INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA

UMI®
800-521-0600

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

DISSERTATION

EDUCATIONAL TECHNOLOGY IN SECONDARY AGRICULTURAL EDUCATION PROGRAMS A NATIONAL STUDY

Submitted by

Terrel W. Jeffery

School of Education

In partial fulfillment of the requirements

for the Degree of Doctor of Philosophy

Colorado State University

Summer 1999

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

UMI Number: 9947965

UMI®

UMI Microform9947965
Copyright 2000 by Bell & Howell Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

Bell & Howell Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

COLORADO STATE UNIVERSITY

May 13, 1999

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY TERREL W. JEFFERY ENTITLED EDUCATIONAL TECHNOLOGY IN SECONDARY AGRICULTURAL EDUCATION PROGRAMS: A NATIONAL STUDY BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

Committee on Graduate Work

_____

_____

_____

_____

_____

_____

Adviser

_____

Director

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

ABSTRACT OF DISSERTATION

EDUCATIONAL TECHNOLOGY IN

SECONDARY AGRICULTURAL EDUCATION PROGRAMS

A NATIONAL STUDY

The purpose of this study was to assess the extent of the use of technology in secondary agricultural education programs in the United States. Comparison with a 1989 study by Birkenholz, Stewart, and Craven provided the basis for determining the increase or decrease of the use of technology in the classroom over the past ten years. A survey was employed similar to the one used in this 1989 study, requesting information about the type and quantity of equipment in inventory, level of current and anticipated use, future needs, what data was used from informational services, what educational and curriculum materials were valued, and whether technology had been adopted as a pedagogy was sent to 373 randomly selected secondary agricultural teachers. Usable data were compiled from 183 teachers, a 49% response rate.

The study showed the following findings: the use of microcomputers in the agricultural classroom has significantly increased, from 73% in 1989 to 98% in 1999. Apple was the dominant system in 1989 at 64%; in 1999 the Personal Computer (MS-DOS) is used in 73% of the programs. The use of an Internet service provider by agricultural education programs has increased 31%, the current and anticipated use of technology has increased 50%, a word processing program is the software most often

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

used. Lesson plans remain the most preferred feature of a computer accessed database information system. Lack of funds remains the most often cited barrier to the utilization of educational technology. More teachers have incorporated the use of technology in their curriculum.

This researcher recommends that agricultural educators identify ways to overcome the barriers of limited funds which restrict the utilization of the new technologies. The lack of expertise is not as much a barrier in 1999 as it was in 1989; however, continued inservice is essential to the improved use of technology. A continued increase in the use of technology in preparing the agricultural education students for their future employment is seriously recommended.

Terrel W. Jeffery
School of Education
Colorado State University
Fort Collins, CO 80523
Summer 1999

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

ACKNOWLEDGMENTS

I would like to thank Dr. David Whaley, my adviser, for all his assistance and encouragement with my dissertation, and for instructing me in becoming an effective agricultural teacher educator. Without his confident belief in me I would never have attempted this doctoral venture.

A special thanks of gratitude to Dr. Wiley Lewis for his assistance with statistical procedures, analysis, interpretations and for answering all 1000 questions.

To Dr. Duane Jansen and Dr. Russell Johnson for their efforts and input for the completion of this study.

To Linda White and Keith Bromley for all the hours of editing and keeping me on track in following the Graduate Thesis Manual and American Psychological Association in finishing this dissertation.

I am greatly indebted to my wife as without her this doctoral dissertation would have been impossible. Her many hours of typing, assembling materials, tabulations and especially for all the love and encouragement.

I would like to thank my parents for instilling in me the value of education and the encouragement of my mother in completing this degree.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

TABLE OF CONTENTS

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

TABLE OF CONTENTS (continued)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

LIST OF TABLES

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

LIST OF TABLES (continued)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

CHAPTER I: INTRODUCTION

Purpose

The purpose of this study was to examine the need and use of technology in secondary agricultural education instructional programs. According to one researcher, "Supporters of vocational agriculture have agreed upon the need for expanded programs and better resources in the high schools and on the importance of science, technology, and problem-solving in the curriculum" (Rosenfeld, 1986, p. 2). These programs are found in secondary schools, and they serve those students who are interested in agriculture and the FFA, defined as "a national youth organization whose main goal is to make a positive difference in the lives of students by developing their potential for premier leadership, personal growth, and career success through agricultural education" (National FFA Organization, 1998, p. 5). Says an authority on agricultural education, "Vocational education in agriculture may be defined as systematic instruction in agriculture at the elementary, secondary, post secondary, or adult level for the purpose of preparing persons for the initial entry or reentry into occupations in agriculture" (Phipps & Osborne, 1988, p. 3).

The focus of this study was to examine the population of those secondary agricultural education programs (grades nine through twelve). The National Association of Agricultural Educators, Inc. (1998), reported there are 12,621 agricultural education

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

programs in the United States; of these programs, 7925 are at the secondary level. This study randomly examined 373 of these secondary programs.

Professionals in secondary agricultural education programs recognize the importance of technology and of keeping current with the changes the information age has set forth.

> ...Over the next seven years, according to the Bureau of Labor Statistics, it is estimated that there will be a 70 percent growth in computer and technology related jobs — jobs with a real future. In this information age, information is the currency that drives the economy. If people do not have access to information or the necessary tools, they can not participate in this economy. (Riley, 1998, p. 3)

Concern over the use of technology in the classroom by both the teachers and students has continued since the 1980s. Mihalevich (1989) expressed his views on the future needs of technology in schools:

Projections are that cost of education will continue to rise. Funding agencies will demand a "return on investment" mentally.

Implication: Educational process and products will be the primary alternative for labor-intensive instructional systems in an effort to hold down cost of education and training.

Communication technologies will become more powerful.

Implication: Educational technology in schools will provide a window to the world.

Nationally we will spend more on computer-assisted instruction than on textbooks.

Implication: Educational technology will be an integral part of the move away from school-based systems and toward high-tech, consumer-based learning systems.

The input devices of today will give way to better methods of tomorrow.

Implication: Educational technology will replace the keyboard and mouse with voice-activated input.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Schools will continue to adapt – rather than adopt – educational innovations.

Implication: Educational policy-makers will become more concerned about the fidelity of program implementation, especially those involving educational technology products. (p. 3)

Technology has changed our global way of life, says another commentator:

> The rapid development of electronic technology in the final two decades of the 20th century and the subsequent integration of these technologies into the workplace have significantly impacted America's workforce. Today, jobs in the American workplace require multiskilled workers with the ability to think critically, to communicate proficiently, and to utilize electronics in the completion of job duties. (Kercher, 1996, p. 1)

This study examined the following: the types of technologies in inventory, how they are currently being used, and the anticipated use in the program. "With computers and advanced telecommunications technology revolutionizing nearly every aspect of life and work, the question is no longer whether states and local school districts should incorporate technology into teaching and learning, but how they should do so" (Houghton, 1997, p. 1). Funding and other barriers that have prevented the utilization of educational technologies in the classroom were investigated.

"Technology investment in schools," says Lovejoy (1997), "should be done with a plan that takes into account the jobs for which students should be prepared. Instead of more computers, this may mean the school districts purchase special software, a lab, CNC machinery and the teacher training necessary to ensure its application to the learning process to meet the requirements of employers" (p. 58). Hill and Wicklein (1996) agree: "Efforts to integrate technology into the total school environment was met with resistance and failed as administrators, counselors, teachers and other support staff did not understand the purpose of technology in education" (p. 7). To address this, this study

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

examined agricultural education program subscriptions to online systems and educational features that instructors prefer.

Changes in enrollment and the curriculum in agricultural education have also spurred changes in facilities. Many schools have greenhouses, aquaculture tanks, agriscience labs, computer labs, land labs, livestock facilities, turf and landscape labs, and small animal facilities. Many agriculture departments are supported by being linked to the Internet, Agri-Data or other providers of electronic information (Klein & Luft, 1997, p. 11).

The educational software currently being used and educational technology curricula are also important areas to consider. Whether the technologies are being used simply as informational media by the students or if the instructors have also included technology as an integral part of their pedagogy was an important area to study.

> A primary reason for the failure of technology to become an integral component of educational practice has been the misunderstanding of appropriate roles for technology. Many, if not most, technological innovations in education have been conceptualized as forms of media that communicate information, transmit knowledge, or tutor students. This 'technology as instructional media' perspective involves the deliberate and intentional act of transmitting content to students with the assumption that they will learn something 'from' these media's. The instructional media perspective, although widespread throughout education, is inherently flawed because it fails to recognize learners as active constructors of knowledge. (Reeves, 1996, p. 74)

Also taken into account is whether the teachers use technology in administration and planning of the local agricultural education program, for as Birkenholz, Stewart, and Craven (1989) say, "Microcomputers continue to be primarily used for planning and administration rather than for instructional purposes in programs of agriculture" (p. 21).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

A secondary purpose of the study was to determine which factors seemed to be most significant as they related to either promoting or obstructing the adequacy of educational technology in the secondary agricultural education classroom, exploring the idea that "The greatest barriers to the use of microcomputers in agriculture programs are a lack of expertise, limited available software and funding sources" (Birkenholz, Stewart, & Craven, 1989, p. 27).

After all these factors were examined, a comparison to a similar study completed by Birkenholz, Stewart, and Craven (1989) was conducted to determine if there was a trend for an increase or decrease in the availability, use, and financial support of technology in the secondary agricultural education classrooms. To presume all agricultural education programs have kept current with the changes in technologies over the past ten years would be an unreasonable assumption, especially in agricultural mechanics, as Eighmy (1996) notes:

> Agricultural mechanics instruction is not being adequately addressed and the structure and course content of agricultural mechanics curricula needs to change. A national vision for the role of the technology-related component needs to be developed. The respondents indicated the descriptor "mechanics" does not adequately describe future content and aims of agricultural technology instruction. (p. 1)

The majority of agriculture teachers reported "a computerized data base should provide lesson plans, instant access to information, agriculture markets, news reports, and other information" (Birkenholz, Stewart, & Craven, 1989, p. 19). Agricultural educators and their students need to use technologies that represent the changing work place and be informed at a current pace with society, because "The image of the instructional program in agricultural education must reflect a scientific and futuristic nature and one that

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

prepares their students for tomorrow's changing job markets. Emphasis on technologies are predicted to reduce barriers for entry into production agriculture and to increase market efficiency" (Newsom-Stewart & Sutphin, 1994, p. 1). Studies indicate the importance for technologies to be present and used in agricultural education programs and point to a real concern by educators. Modern technologies occupy a place of unique importance in today's agriculture education programs.

Problem Statement

The question for this study was to determine what, if any, changes have occurred that have promoted or obstructed the adequacy of educational technology in agricultural education programs in the United States. The demographics chosen for the study were based on a similar study conducted by Birkenholz, Stewart, and Craven (1989). That research study defined the demographics to mean technologies used in conducting instruction in agricultural education, the availability of technologies, and support of technology in agricultural education.

