA chapter and advise FFA members. It contained items that addressed contests, program of activities, and leadership development. This scale had a Cronbach's alpha of .83 for Preparation and .86 for Importance.

The Adult scale measured the ability to plan and conduct adult education programs. It contained items that related to Young Farmers, adult instruction, and adult teaching methodology. This scale had a Cronbach's alpha of .78 for Preparation and .80 for Importance.

The Role scale measured professionalism of the teacher. It included such items as participation in professional organizations, staying current in the profession, and maintaining ethical standards. This scale had a Cronbach's alpha of .63 for Preparation and .60 for Importance.

The SAE scale measured the ability to teach about and supervise SAE programs. It included items that related to supervision of SAE, advisement of students in SAE, and evaluation of students' SAE programs. This scale had a Cronbach's alpha of .80 for Preparation and .84 for Importance.

Because the response rate was less than 100% non-response bias was addressed using recommendations by Barrick and Na (1994). The respondents were divided into early and late groups according to the arrival time of the returns and compared using analysis of variance, or the Chi-square statistic where appropriate, to determine if any differences existed. This is based on the assumption that late respondents are similar to nonrespondents. Therefore, if late and early respondents show no statistically significant differences, then it is possible to conclude that non-response bias should not be a concern. Although there are problems with this method, it was found to be more consistent than other alternatives (Barrick, Na, and Catri, 1994). No differences were found between early and late respondents on any of the demographic variables. However, statistically significant differences were found for teachers on the importance scales of Teaching, Evaluation, and Adult and the preparation scale of Adult. Also, statistically significant differences were found for supervisors on the importance scales of School-Community Relations, Role, and Adults and the preparation scale of Adult. Because late respondents were different than early respondents on some of the scales, one interpretation of these results is that non-respondents are different than respondents in their perceptions. Therefore, generalizations made beyond the population represented by respondents should be made with care.

Data were analyzed using SPSSx. Descriptive statistics such as frequencies, percentages, central tendencies, and variance were used to present the data. An analysis of variance statistic was used to determine significant differences between groups. An alpha level of .05 was set a-priori.

Results and Findings

Table 1 shows the demographic characteristics of the sample. There were no supervisors under the age of 30 while greater than 50% were 40 years or older. For the teachers, almost half were less than 40 years old. Both groups were predominantly male and White. A majority of Agricultural Science teachers grew up on a farm or rural environment while a majority of supervisors were from a town or urban environment. Greater than 90% of the Agricultural Science teachers took agriculture classes in high school and were members of the NFA/FFA while less than 50% of the supervisors had such experiences.

Table 1. Demographic Characteristics of the Sample

Characteristic		Teachers n *	Teachers %	Supervisors n *	Supervisors %
Age	≤29	29	14.4	0	0.0
	30-39	69	34.2	20	15.3
	40-49	68	33.6	59	45.0
	≥50	36	17.8	52	39.7
Gender	Female	7	3.5	18	13.8
	Male	194	96.5	112	86.2
Ethnicity	Black	4	2.0	2	1.5
	Hispanic	9	4.5	7	5.4
	White	188	93.5	121	93.1
Location Where Grew Up	Farm/Rural	150	74.3	53	40.2
	Town/Urban	52	25.7	79	59.8
Enrollment in Ag in H.S. (# of Semesters)	0	14	6.9	71	53.8
	1-4	23	11.3	25	18.9
	5 and greater	166	81.8	36	27.3
Membership in NFA/FFA in H.S.	Yes	190	93.1	58	45.3
	No	14	6.9	70	54.7

* n = those respondents who answered that item

Table 2 shows the perceived level of importance in professional competencies by Agricultural Science teachers and supervisors. Both groups rated Evaluation, Role, FFA, and School-Community as high to very high importance. They rated SAE, Teaching, and Planning as high importance and Adult as medium importance. When ranked by means, Evaluation was ranked first by both groups and Adult was ranked last by both.

Table 2. Perceived Level of Importance in Professional Competencies as Reported by Agricultural Science Teachers and Their Immediate Supervisors

Scale	Teachers Rank	Teachers Mean *	Teachers S.D.	Supervisors Rank	Supervisors Mean *	Supervisors S.D.
Evaluation	1	1.57	.37	1	1.56	.39
Role	2	1.68	.50	2	1.61	.43
FFA	3	1.75	.62	3	1.76	.57
School-Community	4	1.78	.41	3	1.76	.46
SAE	5	1.96	.61	6	1.94	.55
Teaching	6	1.97	.41	5	1.82	.43
Planning	7	2.23	.57	7	1.96	.52
Adult	8	3.01	.86	8	2.81	.83

* Scale: 1 = very high, 2 = high, 3 = medium, 4 = low, 5 = very low

Analysis of variance was performed to determine if differences existed between immediate supervisors and teachers in the means for each of the Importance scales. There were significant differences for the scales Teaching and Planning as shown in Table 3. For both scales, immediate supervisors thought the underlying construct had a higher importance.

Table 3. Analysis of Variance of Importance Scales by Position

Scale	Position	n *	Mean **	S.D.	F Ratio	F Prob.
Evaluation	Teacher	198	1.57	.37	.0007	.98
	Supervisor	123	1.56	.39		
Role	Teacher	198	1.68	.50	1.69	.19
	Supervisor	122	1.61	.43		
FFA	Teacher	198	1.75	.62	.04	.85
	Supervisor	120	1.76	.57		
School-Community	Teacher	195	1.78	.41	.14	.71
	Supervisor	122	1.76	.46		
SAE	Teacher	197	1.96	.61	.05	.82
	Supervisor	110	1.94	.55		
Teaching	Teacher	192	1.97	.41	8.98	<.01
	Supervisor	115	1.82	.43		
Planning	Teacher	196	2.23	.57	17.53	<.01
	Supervisor	118	1.96	.52		
Adult	Teacher	190	3.01	.86	3.28	.07
	Supervisor	108	2.81	.83		

* Includes only those Agricultural Science teachers and immediate supervisors who responded to all the items which comprised the scale.

** Scale: 1 = very high, 2 = high, 3 = medium, 4 = low, 5 = very low

Table 4 shows the perceived level of preparation in professional competencies by Agricultural Science teachers and supervisors. Both groups rated Role and Evaluation as good to excellent, and all other scales as good except for Adult which they rated as fair to good. When ranked by means, Role was ranked first by both groups and Adult was ranked last by both.

Table 4. Perceived Level of Preparation in Professional Competencies as Reported by
Agricultural Science Teachers and Their Immediate Supervisors

	Teachers			Supervisors		
Scale	Rank	Mean *	S.D.	Rank	Mean *	S.D.
Role	1	1.73	.44	1	1.66	.53
Evaluation	2	1.88	.45	3	1.78	.51
FFA	3	1.92	.52	2	1.72	.58
School-Community	4	1.96	.40	4	1.97	.54
SAE	5	1.98	.47	5	2.00	.56
Teaching	6	2.06	.41	6	2.07	.54
Planning	7	2.22	.48	7	2.18	.62
Adult	8	2.80	.76	8	2.58	.74

* Scale: 1 = excellent, 2 = good, 3 = fair, 4 = poor, 5 = inadequate

Analysis of variance was performed to determine if differences existed between immediate supervisors and teachers in the means for each of the Preparation scales. There were significant differences for the scales FFA and Adult as shown in Table 5. For both scales, immediate supervisors thought the teachers were better prepared than teachers themselves thought.

Table 5. Analysis of Variance of Preparation Scales by Position

Scale	Position	n *	Mean **	S.D.	F Ratio	F Prob.
Role	Teacher	201	1.73	.44	1.75	.19
	Supervisor	127	1.66	.53		
Evaluation	Teacher	201	1.88	.45	3.57	.06
	Supervisor	126	1.78	.51		
FFA	Teacher	200	1.92	.52	10.45	<.01
	Supervisor	124	1.72	.58		
School-Community	Teacher	198	1.96	.40	.05	.83
	Supervisor	124	1.97	.54		
SAE	Teacher	200	1.98	.47	.07	.80
	Supervisor	118	2.00	.56		
Teaching	Teacher	193	2.06	.41	.02	.89
	Supervisor	119	2.07	.54		
Planning	Teacher	197	2.22	.48	.36	.55
	Supervisor	120	2.18	.62		
Adult	Teacher	192	2.80	.76	6.69	.01
	Supervisor	104	2.58	.74		

* Includes only those Agricultural Science teachers and immediate supervisors who responded to all the items which comprised the scale.