The acceptance of the use of technologies as a pedagogy in agricultural education should be universal; "Far from seeking out farmlands, the agricultural industry needs educated and skilled people for jobs ranging from horticulturist and plant biologist to those not immediately associated with the field such as environmental engineer and futures trader" (Vo, 1997, p. 30). The Office of Technology Assessment (OTA) stated, "For students, the ability to use technology has come to be recognized as an indispensable skill and those who are unable to use it will face a life time of menial work" (United States Congress, OTA, 1995, p. 4). As authors John Naisbitt and Patricia Aburdene

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

(1990) stated, "We are laying the foundations for an international information highway system" (p. 23).

There would naturally be substantial variability in the adequacy of educational technology among agricultural education programs, but since it has often been stated that we are living in an information age that is driven by data access use, the researcher hoped to find increased use of technology in the agriculture classroom.

Research Questions

The researcher investigated the use of technology in the classroom and determined the following:

1. Type of technology equipment in inventory;
2. Type of microcomputers and disk drives are used;
3. Online informational services agricultural education programs subscribe to;
4. Technologies used for administration and planning (are they being used for individual instruction? For group instruction? What is the current and anticipated or future use of technology?);
5. Extent of educational materials and equipment in secondary agricultural programs;
6. Preferred features of a computer accessed database;
7. Type of instructional materials preferred by agricultural teachers;
8. Reasonable price range for materials;
9. Barriers that have prevented the utilization of educational technologies;
10. Technologies used simply as informational media or incorporated as an instructional pedagogy.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Definition of Terms

The terms used in this study are common to both technology and operating an agricultural education program:

Adequacy of educational technology – whether adequate technologies are available for competent instruction for the training of students for today's job market and information age.

Administrator support – confidence in the use of technologies used in the agricultural education program as well as funding support.

Age of equipment and usage – the older equipment becomes the less likely it is that it will be used.

Agricultural education – formal or nonformal system designed to educate about such subjects as animal and plant production, horticulture, natural resources and the environment, mechanics, and marketing and distribution—also a partner in educational leadership with the National FFA Organization.

Available technologies usage – the amount that the available technologies were used.

Barriers – include all obstacles which prevent the utilization of any and all technologies in the agricultural education classroom.

Educational technology – technologies used by students, or exposed to, in the classroom to include, microcomputers, VCR player/recorders, VCR cameras, satellite receiver dishes, interactive videos, carousel slide projectors, overhead projectors, audiocassette players and filmstrip projectors.

Informational media technology – students visualizing information, copying information for their notebooks as an assignment or using it for reports. No problem solving or

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

cognitive thinking skills are involved in transmitting this information (e.g., copying information, reports to class, notebook reports).

Information technologies – any advancement in technology that would connect the students and classroom with the outside world or bring information into the classroom to be used for learning.

Promoted or obstructed – the adequacy of technology accepted or handicapped in its use by instructors in the classroom.

Secondary agricultural education – all agricultural programs which teach agriculture at the secondary level.

Study comparison – a descriptive comparison between this study and the study conducted By Birkenholz, Stewart, and Craven (1989).

Teacher and administrator posture – the view of technology as an integral part of the pedagogy of classroom instruction.

Teaching style (pedagogy) using technology – teacher use of technology in such a way that the student is required to use problem solving techniques or cognitive thinking skills to determine solutions to a problem (e.g., computerized FFA leadership applications or recordbooks, use of computers to solve feed balance rations).

Technological pedagogy – technologies used in the classroom not as a "media hype" but rather technology as pedagogy by which learning and information is transferred.

Vocational agricultural education – a system of education founded on production agriculture and farming. Prior to 1989 this term was used to describe agriculture education programs; they have since expanded their curriculum and cover a much broader scope of modern day agriculture and are referred to by the term "agricultural education."

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Significance of Study

A great deal of concern has been expressed about training all students to become active workers in our changing environment, as in this comment by Stone (1996): "Language about technology in federal legislation such as School-to-work Opportunities Act implies that all students would be connected to some sort of technology-driven work that would pay well and offer a bright future" (p. 26).

Over 450,000 students in the United States are involved in agricultural education and this significantly warrants attention in determining if in fact they are being instructed for the information age with sound technological pedagogy (National FFA Organization). The information obtained from this study and the comparison of change over the last ten years revealed valuable insights into agricultural education's technological pedagogy. The final assessment may indicate whether agricultural educators are remaining current using newer technologies to instruct their students. The factors considered in determining the significance of this study were used in assessing the instructional programs as they relate to the information age.

Delimitations of the Study

Inherent to this research study:

1. This study was limited to the secondary schools with agricultural education programs in the United States.
2. Data collection was limited to secondary schools in the United States and did not include middle or junior high schools.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

3. Respondents were limited to individuals from a stratified, randomly selected schools, and did not necessarily include the department chair or the instructor who was best trained in the use of technology.

Limitations

The study was limited by these constraints:

1. All data collected through the use of a written questionnaire. Response to the questionnaire was voluntary. Additional explanations or elaborations were not offered.

2. Only data from those secondary schools having agricultural education programs were examined.

Assumptions

The following statements were presumed true:

1. The survey respondent representing each program will be representative of the entire staff.

2. Responses to the survey were accurate and reflected fair perceptions of the adequacy of educational technology in the respective agricultural education programs.

3. Sending the instrument out after the spring semester was in progress should result in a higher percentage of returned surveys as school is in session.

4. Agricultural teachers are professionals and will recognize the relevance of completing the survey.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

CHAPTER II

Review of Literature

Introduction

The literature review for this adaptation study first examines the literature review of the original 1989 study of Robert Birkenholz, Bob Stewart, and J. Craven. This review covered the descriptor areas of Agricultural Education; Computer Software; Computer Uses In Education; Educational Equipment; Educational Practices; Educational Resources; Educational Technology; Educational Trends; Instructional Improvements; Microcomputers; Secondary Education; Teacher Attitudes; Teaching Methods; and Vocational Agriculture Teachers. The adaptation study conducted in 1999 concentrated on these descriptor areas and on changes that have taken place over the last 10 years on the use of educational technology in the agricultural education classes.

The Importance of Technology in Agricultural Education

The Search Process for Uses of Technology in Agricultural Education

The literature review was developed by using the following search sources:

Databases

1. Dissertation Abstract International (CD-ROM)
2. Educational Research Information Center (ERIC)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

General Searches

1. Journal Publications
2. Internet
3. Government Publications

Many different combinations were entered utilizing the descriptor list to find articles related to technology use in agricultural education. When using these descriptors it was necessary to refine the search a number of times as limitless material was available when combining the words. The fewest articles and materials were found when the words agricultural education were included. Reviewing the literature from the first study helped to develop an understanding of the analysis and conclusions of the 1989 research. The current literature review developed the basis for understanding the changes that have occurred in the changing technology and pedagogy in education. The changes in industry have promoted changes in the way we prepare our students for their work futures.

Technology in Agricultural Education - 1989

The literature review in the first study indicated that there was a need for the increased use of educational technology in the classroom and that it was crucial to the success of education. It was confirmed that the issue of technology in the classroom was important to both general and agricultural classrooms. McCarney (1987) indicated that a shift in education from a labor-intensive emphasis to a capital-intensive emphasis could best be accomplished in the classroom through the use of technology. Mihalevich (1989) suggested that educational technology should support and empower the learner, and that

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

educational technology would become very important in the 1990s. Birkenholz, Stewart, and Craven, in their literature review, found the trends current to 1989 as expressed by Mihalevich (1989) were:

> Projections are that cost of education will continue to rise. Funding agencies will demand a "return on investment" mentally.
>
> Implication: Educational technology processes and products will be the primary alternative for labor-intensive instructional systems in an effort to hold down costs of education and training.
>
> Communication technologies will become more powerful.
>
> Implication: Educational technology in schools will provide a window to the world.
>
> Nationally we will spend more on computer-assisted instruction than on textbooks.
>
> Implication: Educational technology will be an integral part of the move away from school-based systems and toward high-tech, consumer-based learning systems.
>
> The input devices of today will give way to better methods of tomorrow.
>
> Implication: Educational technology will replace the keyboard and mouse with voice-activated input.
>
> Schools will continue to adapt – rather than adopt – educational innovations.
>
> Implication: Educational policy-makers will become more concerned about the fidelity of program implementation, especially those involving educational technology products. (p. 3)

An obvious concern about the use of technology in the classroom was a key element in the discussion of 1989. One of the most talked about themes was the necessity not to view the use of technology as a media but to encompass it as an integral part of classroom pedagogy. The cost of keeping up with rapidly changing technology puts

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

additional financial burdens on schools' already stressed budgets. Birkenholz, Stewart, and Craven found that Rosenfeld (1986) suggested that keeping up with technology is like chasing a moving target, and noted problems in readjusting programs and obtaining needed equipment.

Rosenfeld concluded this:

> Supporters of vocational agriculture have agreed upon the need for expanded programs and better resources in the high schools and on the importance of science, technology, and problem-solving in the curriculum. (p. 10)

And in 1984, legislation (The Carl D. Perkins Vocational and Applied Technology Act) was enacted that:

> For the first time, explicitly addressed and responded to the impacts of technological change. Technology was no longer treated as an unseen force acting on labor demand, but as a force with known dimensions that should be factored into vocational education instructional policies. (p. 13)

In 1989, Birkenholz, Stewart, and Craven reported that their findings indicated instructors anticipated using the newer technology more frequently in the future and felt a lack of funds and expertise were their greatest barriers to success. They felt the pressure of the changing world and knew that technology advancements in the agricultural industry would be far reaching. It was felt that the primary determinant in the classroom would be the microcomputer. Camp (1983) reasoned that because of cost and availability, microcomputers would continue to play an increasingly important role in agricultural education.

Birkenholz, Stewart, and Craven (1989) researched a study compiled in North Dakota to identify successful microcomputer activities that had been used in agricultural education instruction. They found that Zidon and Luft (1986) reported the following:

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

1. Nearly all North Dakota vocational agricultural teachers could have used microcomputers within their programs. Most have microcomputers within their departments; others had them available in other departments of the school. Printers and extra disk drives were the most predominant types of microcomputer peripherals available in the departments.

2. One or more teachers were using microcomputers in all units of instruction. They were used most to work decision aids and tutorial programs in such units as farm business management, SOE, animal nutrition, FFA leadership, and advanced crop science.

3. Teachers perceived the use of microcomputers for instructional purposes to be effective. It was identified as being most effective for teaching farm business management, perhaps because of the decision aid programs available.