** Scale: 1 = excellent, 2 = good, 3 = fair, 4 = poor, 5 = inadequate

Conclusions, Recommendations, and Implications

Minority and female representation among Agricultural Science teachers and their immediate supervisors was not proportional to that of the general population nor the student population. This supports findings by Talbert and Larke (1995) which recommended that more efforts be concentrated on providing minority and female role models in agricultural education. This might result in more ethnic and gender diversity among students taking Agricultural Science classes.

Greater than 50% of the immediate supervisors reported not having had agriculture or NFA/FFA experience when they were in high school. Agricultural Science teacher education should continue to emphasize preparation in the area of public relations for prospective teachers in order to facilitate a stronger image for the Agricultural Science program.

Agricultural Science teachers and immediate supervisors ranked importance of the professional competencies essentially the same. This information can give teacher educators an idea of perceptions of practicing teachers and administrators toward the importance of specific professional competencies. These groups also rated the importance of the professional competencies as high to very high in each of the areas except Adult. This can be interpreted that teacher education programs in Texas should continue to include instruction in these areas in the curriculum.

Agricultural Science teachers and immediate supervisors ranked preparation in the professional competencies essentially the same. This information can give teacher educators an idea of perceptions of practicing teachers and administrators toward the teachers' preparation in specific professional competencies. These groups also rated the preparation of Agricultural Science teachers as good in each of the areas except Adult. This can be interpreted that teacher education programs in Texas are adequately preparing their graduates in these areas.

Agricultural Science teachers and immediate supervisors perceived the importance of Adult Education to be medium and preparation to be fair to good. Teacher educators should reevaluate the role and expectations of Agricultural Science teachers regarding Adult Education programs.

Although the research findings cannot be generalized beyond the population represented by the respondents because of non-response bias and cannot be generalized beyond Texas teacher education programs because of the defined population, there are some implications that can be drawn from the study. This is the fourth study in five states that has used this set of professional competencies. Are there other professional competency areas that have not been identified? Is there a core of professional competencies that all Agriculture teachers in all states should possess? If so, a national study should be conducted to develop a model or framework outlining these areas and possibly specific competencies under each area.

Is adult education still a priority area for the local high school agriculture teacher to conduct? If so, and if the findings of this study are consistent nationwide, research needs to be conducted to determine what needs to be done to improve both the preparation of agriculture teachers and the perceived level of importance in this area.

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LIST OF PAPER PROPOSALS SUBMITTED FOR REVIEW

Adam, B.M.; Key, J.P.; *Attitudes And Perceptions Of International Students From Developing Countries Toward Agriculture And Studying Agriculture*

Akpan, M.J.; Martin, R.A.; *Activities Conducted By Agricultural Education Professors In U.S. Institutions Of Higher Education To Add An International Perspective To The Agricultural Education Curriculum*

Akpan, M.J.; Martin, R.A.; *Perceptions Of Agricultural Education Professors In U.S. Institutions Of Higher Education Regarding Internationalization Of The Agricultural Education Curriculum*

Allen, M.G.; Abaye, A.O., McKenna, J.R., Camp, W.G.; *Using Decision Cases in Agriculture: Comparison Of Decision Case Method And Traditional Lecture*

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Four copies of the ***complete research paper*** should be submitted for blind review. The paper should not exceed 12 pages (single-spaced, 12 point font). The left margin should be 1-1/2 inches, with the remaining margins one inch. All tables, figures, etc. should be incorporated into the paper (do not append tables or figures to the paper). A computer disk containing the paper as a Word Perfect (Version 6.1 or earlier) or DOS text file should be submitted along with the paper copies.

On matters of style, authors should consult the APA *Publication Manual* (4th Edition). Components to be included in the proposal are as follows:

- Name, mailing address, phone number, FAX number, and E-mail addresses of the author(s) on **a separate title page**. The title page will not be considered as part of the 12 page limit. However, a title page must be attached to each of the four copies of the proposal.
- Paper Title (centered, all caps) on first page of paper
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