4. Microcomputers were used by many teachers for non-instructional purposes. Activities which received most frequent microcomputer use included word processing, correspondence, entertainment, and generating tests. (pp. 55-56)

Birkenholz, Stewart, and Craven (1989) reviewed another study compiled by Miller and Kotrlik (1986). This study was nationwide and addressed the issues of type and level of microcomputer use in vocational agriculture. Miller and Kotrlik reported the following:

> 1. The percentage of teachers who have computers in their vocational agriculture departments does not appear to be as high as the percentage reported by the National Agricultural Computing Service (1985) which reported that 51 percent of the programs in the nations had computers. This study found that only 39 percent of the teachers in the sample had computers.
>
> 2. Computers currently in vocational agriculture programs are used for instructional management (as a tool) than for tutorial or direct instructional purposes. Existing research findings on how to effectively incorporate the computer into the instructional environment should be used by teacher educators and state supervisors to aid teachers in using the computer to improve instructional effectiveness. (p. 173)

A 1989 study conducted by Birkenholz, Stewart, McCaskey, Ogle and Linhardt examined tutorial, drill and practice, and simulation teaching strategies when microcomputers were used to incorporate information in the classroom setting. The

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

study was conducted on 31 randomly selected agriculture classes in Missouri. There was a population of 312 students.

Conclusions reached by the researcher:

1. Student attitudes did not vary when they were taught with one of the three microcomputer-enhanced strategies or a traditional lecture/discussion strategy.

2. Student achievement was not found to be significantly affected when microcomputers were used to enhance instruction.

Among the recommendations made by the Birkenholz, Stewart, McCaskey, Ogle and Linhardt (1989) were the following:

> Microcomputer-enhanced teaching strategies may be used to supplement or replace a portion of the traditional classroom instruction, which would enable teachers to spend more time attending to students' individual needs and successful microcomputer-assisted instruction can take place in the classroom using the three strategies studied. (p. 51)

Birkenholz, Stewart, and Craven in 1989 felt that the review of their study left many unanswered questions concerning the use of educational technology in the secondary agriculture education programs. They also viewed technology as vitally important and a dynamic addition to classroom pedagogy. Their abstract revealed the following:

> A study was conducted to assess the extent to which instructional technology has been adopted in secondary programs of agricultural education in the United States. Teachers from 479 secondary agriculture programs were randomly selected to provide responses to a mailed survey instrument requesting information about types and quantity of equipment, level of current use, level of planned future use, future needs, and barriers to using existing technology. Usable replies were received from 254 teachers (a 53 percent response rate). Some of the findings were as follows: (1) a majority of the respondents had an overhead projector (80 percent), a microcomputer (73 percent), a slide projector (67 percent), a printer (66 percent), a filmstrip projector (61 percent), and an audiocassette player (56 percent) in their agriculture departments; (2) more than 50 percent of the programs had Apple II or compatible machines; (3) 17 percent

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

> of the respondents subscribed to Agri-Data Network; (4) overhead projectors, carousel slide projectors, and videotape players were most frequently used for group instruction; (5) instructors anticipate using the newer technology more frequently in the future; (6) teachers supported the development of technological advances for use in their curriculum; and (7) lack of funds was the most of ten-cited barriers to use of educational technology. Recommendations were made for teachers to identify ways of increasing funding for technology use and to receive inservice education to develop their expertise in educational technologies. (p.1)

Technology in Agricultural Education - 1999

The revolution in information technologies has made the computer a basic tool for educators allowing access to the information age and has changed the pedagogy of teaching. The learning process is no longer limited to the classroom but rather encompasses the entire world.

> At schools and colleges across the country and around the world, the use of the Internet and Web for learning and teaching is causing a major change in the landscape of education. Building upon decades of computer networking activities (e.g. e-mail and bulletin board systems), the Internet has produced phenomenal growth in the extent and scope of online education. Online education has created a new paradigm for teaching and learning different from the traditional classroom experience, and also different from earlier attempts at computer-based instruction. (Kearsley, 1998, p. 1)

Technology has changed our global way of life. Kercher (1996) noted,

> The rapid development of electronic technology in the final two decades of the 20th century and the subsequent integration of these technologies into the workplace have significantly impacted America's workforce. Today, jobs in the American workplace require multiskilled workers with the ability to think critically, to communicate proficiently, and to utilize electronic technology in the completion of job duties. (p. 1)

The Carl D. Perkins Vocational and Applied Technology Act (1984) was designed to address these concerns. "The stakes are high, and several states are responding accordingly. Adopting what is considered an exceptional tough standard, North Carolina

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

will require students to pass a computer skills test to get a high school diploma, starting with the class of 2001" (McCafferty, 1998, p. 28).

Vice President Al Gore (1998) explained the situation by stating, "By the year 2000, 60 percent of the new jobs in America will require advanced technological skills." He further stated,

> The four pillars of our challenge are:
>
> I. Modern computers and learning devices will be accessible to every student.
>
> II. Classrooms will be connected to one another and to the outside world.
>
> III. Educational software will be an integral part of the curriculum – and as engaging as the best video game.
>
> IV. Teachers will be ready to use and teach technology. (p. 1)

On a recent Webcast, U. S. Secretary of Education Richard W. Riley (1998), while talking about technology and education, gave the following comments:

> My Friends, I come before you to talk about the promise and the possibilities of technology in education. I want to assure you that this future can be a rich and limitless one, full of opportunity for students of all ages. But I also want to make clear that to achieve this kind of bright future requires a real commitment by this nation to end the great disparity that exists between those who have and those who do not have these exciting tools for learning. We have the potential to do great things with technology in our schools, but it is a potential still largely unrealized. It is the ability of all students – no matter whether rich or poor, or whether they are from a small town, a city, a rural area, or a suburb – to learn the highest levels with the greatest resources and have the promise of a future of real opportunity. This is the potential of technology. (p. 1)

The importance of having technology in all phases of education and in every classroom was emphasized by Riley (1998):

> Today's students are the first generation that will be expected to have technology skills of careers and future success. These skills are the "new basics."

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

> By the year 2000, 60 percent of all jobs will require high tech computer skills. Over the next seven years, according to the Bureau of Labor Statistics, it is estimated that there will be a 70 percent growth in computer and technology related jobs – jobs with a real future. In this information age, information is the currency that drives the economy. If people do not have access to information or the necessary tools, they can not participate in this economy. (p. 2)

Many schools today are providing excellent learning experiences using technology. One such system was explained by Reynolds (1998):

> The North Star Approach to technology takes its cues not from technology manufacturers, software developers, or academic committees, but instead from the students. The NS Approach encourages the student to become an active participant in the learning voyage–to help determine the direction–to help us know how to help guide them. To help us see what knowledge, research, additional skills they will need on their own unique life journey. After all isn't that what the whole learning endeavor is about? Helping young people navigate productive, fulfilling, rewarding life journeys. The North Star Approach suggests that each learner develop a personal curriculum. (pp. 1-2)

A system that is proving successful in vocational education is the modular concept; several companies offer these programs. Creative Learning Systems is one of the leading companies to offer agriculture curriculum through this concept:

> The founding vision of Creative Learning Systems is to change the way learners are allowed to learn. Today, CLS is inventing, defining, and redesigning education for the 21st century. Environments such as SmartLab, Technovation Studio, and Creative Learning Plaza nurture the creators of tomorrow. Creative Learning Systems expertise is in the design and implementation of complete, technology-rich learning environments. These environments integrate instructional subsystems and physical environments that are dynamic and respond to the needs of the learner on a just-in-time basis. The cornerstone of the learning systems approach used by CLS is the empowerment of the self-directed learner. (Dell Computer Corporation, 1998, p. 1)

These modular technology labs lend themselves to the workplace environment, an important aspect of teaching. "If we do not give students the opportunity to have experiences that closely align with the workplace, they will not leave us prepared to function there" (Dykman, 1998, p. 21). Dykman also stated that his school,

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Great Oaks Institute of Technology and Career Development, Cincinnati, Ohio, uses modular units to teach business technology, cosmetology, health, math science, food services, child care, aviation, trade industrial programs, and agriculture.

In a study that sought to examine the types of curriculum and instruction found in schools where a high content of technology was used to teach, Seguin (1998), showed that for this population, online activities using technologies was successful with students of all ability levels, from at-risk through gifted and talented. Multicultural understanding and global perspectives were enhanced through online activities, and for older students attainment of vocational skills and increased understanding of the world of work resulted. Findings also indicated that teachers used the Internet for individual learning. The Internet changed the way teachers taught in positive ways, improving student achievement, thinking skills, motivation, social skills, metacognition, and communication. Some concern was reported regarding inappropriate materials on the Internet, possible network addiction, and the inability of some students to distinguish between online facts and opinion.

Certainly the increased use of technologies in all facets of industry is not in question; however, the increased use of technologies by everyday consumers has flourished. A 1998 American Society for Quality/Gallup quality survey revealed how consumers use technology in their daily personal lives and in education, as shown in Table 1.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 1

Consumer Response to Use of Networking and Communication Technologies

Value of Technologies	Percent
Personal Computer	43%
ATM Card	42%
Cellular Phone	40%
Pager	39%
Fax Machine	31%
Enhanced Telephone Services	31%
Internet Access	22%
Conference Calling	21%
Video Conferencing	18%

Incorporating technology into the educational classroom is becoming the expected challenge in today's educational systems. Houghton (1997) indicated that this is being accomplished:

> With strong backing from the federal government, states and school districts are in the midst of a major push to put technology in the hands of America's teachers and students. Their efforts seek to equip schools and classrooms with computers, educational software, school-based computer networks, and links to both statewide and global information networks. (p. 1)

Houghton's study examined several major issues that state leaders need to consider as they develop programs to promote the use of technology in public schools. The key issues for educational planners as Houghton viewed them were providing teacher

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

training, securing ongoing funding, dealing with obsolescence, ensuring equity, measuring the effectiveness of education technology, recognizing the role of the teacher in a technologically equipped classroom, and finding funds for technology. "With computers and advanced telecommunications technology revolutionizing nearly every aspect of life and work, the question is no longer whether states and local school districts should incorporate technology into teaching and learning, but how they should do so" (p. 1).

A study was conducted to determine which technology clusters are the most appropriate for the high school technology programs in Arkansas. Vore (1997) found that four technology clusters (communications; construction; manufacturing; and energy, power, and transportation) were of the greatest concern. Agriculture curriculum was mentioned in this study.

The change from a traditional vocational curriculum to a technology-driven curriculum was not an easy assignment for Medinah Middle School. Potosky (1997) examined one instructor's plight:

> "We purchased two dozen high-tech modules to revamp our family and consumer science program, teacher Phyllis Ludwig was, at first, less than enthusiastic. She felt uncertain about the transition from teaching in a room filled with kitchen equipment and sewing machines to one that features computers, TV/VCR's and interactive CD players" (p. 40).

Potosky pointed out that it is difficult for the teachers to see the advantage of using modular technological units and still teach the traditional curriculum. Ludwig commented on how she felt, "It was difficult for me to understand the hands-on projects until I actually had the program up and running and was interacting with students, she says. I was sold after the first month" (p. 40).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

The modular project approach enables a multitude of activities to be going on at the same time; the teacher becomes a facilitator and interacts with the students. Another factor Potosky pointed to is that the students experience group learning and responsibilities as well as social skills related to the world of work.

In Napa, California the county school created a new "High-Tech High School." The approach was to use modular technological units designed with the input of the local business community. One of the teachers, Robert Nolan, recalled, "If we were going to have a school with more robust connections to business, then we had to adopt that culture as much as possible and as soon as possible" (Lozada, 1997, p. 18). Lozada pointed out that the teaching staff, school district, and business community took the approach that they needed to really make a change and upgrade their technology training. She further stated that the county school district made a real commitment when they purchased $600,000 of furnishings and technological equipment. One important concept here is that this program tried to create their modular units to duplicate real work place environments.

In agricultural education most increases in the use of technology have occurred in the teaching of agriculture sciences. There has been a continued movement at the post-secondary level to keep agricultural mechanization abreast with the new mechanical technologies used in the industry. Schumacher (1997) stated,

> Agricultural mechanization has been a strong component of the local high school agricultural education program since its early beginnings. The mechanization of agriculture allowed agriculturalists to expand their business operations and to operate more efficiently. As a result, agricultural mechanization instruction was accepted as an integral part of the agricultural education program. (p. 10)

Many secondary agricultural education mechanization programs use microcomputers only for the business part of its program. Little has been done to encompass technology

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

into the mechanical production area. At the post secondary level including mechanization technology is being taught as an integral part of the curriculum. "Students study technological systems with more emphasis placed on business and economics (including organization, operations, management, marketing and sales) and oral and written communications" (Schumacher, p. 10). The trend to train mechanization students for management level positions does not help the secondary schools in which the training of students is for entry level positions, in agricultural mechanics. More technology training is needed for these entry level positions whether it be in a farm oriented fabrication welding shop or running a computerized herbicide spray tractor in a broccoli field.

Martin (1997) conducted a study to determine the perceptions of secondary agricultural educators regarding the role of agricultural mechanization in the agricultural education curriculum. Martin concluded,

> "This study indicated that teachers are following a traditional agricultural mechanics program; some new areas of instruction in agricultural mechanics are being added to the curriculum; there are a number of challenges to teaching agricultural mechanics; and that agricultural mechanics is an important instructional component of the curriculum in agricultural education" (p. 1).

In addition, Martin determined that more classroom and shop instruction with technology was desirable; further, the technologies should be reflected in the Model for Agricultural Technology Education. Also, Martin stated, "In-service education should be provided for teachers to explain instruction in selected areas of agricultural mechanization technology" (p. 1).

The use of technology in the field of vocational education is on the rise. Lovejoy (1997) indicated, "The use of technology in the classroom is an issue of vital importance

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

to vocational educators and our programs. Surveys report that technology is used more often in vocational and agriculture classes than in other subject areas" (p. 58). Vocational educators recognize the importance of training their students to meet the changing requirements in today's technological world of work. Most programs are attempting to meet the new requirement standards.

> More and more jobs are requiring not only high levels of personal computer skills but also high skill levels in broader technologies, including the use of telecommunications, computer controlled machinery, diagnostic equipment and data based management to mention a few. The future success of vocational education will depend in large part on how well we prepare students with these technological skills required by the vast majority of employers. (p. 58)

Currently, industry leaders are saying that we need more highly skilled workers for the information age and the school systems are falling behind in meeting this demand. Lovejoy pointed to Congresses' concern: "Congress has held several hearings about vocational education as they prepare to reauthorize the Perkins Act. One of the major issues that emerged from these hearings was the dire need of skilled workers in the information technology sector" (p. 58). This high-tech shortage is nationwide and a concern many vocational education programs are addressing. Students' needs in terms of the job market they are trained for is the determining factor in choosing the information technology used to educate them. Lovejoy summed this up:

> Technology investment in schools should be done with a plan that takes into account the jobs for which students should be prepared. Instead of more computers, this may mean the school districts purchase special software, a lab, CNC machinery and the teacher training necessary to ensure its proper application to the learning process to meet the requirements of employers. (p. 58)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

The Global Strategy Group, Inc., for the Jostens Learning Corporation and AASA (April 1997) conducted a survey to determine the usage of computers for instructional activities. Table 2 is a synopsis of the results.

Table 2

Survey to Determine the Percent Use of Computers for Instructional Activities by Agricultural Education Programs

(n=1001, teachers and superintendents)

Type of Use	Percent
Vocational Programs	53%
Reading, Language, & Writing	52%
Sciences & Health	35%
Math	33%
Non-Curriculum Activities	22%
History/Social Studies	19%
Arts/Music	10%

The nation's schools are still struggling to utilize the technologies that they have; many administrators simply bought new equipment to be flashy. Henry (1997) reported that the CEO Forum on Educational Technology says, "Schools have made progress installing hardware and linking to online services but 'still have a long way to go' combining technology and traditional education" (p. A3). Data from nearly 80,000 public schools showed:

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

- 3% of schools are on target integrating technology with the curriculum. Students' method of learning on those schools has completely changed.
- 12% come close to the ideal; students use technology to research, create, communicate, and practice basic skills.
- 26% have a blend of old and new technology, but teachers lack training to fully utilize computers for instruction.
- 59% have older computers that are confined to laboratories or administration offices.

Henry (1997) also reported that Thomas Wajnert, the chairman of AT&T Capital Corp., said, "The report signals a move away from the traditional practice of counting boxes and kinds of computers in schools" (p. A3). Terry Crane, president of Jostens Learning Corp. agreed and stated, "What we've got to start talking about today, though, are what are the educational objectives and benefits of this technology and how are we going to apply it to get increases in student performance and better work force skills for the kids?" (Henry, 1997, p. A3). Crane pointed to the need to protect and ensure a payoff for the huge investments in school technology, estimated at $4.5 billion last year (cited in Henry, p. A3).

Vojtek (1997) asked, are schools ready for the technology age? "All Aboard! The age of telecommunication has arrived. Spawned from leadership like the Clinton administration's challenge to connect every classroom to the Internet by the year 2000, and efforts like NetDay, in which community volunteers run cables and rewire entire buildings, schools are climbing aboard the information superhighway" (p. 60). As Henry's (1997) report indicated, and as Vojtek (1997) informed us, schools mechanically may be ready for the information age, but teachers are not, and few teachers are actually

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

using this new technology in their teaching. With all the effort to integrate technology into the classroom and to help students to prepare for the 21st century we have failed to heed this warning that our teachers also need to be educated in the use of these technologies. "It appears that, in the process of equipping our students to learn with technology, a valuable part of the education equation has been virtually overlooked: the teacher" (United States Congress, OTA, 1995, p. 60). Certainly more is going to have to be spent on staff development before our teachers will become proficient in the use of technologies in classroom instruction.

The facilities, equipment and curriculum that are used in teaching agricultural education have changed over the past ten years. Klein and Luft (1997) noted that:

> Changes in enrollment and the curriculum in agricultural education have spurred changes in our facilities. Most agriculture departments now have lavatory facilities for females instead of a lock on the boy's room. Many schools have greenhouses, aquaculture tanks, agriscience labs, computer labs, land labs, livestock facilities, turf and landscape labs, and small animal care facilities. (p. 11)

They indicated that almost all departments have at least one computer. Many are linked to the Internet, AgriData or another provider of electronic information. In all areas of agriculture the increased use of technology is an obvious perception. "Electronic instructional equipment has improved over the years. Most teachers have the capability to show videos and CD's as well as slides and overheads. We haven't seen a filmstrip shown in years! Photocopiers provide the capability to enlarge, reduce, collate, and staple" (Klein & Luft, 1997, p. 10). Klein and Luft illustrated that a drastic change took place in the late 1970s and 1980s when the technology changes came at the post secondary level. The preparation of agriculture teachers has changed to reflect the

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

needs of today's teachers when using technologies for classroom instruction. "When we think of these changes, we realize a lot has changed, yet our goal is still to prepare students with the skill necessary to enter and succeed in agriculture" (p. 15).

One of the main concerns in education is the financing of the technology to remain current in the classroom. Equipment becomes obsolete at a rapid pace and usually needs to be replaced within five years. "Experts estimate that schools will spend $5.2 billion on technology during the 1997-98 school year, but this number represents less than five percent of the total funds needed to equip America's schools properly" (Daly, 1997, p. 10). Financing has been a continued problem since the onset of the information age, and is also thought of in terms of capital expense. Daly offered a reasonable solution to this problem: "To enrich school curricula with quality education technology, schools need a funding alternative that maximizes their limited financial resources. Leasing is steadily gaining acceptance among school administrators as a cost-effective and practical approach especially well-suited to the unique requirements of technology" (p. 10).

The monies used in leasing are operating expenses not capital expenses. This would make it easier in budgeting and offer the following:

1. Staying Current
2. Leverage Purchasing Power
3. Immediate Access
4. Customized Solutions
5. Capital Conservation
6. Simplifies Funding
7. Technical Support and Maintenance (Daly, 1997, p. 10).

Daly (1997) concluded, "Bringing America's schools into the information age is no longer a pipe dream. It's a reality. And with leasing, any school now can afford the

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

equipment, software and training it needs to enrich the learning process for its students" (p. 10).

The issue becomes whether your technology curriculum is delivering the results you desire or whether just hardware in the classroom. Golden (1997) summed it this way:

> School districts throughout the United States have spent billions on technology over the past ten years, yet little about the classroom has really changed since the 1960s. The technology is not to blame; it has tremendous power to affect students' learning. The problem is that educators feel pressured to purchase the latest computer hardware and software to bring their schools up to snuff, but they seldom give much thought to its long term purpose. (p. 16)

As Golden pointed out, principals usually support technology improvements but seldom do they use the new technology themselves. Course content and a competent technology teacher are the two main driving forces in a successful technology instruction driven classroom. Vocational teachers, as he pointed out, are much more likely to keep up with technological changes and use them in their daily classroom instruction, as they know they are important skills in the world of work. "Despite tremendous improvements in speed and sophistication of hardware and software, few teachers use the computer as an integral part of their daily instructional process" (Golden, 1997, p. 17). Specifying many of the causes that have resulted in lack of computer use in daily instruction, Golden indicated the following as problems: personal dislike of technology, not having the right computers, or teachers too near retirement to try new techniques. Whatever the excuses, they need to be set aside and educators need to address the real needs of the students to succeed in today's changing job market. Certainly a lack of leadership, poor vision, and teachers who are poorly trained will not assist in training students with technology skills.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

There is a growing concern in agricultural education that instruction in the agricultural mechanization programs using the available technologies is not occurring at either secondary or post secondary levels. Part of the problem lies in the fact that post-secondary institutes are eliminating agricultural mechanics from the preparation of agricultural teachers' preparation.

Eighmy (1996) found:

> Agricultural mechanics instruction is not being adequately addressed and the structure and course content of agricultural mechanics curricula needs to change. A national vision for the role of the technology—related component needs to be developed. The respondents indicated the descriptor "mechanics" does not adequately describe future content and aims of agricultural technology instruction. (p. 1)

Eighmy found that more emphasis needs to be put on teaching applied physical science and mathematics concepts related to agricultural-related technologies. Technology was being used for instruction in the agricultural sciences, but has yet to be fully addressed in agricultural mechanics. "Agricultural mechanics instruction should focus on the technological concepts and principles that are transferable across the broad fields of agriculture" (p. 1). Hands-on application has proven to be best in agricultural mechanics, and instruction should include a systems concept with emphasis on problem solving, troubleshooting, and higher level cognitive skills using existing technologies.

> The School-to-Work Opportunities Act implies that all young people would be connected to some sort of technology-driven work that would pay well and offer a bright future. As employers downsize, companies leave town and the 'good' jobs get rarer, rural and urban schools must get creative with work-based learning. (Stone, 1996, p. 26)

The decline of jobs in manufacturing over the last ten years leaves educators wondering how and in what they need to train our students. Pointing to a flattening of

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

business and downsizing, Stone felt educators need to be more responsive to community needs and should become economic partners and the engines for local growth, while using the community as a "textbook." Stone perceived that if educators do not train their students for the information age using today's technology, students will be confined to the "youth labor market," where little formal education and few specific skills are required, resulting in limited pay and benefits. These jobs would be in lower level service jobs that the economy is producing at an ever increasing rate in places like fast food establishments and retail sales.

A changing job market, based on the information age, will change the way educators prepare their students for the future. Chrestman (1996) studied and identified the skills and technology training needs of the Fortune 500 companies for the 21st century as perceived by top-level managers. A second purpose of his study was to provide research data that could guide the public and private sectors in developing skills and technology training programs that would be valued and needed for the 21st century. "The results of this study suggest that a new set of technical abilities is steadily evolving in areas that have never before been competitive, training in these technical areas will not only be important but will become critical in the development of high performance employees for high performance firms" (p. 1).

Restructuring at secondary schools is influencing vocational education with a name change to reflect the change in course offerings and to clear the air with a more technological look. "Within a given area, new courses are being added to reflect the advent of new technologies and management practices in the workplace" (Lankard, 1996, p. 1). Lankard indicated that guiding school restructuring efforts is the knowledge

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

that skills required for employment should be taught in courses in which the content is allied with real world living and working. "Spearheading the restructuring of courses and course requirements for vocational education is the integration of academic and vocational programs" (Lankard, p. 1). During this restructuring vocational education has brought the academic areas into their programs through the use of technologies for the information age. "The group pushing hardest for school reform today is the business community. Employers recognize that our high school graduates lack the skills to function in a workplace transformed by technology and global competition" (Vidaurreta, 1996, p. 1).

Learning to teach using technology has been a real challenge for today's educators, and an explanation by Reeves (1996) proved valuable in understanding the reason why this has occurred:

> A primary reason for the failure of technology to become an integral component of educational practice has been the misunderstanding of appropriate roles for technology. Many, if not most, technological innovations in education have been conceptualized as forms of media that communicate information, transmit knowledge, or tutor students. This 'technology as instructional media' perspective involves the deliberate and intentional act of transmitting content to students with the assumption that they will learn something 'from' these media. The instructional media perspective, although widespread throughout education, is inherently flawed because it fails to recognize learners as active constructors of knowledge. (p. 74)

What is needed is to recognize the application of technologies as cognitive tools; students learn best "with" technology rather than "from" it. Reeves directed us to the understanding of the shift from "technology as instructional media" to "technology as a cognitive tool." Many schools used "media" technology as entertainment, and expect the students to learn from this; when more educators give up this idea and learn to use

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

technology in a cognitive manner, students will gain the most. Reeves suggested educators address this problem during the teacher preparation period at the post secondary level. Technology is being introduced to the prospective teacher at a higher rate today than any other time in education.

Administrators have played a crucial role in the quest for the use of technology in the classroom. "Some efforts to integrate technology education into the total school environment have met with resistance or failed because administrators, teachers, or ancillary staff members (i.e., guidance counselors) did not adequately understand the new role and purpose of technology education" (Clark, 1989 as cited in Hill & Wicklein, 1996, p. 7). It was pointed out that while technology education professionals have made considerable strides in curriculum and program development, it is not clear whether the impact of this progression has been felt or understood by educational decision makers. An accurate understanding of the purposes of technology education by key public school decision makers is essential for continued development of the field. Some teachers have been so influenced by negative administrators and decisions that they have left teaching entirely. We are still tied to the stigma that technology is a non-scholastic subject that fails to promote students' achievement. "Clearly, the literature reflects considerable concern that technology education is not understood or fully appreciated by those outside the profession, especially among administrators and other key school personnel" (Hill & Wicklein, p. 8). The fact that administrators may have not been introduced to computer technologies until a later time in life may have a bearing on why they are not sold on the idea of technology education. Ritchie (1996) stated, "The potential for technologies to enhance classroom instruction and school administrators is wide spread, but the majority

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

of schools have yet to implement technologies beyond a basic level. Reasons for this are varied, but often included a lack of support from school administrators" (p. 1). If schools are to continue with their efforts to meet the needs of the information age, administrators must have confident plans for keeping current with technology.

> A better way would be to not only help develop technology skills but also focus on the conceptual knowledge of how technologies can be used to augment student learning and the leadership and strategy skills needed to promote, achieve and sustain a vision of how our schools can and should evolve in a society that will increasingly depend on creative technology-using citizens. (Ritchie, p. 2)

Administrators, teachers and support staff must be included in the retraining process to gain support for technology education.

> Administrators and guidance counselors are primarily responsible for enrollment in secondary technology education programs. Therefore, it is imperative that the field first identify the perceptions held by these decision makers and then take action to influence them. As this task is approached by professional associations and through other collective efforts, it is important that negative expectations and beliefs be changed if they are no longer valid. (Hill & Wicklein, 1996, p. 9)

Before it closed its doors in 1995, the Office of Technology Assessment (OTA) printed their final Summary and Policy Options Report. It projected that by the spring of 1995 schools in the United States would have 5.8 million computers for use in instruction—about one for every nine students. Technology was in schools nationally but was just starting to reflect the more advanced computer technologies. OTA (United States Congress, OTA, 1995, p. 1) stated,

> While technology is not a panacea for all educational ills, today's technologies are essential tools of the teaching trade. To use these tools well, teachers need visions of technologies' potential, opportunities to apply them, training and just-in-time support, and time to experiment. Only then can teachers be informed and fearless in their use of new technologies.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Vocational education continued to lead the way with the use of technologies in classrooms. Educators still face today the same obstacles that OTA was dealing with in 1995. Teachers still use the computer mostly for drill and practice and for the mastery of basic skills. Using the Internet for informational text is appropriate. However, classroom pedagogy using technology needs to be developed with more cognitive thinking as its main ingredient. When comparing the problems in the use of technologies in the classroom today we find they are very similar to what OTA reported in 1995 (p. 2):

- Increased communications is one of the biggest changes technology offers classroom teachers.
- Helping teachers use technology effectively may be the most important step to assuring that current and future investments in technology are realized.
- Most teachers have not had adequate training to prepare them to use technology effectively in teaching.
- A majority of teachers report feeling inadequately trained to use technology resources, particularly resources, particularly computer-based technologies.
- Although schools have made significant progress in helping teachers to use basic technological tools such as word processing and databases, they still struggle with integrating technology into curriculum.
- Technology can be a valuable resource or improving teacher education overall.
- Despite the importance of technology in teacher education, it is not central to the teacher preparation experience in most colleges of education in the United States. Currently this trend has been addressed by most universities and during the pre-services of teachers they are introduced to the use of computers in teaching their classes.
- The federal government has played a limited role in technology-related teacher development compared with states, universities, and school districts. The federal government has addressed new teacher technology skills supplying funds at post secondary level for teacher preparation.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

- The federal government has a unique opportunity to encourage greater links between technology and professional development, through recent legislation such as Goals 2000 and the Improving America's Schools Act. With the onset of the information age it is obvious that technologies are essential tools for doing business and a primary means for people to acquire information.

Eckhouse (1993, p. C1) said that an estimated 12 million-plus Americans regularly used electronic mail and related online information services. By October 1994 the number of e-mail users was estimated to be more than 27 million (Matrix Information, 1994). The Secretary's Commission on Achieving Necessary Skills (U.S. Dept. of Labor, 1991, p. 15) stated, "Those unable to use ...[technology] face a lifetime of menial work." Most states have realized the importance of technology for the future and have addressed the problem by adopting standards for teaching students with and about technology. The policy discussions and technology initiatives in 1995 focused on hardware, software, and student access to technology. In doing this, many teachers' issues were never addressed. OTA found the lack of attention to teachers and technologies ironic, for at the center of the effective use of instruction technologies are those who oversee the daily activities of the classroom—the teachers. To use new technologies well, teachers not only need access to them, but they also need opportunities to discover what the technologies can do, learn how to operate them, and experiment with ways to apply them. The process of adopting new technologies has never been quick or effortless; however, like all professionals, teachers have instructional methods, teaching styles, and working procedures that have served them well in the past and often reflect how they were prepared. And like other large institutions, schools have organizational characteristics that make change difficult. Moreover, the unique culture of schools and

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

changing public expectations for them create conditions substantially different from those of other work places.

Mirdamadi (1995) conducted a four part study on the relationship between computer anxiety and degree of infusion of computer technology among the secondary agricultural teachers in Kansas. The purpose of this study was to:

a) determine the extent of usage of microcomputers by secondary agricultural teachers in Kansas at the present time.

b) determine the barriers that prevent secondary agricultural teachers in Kansas from utilizing microcomputers.

c) determine the computer anxiety level exhibited by secondary agricultural teachers in Kansas; and develop guidelines for decision makers in Kansas to enhance microcomputers skills of teachers in the secondary agriculture programs in Kansas. (p. 1)

Mirdamadi (1995) reported his findings from a study in which 140 of the 166 (84%) secondary teachers in Kansas responded. The majority of the respondents indicated the largest percent of the support from local sources (principal, 72%; other faculty 56%; superintendent 54%; and school board 43%, respectively). Over 90% of the respondents used computers in their agriculture education departments. Sixty-two percent claimed a computer was available in their office for use, while thirty-nine percent and thirty-five percent, respectively, reported they had a computer at home either for personal and/or school use. Fifty-seven percent of the respondents reported they used a computer in their office between one and six hours per week. The majority of the respondents (83%) perceived their computer knowledge as novice to intermediate (or fairly knowledgeable). The main factor preventing the use of the microcomputer in the agriculture classroom was seen to be the need of additional software. Needs of additional

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

information and/or experience to expand classroom usage of microcomputers was ranked second, while need for purchasing new computers was ranked third. Over 75% of the respondents indicated they were self-instructed in using microcomputers. In general, 76% of the respondents stated their students used microcomputers in class one to five hours per week. A majority of the participants felt they were generally relaxed in regards to the computer anxiety items. All of these are important findings for any study on technology in the agricultural education classroom and support further study.

In October 1994, the National Science Foundation and the National Aeronautics and Space Administration awarded the International Technology Education Association a contract to produce the National Standards for Technology Education. "The Technology for All American Project will parallel other national endeavors (e. g., Mathematics, Science, History, Geography) to conceptualize and develop standards that prepare all American students with a desired level of knowledge, values, and skills related to technology" (Satchwell & Dugger, 1995, p. 93). The Technology for All Americans Project was divided into two phases. The goal for phase one was to develop a long term vision for what the intellectual domain for technology education should encompass. The second phase was to seek funding to continue this effort so that the profession could develop, validate, and gain national consensus on the standards for curriculum contents in technology education. The International Society for Technology Education (ISTE) recently released the new Standards. The National Educational Technology Standards (NETS) for Students provided performance profiles that indicated what students should know about and be able to do with technology by the completion of 2nd, 5th, 8th, and 12th grades. There were six broad categories addressed: basic operations and concepts;

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

social, ethical, and human issues; technology productivity tools; technology communications; technology research tools; and technology problem solving and decision-making tools. As detailed by ISTE, the students mastered technology skills and concepts throughout their primary and secondary educational experiences. They became technologically literate lifelong learners who will make informed decisions about the role of technology in their lives. Harvey (1995) stated,

> The transition to technology-rich schools has begun in earnest, often without federal aid or guidance. The government must remain neutral in the aspects of technology acquisition which pertain to private enterprise, but it could encourage schools around the country to plan for technology. Educators for their part, should foster a driving vision for technology in their school communities. (p. 1)

A study was conducted by Lua (1995) to determine both computer literacy levels and critical thinking skills in Taiwan, China and Stillwater, Oklahoma. The Taiwan study concluded (a) technology teachers of Taiwan have a higher computer literacy level than the sample which included subjects across the United States; (b) computer peripherals such as a keyboard, a disk drive, a joystick, a monitor, or a floppy disk are more easily identified by teachers in Taiwan than in the United States; (c) it was technology teachers of urban schools have more positive attitudes toward computers than technology teachers of rural schools; (d) it was concluded that a significantly positive relationship was found with computer literacy level and computer attitude and its sub-scales (computer anxiety, computer confidence, computer liking); and, (e) critical thinking skills improved when using educationally technological instructional delivery systems. In conducting a separate study on "critical thinking" to determine if the use of educational technology in vocational programs and applied academics curriculum instructional delivery system increased students' critical thinking, Underwood (1995)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

determined that a control group with no intervention remained unchanged in their problem solving skills. A critical thinking skills test was administered as a pretest and posttest with the intervention, specifically designed, educational technology for vocational and applied academics. Underwood concluded there were significant gains found for the educational technology treatment group on two or more critical skills sub-tests. There is general acceptance of the fact that computer instruction, if done correctly, can aid in the learning process.

> It is traditional to think of adult learners when distance education is mentioned. Indeed, the greatest percentage of distance students have been adults. That tradition is changing. With the implementation of well funded programs, such as the U.S. Federal Government's Star Schools Program, the vast possibilities of distance learning are being increasingly offered to K-12 student populations. (Schlosser & Anderson, 1993, p. 37)

Many states are installing fiber optic networks to reach all schools, some of these are assisted with federal monies and others are privately and state supported. This may be good news for secondary agricultural educators in Iowa. According to the National Research Council (1988) educators must create new ways to deliver agricultural education to a greater number of students. "The Iowa Communications Network may provide a suitable mechanism for delivering agricultural instruction to a large audience of youth and adults" (Miller & Doerfert, 1995, p. 424).

Miller & Doerfert (1995) attempted to answer the question, "Will distance education technology be accepted by secondary educators in general and agricultural educators specifically?" (p. 424). They found that faculty resistance can be a major barrier to distance education. Negative teacher attitudes, additional workloads, lack of funding, reduced student interaction, lack of time, fear of job loss, fear of technology, and

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

technical problems were all been identified as obstacles to the adoption of distance education technologies. "Teacher experience with technology seems to be the key in overcoming barriers" (Miller & Doerfert, p. 424).

"Overall, the 16 obstacles to using the Iowa Communication Network (ICN) in secondary agriculture programs were perceived to be slightly significant (Miller & Doerfert, 1995, p. 424). Teachers were most concerned with scheduling problems, but were also concerned that laboratory sessions and supervised agricultural experience programs could not be managed over the system. Additionally, the respondents were concerned with cost, lack of training, and incentives for using the system.

Miller and Doerfert (1995) found that different teachers perceived the same content-related categories to be both suitable and unsuitable for delivery via the ICN to schools with no agriculture teacher. A clear pattern was evident regarding the suitability of agricultural mechanics courses and agricultural economics courses. Teachers generally agreed that agricultural mechanics courses were not suited to ICN delivery but agricultural economics courses were suited to ICN delivery; however, it was believed that teachers, administrators and others with an interest in agriculture should work collaboratively to facilitate the delivery of instruction about agriculture to schools without agriculture teachers. The teachers who participated in this study placed considerable emphasis on agricultural economics, but agronomy and animal science courses were also listed as promising areas for course delivery.

The literature of the early 1990s indicated several areas of concern and futuristic thought. It was claimed that educators were in transition from the industrial to the information age and that the workplace was taking on a different atmosphere. As

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Green (1994) detailed, "The American workforce is in the process of transition. Research indicates that the United States will experience a shortage of skilled labor, and technology will have a significant impact on the workplace as we approach the new millennium" (p. 1). Whatever the work-base becomes it will have been sufficiently impacted by technology to call for the retraining of the workforce. Green also found that joint partnerships and work-based education programs promise to solve a myriad of social and economic problems for the technically-oriented and culturally diverse workforce of the future. Throughout the 1990s restructuring of schools has been a priority with education. This has more to do with technology now as the main catalyst. Pisapia (1994) stated, "Technology has the greatest potential to further the goals of restructuring U.S. schools" (p. 1). The restructuring movement as pointed out by Pisapia has generally focused on reorganizing school processes, taking a constructivist and cognitive view of learning, and moving toward a well integrated use of technology in schools. It was believed that technology, by itself, could not restructure schools, but that it has an essential role to play in boosting educational productivity. Pisapia indicated that a strategy for introducing technology in the schools could be based on principles of: (a) planning; (b) curriculum; (c) instruction; (d) access to computer; (e) teacher support; (f) effectiveness; connectivity; and (g) activities phased in. Two models that he indicated accomplish this by using educational technology are the Apple Classrooms of Tomorrow Program and the Integrated Technology Classroom of the Bellevue School District, Washington. Modular vocational educational technologies are becoming the trend in today's schools, and used with traditional shop programs will continue to meet the needs of the vocational informational age.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

A study was conducted by Atherton (1994) for the South Carolina Young Farmers' Education Association regarding the decision to adopt new technologies to support organizational activities and teach adult education. The technology in question for this investigation was the microcomputer. A cluster sample stratified by agricultural education districts was employed to select the sample. One hundred sixty-four young farmer members participated in the study. Twenty-five percent of the individuals indicated they had adopted the technology in their farm business, while another 16% indicated they planned to adopt within a year. Forty-two percent of the respondents indicated they had not made a decision, and 17% had rejected technology. As a result of this investigation, specific recommendations were made to enhance the infusion of technology into the adult instruction in agriculture.

"In the area of orientation, respondents reported that Extension communication and teaching methods was the most important orientation training topic for new field-based personnel" (White, 1994, p. 2). This was a study on determining the perceptions of directors, administrators, and staff development personnel as to the most important training topics for field-based personnel. White continued to note that respondents indicated that subject matter training and communications training were the most important pre-service training topics for future field-based personnel. Respondents indicated that coalition building and using computers were also important inservice training topics for field-based personnel. Directors and staff development personnel considered extension communications and teaching methods to be the most important activities, while administrators indicated that extension operational policies and procedures were the most important. The Young Farmers organization and the Extension

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Service have incorporated microcomputers into the educational portions of their function. Only 75% of the respondents in this study indicated that extension communications and teaching methods were included in their orientation training. Universities need to teach communication technologies including microcomputers to better train their graduates for today's information age.

"Agri Tech Prep 2000 (ATP 2000) is a four year tech prep program intended to link high school and postsecondary curricula preparing New York students for careers in agriculture or acceptance into a college program of agriculture" (Newsome & Stewart, 1994, p. 1). Not only has tech prep entered vocational programs but it also has been used in agricultural education. These programs consisted of efforts to bridge the gap from high school to post secondary educational institutes. This was accomplished by teaching skills at the high school that counted for community college and university units. Newsome and Stewart reported that after they had a summer workshop on tech prep and its implications in which one or more representatives from 10 schools participated, feedback was quite favorable. The use of technology as a pedagogy was discussed and many new ideas on its use in the classroom were discussed.

> Tech prep is a new initiative that shows great promise for educational reform however "tech prep" is not the new name of vocational education. Tech prep is a new program of articulated education involving two years of high school and two years of postsecondary preparation that includes a common core of mathematics, science, communications, and technologies designed to lead to an associate degree or certificate in a specific career field. (Hoerner, 1991, p. 1)

In the training of extension personnel it was important to ensure that they be competent in the use of technologies in order to disseminate information correctly and quickly. Scott (1993) reported on a study that described and analyzed the public

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

agricultural research and extension systems in Jamaica, focusing on the linkages between the two systems. An underlying assumption of the study was that one important reason agricultural technology systems sometimes fail to function effectively is dependence on linkages which all though, intended to integrate the system, actually are either weak or non-existent.

> The Jamaican public agricultural research system lacks direct access to external sources of technology and does not invest in sufficient human resources for research activities. The research-extension link in the Jamaican public agricultural technology systems is not sufficient to ensure and maintain and an adequate level of interaction between research and extension. (Scott, 1993, p. 2)

Further, this extension system lacked an adequate number of qualified personnel and only some recommended supervisory and evaluation procedures were followed. Although the Jamaican public extension system does not allocate adequate financial resources to extension programs, it uses a variety of dissemination techniques to transfer technology to farmers and devotes more time to educational activities than to non-educational activities. Scott (1993) concludes by stating, "Strengthening the research-extension link so that researchers can develop appropriate technology and the training of a sufficient number of subject matter specialists are the two most critical elements that the Jamaican public research-extension systems must address" (p. 2). Similar obstacles face education, vocational education, and agricultural education.

A study of the variables associated with the attitudes of teachers toward computers was conducted on Korean vocational high schools by Na in 1993. The purpose of this study was to determine the relationship between the attitude of agriculture teachers toward computers in education and selected independent variables: computer training, perceived level of computer knowledge, perceived level of computer skill,

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

computer anxiety, computer availability, 14 school characteristics, and 15 personal characteristics. Na (1993) found "most agriculture teachers in Korean vocational agriculture high schools have a positive attitude toward computers in education" (p. 1). Computer training, knowledge, skill, anxiety, and availability were significantly related to the attitude of agriculture teachers toward computers. Eight out of 14 school characteristics were significantly associated with computer attitudes of agriculture teachers toward computers. The proportion of the variance in computer attitude explained by the linear combination of the six variables in the equation was about 38%. Korean vocational agriculture high schools have many of the same concerns that we have, and Na suggested that more research needed to be done: (a) to study administrators attitudes towards using computers in agriculture; (b) to determine if attitudes towards computers in education is the best predictor of teachers' computer use in a school system; (c) to test a proposed model about attitude formation and changes toward and computers in education; (d) to establish cause and effect influences relating to computer attitude.

A study was conducted by Gementiza (1993) to examine the effectiveness of the International Rice Research Institute's (IRRI) Training and Technology Transfer Course (T3C) in developing a critical mass of trainers in Bhutan. It also aimed to determine the extent of T3C contribution to the attainment of the goals and objectives of the IRRI-Bhutan project.

> The results showed that the objectives of T3C were not fully met because of either non-utilization or under-utilization of acquired technology transfer knowledge and skills. However, despite the reported constraints, there were indications that the course has established an initial base in terms of building training capacity among the extension personnel in Bhutan. Although not conclusive, the farmers' case study showed that technology transfer contributions had reached the farmers level. The recommendations given to the program planners and administrators were: to

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

> review the technology transfer shuttle training program, build on its present achievements, and realign the observed deviations which are perceived as important to the overall achievement of program goals. (Gementiza, 1993, p. 2)

Like our programs today, technology transfer was one of the most important facets in successfully teaching students. A problem here was that most teachers use a "media" approach and do not use the technology in a real pedagogical way.

A comparison for participants in the National FFA Computer In Agriculture (CIA) Award Program to participants in the National FFA Agriscience Students Recognition (ASR) Program was conducted by Vernon (1992). He stated:

> The numbers of computers available in the participants high school agricultural program were generally low. The western FFA region participants had more computers in their high school agricultural program than did participants from other regions. The CIA participants were more positive in their beliefs about their computer training and the importance of computers to their future than were the ASR participants. Both groups agreed that the CIA and ASR programs were valuable and beneficial to their needs. (Vernon, 1992, p. 2)

Many of today's career events in FFA competition require that the students be proficient with microcomputer technology skills and be able to demonstrate their use.

The use of computers in agricultural education in the early 1990s were viewed as a media, drill and practice technological aide and not used in the actual pedagogy of teaching. Zidon (1991) conducted a study of high school agriculture programs to determine the need for computers to teach agriculture classes, determine how they were being used, and determine the teachers' perceived value of effectiveness of using computers. An additional objective of determining reasons for not using computers was addressed to those teachers where students did not use computers.

Zidon's (1991) study covered 600 schools that randomly selected from a population of 9,093 high school agriculture departments in the United States. The

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

response rate was 53.7%. The use of computers by agriculture teachers was still relatively new with the group mean being less than 5 years of computer experience. Most teachers rated themselves no higher than just able to get by in their ability to use specific software programs. Computers were being used more often as a tool for instruction rather than as an object of instruction. Teachers generally agreed with statements that indicated students needed to use computers in agriculture classes. Teachers, where students did not use computers, were less likely to agree that students needed to use computers. Computer programs most often used were word processing, educational games, and drill and practice programs. Teachers rated educational games as being the most educational and motivational. A slight correlation between years of owning a computer and teachers' agreement that educational games wasted time suggests that games should not be overused, even though they may be motivational. Computers were used most often in crop and livestock production. These topics, however, were the topics most often taught. Teachers were positive about the value of five selected types of software. They agreed that these programs were educational and motivational. They generally disagreed with the idea that these programs wasted time. "Teachers in schools where computers were not used agreed that the teacher is not equipped to teach with computers. They disagreed with the idea that computers were too technical for students and wasted too much teacher time" (Zidon, p. 2).

The change and use of educational technology varies widely. Although we know that technology needs to be used as a pedagogy in agricultural education, the literature review finds little supporting evidence that this has been accomplished on a large scale.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Most agricultural education programs use computers for administrative functions and FFA leadership applications; however they are not used except as a media resource in the classroom. Through the literature review, the researcher was unable to verify the use of educational technology in a pedagogical way in the agricultural education classroom, though the existence of many different types of hardware and software was evident.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

CHAPTER III: METHODS AND PROCEDURES

Introduction

This section describes the research approach and rationale, population and sampling procedures, variables, instrumentation and materials. Validity and reliability of measures, and the procedure for doing data collection and data analysis are also detailed.

This study was designed to: (a) inventory the technologies available in agricultural education programs that are used as instructional aids; (b) determine what type of microcomputers and disk drives are used; (c) determine what online informational services agricultural education programs subscribe to; (d) determine what technologies are being used for administration and planning, are they being used for individual instruction, and are they being used for group instruction; (e) determine to what extent educational materials and equipment are being used in the secondary agricultural programs; (f) determine what selected features of a computer accessed database are preferred; (g) determine what type of instructional materials are preferred by agricultural teachers; (h) determine what is a reasonable price range for materials; (i) investigate the barriers that have prevented the utilization of educational technologies, and (j and k) determine if technologies are being used simply as informational media and have been incorporated as an instructional pedagogy.

Data collected was analyzed using the following descriptive statistics, and a comparison with the Birkenholz, Stewart, and Craven (1989) study was conducted:

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

1. Summarizing
2. Comparing
3. Percent
4. Mean Scores

Participants

The population for this research included all secondary agricultural education programs in the United States. As in the Birkenholz, Stewart, and Craven (1989) study, a stratified by states, proportionally, and random selection was used to identify agriculture programs to provide information needed to meet the objectives of the study. From the 7,925 secondary agricultural education programs, 373 were randomly selected and one teacher from each program was asked to provide responses to a mailed survey instrument. The Agricultural Education Directory contained an alphabetical list of secondary education programs but teachers within the programs appeared to be listed randomly. Teachers selected as participants were the only individuals listed, or multiple staff members were identified. This selection process provided an opportunity for input from all fifty states. Confidentiality of respondents was assured through an assigned identification number so non-respondents could be contacted. The completed survey instruments were shredded as soon as the results were transferred to the master data file.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Instrumentation and Variables

This study was designed to fulfill the following objectives which become the independent variables:

1. Availability of technologies for instruction (inventory)
2. Administration support (funding)
3. Amount of use of technology equipment
4. Age of equipment
5. Future technology needs

The dependent variables were determined from the instrument as the randomly selected secondary agricultural education programs completed it. The results were arranged and expressed through percentages and mean scores and were graphically represented.

Validity and Reliability

A panel of experts including current agricultural education teachers, higher education specialists in agricultural education, and a state FFA advisor assessed instrument validity. Instrument reliability was further tested for internal consistency and by using the analysis of variance technique suggested by Kerlinger (1973, pp. 404-415) and by computing Cronbach's Alpha (Ary, Jacobs, & Razavieh, 1996, p. 285). A summary of the analysis is presented in Table 3.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 3

Instrument Reliability

	Internal Consistency	
	Kerlinger (r)	Alpha (α)
Instrument	0.74	0.76

From the reliability coefficients presented above it was concluded that the instrument ratings were internally consistent.

Procedures

A cover letter (Appendix A) and survey instrument (Appendix B) were sent to each randomly selected secondary agricultural education program. The cover letter included a solicitation for voluntary cooperation from the program and an explanation of the purpose of the research project. Participants were asked to complete the questionnaire and return it in the self-addressed, stamped envelope provided. Respondents were also assured that their responses would be confidential and their questionnaire would be shredded after their responses were transferred to the master data spreadsheet. Three weeks after the instruments were mailed out, a reminder postcard was sent as an

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

encouragement to complete the survey and return it. A final follow-up phone call was made to 10% of the non-respondents and they were encouraged to mail in the instrument or asked to answer a few "yes" or "no" questions in order to allow for a comparison of respondent and non-respondent groups.

All of the 204 non-respondents were sent a postcard reminding them to complete the survey instrument and return it. Only 12 were received as a result of this effort. Ten percent were followed up by telephone. Those contacted were encouraged to send in the survey or answer a few selected questions that could be compared to the survey respondents. These questions asked required a "yes or no" answer. A few questions were asked concerning inventory of microcomputers, accessories and their uses. Table 4 presents a summary of the telephone results by means. An analysis of variance was completed to represent a check for significant difference between respondents and non-respondents (p – value = 0.859 > 0.05). With the follow up telephone contact a 90% response to most of the questions was achieved.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 4

Comparison of Respondents' Instruments Data to Non-respondents Telephone Survey. Only information that required a yes/no answer or provided an inventory count were calculated.

Item	Respondents N=183 $\bar{X}$	Non-respondents N=21 $\bar{X}$	Respondents Percent	Non-respondents Percent
		Hardware		
PC and MAC Computers	4.68	4.47	98	100
3.5 Drive	1.26	1.43	92	100
CD-ROM	1.20	1.66	95	70
Printers	2.18	1.62	93	95
		Computer usage		
Administration	4.38	4.16	82	71

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 4 (continued)

Item	Respondents N=183 $\bar{X}$	Non-respondents N=21 $\bar{X}$	Respondents Percent	Non-respondents Percent
			Computer usage	
Group	3.62	3.44	72	86
Individual	3.96	3.56	74	76
Internet Service	--	--	51	75
			Computer used for	
Information only	--	--	38	24
Problem Solving and Cognitively Thinking	--	--	90	81

CHAPTER IV: RESULTS

Introduction

The results of the study on the use of technology in agricultural education programs in the United States are presented in this chapter. The research questions are addressed separately. Supportive data and statistical information are provided in tables with additional comments by the researcher. Usable data was received from 183 respondents (49% response rate). Additional data was obtained from 21 non-respondents in order to determine the overall generality of the findings to the total population.

A slight difference was found between the use of traditional equipment, such as filmstrip or overhead projectors, or the inventories of equipment that the schools owned. In comparing the results of this study to the 1989 study by Birkenholz, Stewart, and Craven, significant changes have occurred in the inventory and use of most types of technology in the classroom. It was apparent though that with technology, some schools have advanced remarkably with the usage; however there are still some schools that have not made any attempt to stay current. Regardless, all school data was utilized in this study.

The purpose of this study was to investigate great changes ($p<.05$) with the use of the microcomputer, related equipment and other technological advances available to the classroom and reflecting the workplace environment. A statistical contrast was made

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

between the 1989 study by Birkenholz, Stewart and Craven and the 1999 study. Those results and the findings of this study are presented in the description of findings.

Description of Findings

Research Question 1

The first research question (Type of technology equipment in inventory) was analyzed by calculating the percent of programs having equipment in inventory and the mean number of each item. Table 5 presents the inventory of instructional technological equipment in high school agricultural departments. As noted in Table 5, the percent of programs having microcomputers in agriculture classrooms, as reported in 1989 by Birkenholz, Stewart, and Craven, was 72.8%, with a mean of 2.78 microcomputers per program. In 1999 the percent of programs with microcomputers in the agricultural program increased to 97.8% with a mean of 4.68 microcomputers per program. Most notable are the increases, over time, in the use of microcomputers, modems, printers, VCR's, televisions, VCR cameras and satellite receiver dishes. Minute changes have occurred in the use of the audiocassette player and the overhead projector. A 5% decline occurred in the use of the opaque projector.

Research Question 2

The second research question (What type of microcomputers and disk drives are used) are presented in Table 6. In 1989, Birkenholz, Stewart, and Craven found that Apple made 53.5 percent of all computers used in agriculture education classrooms. There has been a tremendous change over the past 10 years as 73% of microcomputers are now personal computers (DOS-Windows). Macintosh (MAC-OS) presently constitutes only 26% of the computers in the agriculture programs. In 1989, Birkenholz,

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Stewart, and Craven reported 56% of the agriculture departments had 5.25 inch disk drives while 26% had 3.5 inch drives. Technology has evolved immensely and in 1999, 43% of the agricultural departments reported using 3.5 inch drives predominantly. The 5.25 inch drives are still being used however, with 11% reporting their continued use. CD-ROM's in 1999 are used by 40% of the agriculture departments with an additional 6% reporting they use a ZIP drive. Only .1% used the latest JAZ drive. To compare the equipment inventory the mean scores of 18 items from 1989 and 1999 were used (p – value = 0.843 > 0.05).

Table 5

Inventory of Instructional Equipment reported by Agricultural Programs - in percentages based on the total number of items of equipment in each category

(1989 N = 254) (1999 N = 181)

Equipment	1989[a]			1999		
	n	Percent	$\bar{X}$	n	Percent	$\bar{X}$
Microcomputer	185	72.8	2.47[b]	179	97.8	4.7[b]
Microcomputer modem	66	26.0	1.6	147	81.1	1.7
Microcomputer printer	168	66.1	1.7	169	93.4	2.2
Audiocassette player	141	55.5	1.6	107	59.1	1.2
Amplified telephone	21	8.3	1.1	56	30.0	1.2

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 5 (continued)

Equipment	1989[a]			1999		
	n	Percent	$\bar{X}$	n	Percent	$\bar{X}$
VCR camera	50	19.7	1.5	75	41.1	1.1
Interactive video	10	3.9	1.1	31	17.1	1.3
Overhead projection	204	80.3	1.4	161	89.0	1.3
16mm film projector	120	47.2	1.2	53	29.0	1.0
Opaque projector	45	17.7	1.3	23	12.7	1.1
Computer projection unit	16	6.3	1.1	25	13.8	1.0
LCD panel	--	--	--	12	6.6	1.0
VCR player/recorder	90	35.4	1.4	154	85.1	1.2
Satellite receiver dish (DTN, etc.)	7	2.8	1.1	63	34.8	1.0
Carousel slide projector	170	66.9	1.2	153	84.5	1.2
Digital still camera	--	--	--	46	25	1.0
Filmstrip projector	154	60.6	1.5	102	53	1.1
Television	26	10.2	1.2	163	90.1	1.3

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.
[b]Means are for programs reporting equipment inventory.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 6

Inventory of Microcomputers and Disk Drives reported by Agricultural Programs

(1989 N = 254) (1999 N = 183)

	1989[a]			1999		
	n	Percent	$\bar{X}$	n	Percent	$\bar{X}$
Microcomputers						
Personal Computer (DOS-Windows)	72	28.3	2.50[b]	161	73.00	3.55[b]
Macintosh (MAC-OS)	163	64.4	2.55	84	23.00	2.57
No Response	--	--	--	--	7.30	--
Disk Drives						
3.5 inch (1.44MB)	66	26.0	1.5	166	91.71	1.26
5.25 inch (720K)	143	56.3	3.1	61	33.70	1.0
CD-ROM (650MB)[c]	--	--	--	171	94.47	1.2
ZIP (100MB)[c]	--	--	--	34	18.78	1.0
JAZ (1GB)[c]	--	--	--	1	.55	1.0

Note. Some respondents answered more than one question.
[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.
[b]Means are for programs reporting equipment inventory.
[c]Data not available in 1989.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Research Question 3

The third research question (What online informational services agricultural education programs subscribe to) results are presented in Table 7. Online informational services were researched to determine if they were still available. The list of informational service providers listed in Table 7 are currently still operating. The single most remarkable change was in the increased use of Internet service providers. In 1989 Birkenholz, Stewart, and Craven reported only 4% of the agriculture departments used this means of gaining information. In 1999, 35% are connected to the Internet through service providers such as CompuServe, America On Line (AOL), etc. Many high schools have their own connections to online information services and the agricultural programs are using these for their classroom.

Two informational services, which were not reported in 1989 but are used by agricultural programs are the DTN (Data Transfer Network) with 11% and Ag Ed Network (Agriculture Education Network) with 15%. The use of AgriData showed a 6% drop in usage. ACRES (Farm Bureau Member Service), AGNET (Agribusiness Network), USDA Online (United States Department of Agriculture), Grassroots, RFD-TV, Instant Update, and TELPLAN all demonstrated some increase in subscribers. ACRES went from 2 to 6%. AGNET increased from 2 to 6%, USDA Online expanded to 5%, Grassroots grew from 0% in 1989 to .2% in 1999, RFD-TV was 0% in 1989 and 3% in 1999. Data-Line declined by 4% in 1989 to .5% in 1999. AgriStar decreased from 1% in 1989 to .3% in 1999.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 7

Number of Agricultural Programs that Subscribe Selected Information Services

	Percent	
Databases	1989[a]	1999
AgriData	17	11
AGNET (Agribusiness Network)	2	6
AgLine (Agriculture Line)	2	2
ACRES (Farm Bureau Member Service)	1	7
Grassroots	--	.2
Data-Line	4	.5
RFD-TV	--	3
The Source	1	1
USDA Online	--	5
Instant Update	--	1
CMN	--	.5
AgriStar	1	.3
TELPLAN	--	.5
DTN (Data Transfer Network)	--	11
Ag Ed Network	--	15
Internet Service Provider (CompuServe, American OnLine, etc.)	4	35

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Research Question 4

In the fourth research question (Technologies used for administration and planning, for individual instruction or for group instruction, current and anticipated or future use of technology) the researcher examined the technology equipment used for: (a) administration and planning, (b) group instruction, and (c) individual instruction. The respondent was asked to rate current and anticipated usage (Table 8). In the area of administration and planning for microcomputers and accessory equipment, there was a measurable increase in their current use in the classroom. The future or anticipated use was also evident; however, use of the VCR player/recorder and VCR camera was slightly lower than the 1989 study of Birkenholz, Stewart, and Craven. In the area of group instruction, current usage increased for microcomputers, accessory equipment and satellite receiver dishes. All other areas increased negligibly except for a decrease in the usage of the carousel slide projector, audiocassette player and the filmstrip projector.

Overall the anticipated and future use of microcomputers and their accessories increased significantly from 1989 through 1999 while virtually no change occurred in the use of the VCR player/recorder. Four areas did decrease slightly, and they included the VCR camera, carousel slide projector, audiocassette player and filmstrip projector. Table 8 revealed an increase in use for individual instruction with microcomputers and accessories. The use of the VCR camera has increased slightly. The carousel slide

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 8

Comparisons of Current and Anticipated use of Instructional Technology in Agricultural Programs

Item	1989[a] Currently Using $\bar{X}$	1989[a] Anticipate Using $\bar{X}$	1999 Currently Using $\bar{X}$	1999 Anticipate Using $\bar{X}$
For Administration and Planning				
Microcomputer	3.26[a]	3.83[a]	4.38[a]	4.12[b]
Microcomputer modem	1.64	2.54	3.10	3.42
Microcomputer printer	3.31	3.82	4.23	4.07
Conference telephone	1.55	2.33	1.86	2.42
VCR player/recorder	3.27	3.68	3.90	3.67
VCR camera	2.26	3.09	2.52	2.95
Satellite receiver dish (downlink)(DTN)	1.16	1.76	2.08	2.59
Interactive video	1.17	1.60	1.53	2.34
Digital still camera	--	--	1.82	2.72
Audiocassette player	1.17	1.60	1.98	1.97

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 8 (continued)

Item	1989[a] Currently Using $\bar{X}$	1989[a] Anticipate Using $\bar{X}$	1999 Currently Using $\bar{X}$	1999 Anticipate Using $\bar{X}$
	For Group Instruction			
Microcomputer	2.72	3.44	3.62	3.74
Microcomputer modem	1.58	2.36	2.84	3.27
Microcomputer printer	2.84	3.40	3.59	3.68
Computer projection unit	1.55	2.33	1.93	3.07
LCD	--	--	1.38	2.24
VCR player/recorder	3.16	3.67	3.97	3.66
Amplified telephone	1.14	1.45	1.44	1.82
VCR camera	2.32	3.11	2.46	2.96
Satellite receiver dish (downlink/DTN)	1.18	1.75	2.03	2.59
Digital still camera	--	--	1.74	2.48
Carousel slide projector	3.28	3.36	2.95	2.72
Interactive video	1.18	1.57	1.51	2.16
Overhead projector	3.37	3.43	3.38	3.46
Audiocassette player	2.85	2.88	2.02	1.98

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 8 (continued)

Item	1989[a] Currently Using $\bar{X}$	1989[a] Anticipate Using $\bar{X}$	1999 Currently Using $\bar{X}$	1999 Anticipate Using $\bar{X}$
	For Group Instruction (continued)			
Filmstrip projector	2.93	2.94	1.89	1.68
16mm film projector	2.80	2.83	1.39	1.24
Opaque projector	1.65	1.68	1.36	1.32
	For Individual Instruction			
Microcomputer	2.91	3.62	3.96	4.14
Microcomputer modem	1.65	2.40	2.96	3.44
Microcomputer printer	2.82	3.41	3.95	4.08
Computer projection unit	--	--	1.79	2.57
LCD	--	--	1.35	2.12
VCR Player/ Recorder	2.68	3.21	3.45	3.41
VCR Camera	2.14	2.78	2.25	2.76
Satellite receiver (Downlink/DTN)	1.22	1.64	1.94	2.52

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 8 (continued)

Item	1989[a] Currently Using $\bar{X}$	1989[a] Anticipate Using $\bar{X}$	1999 Currently Using $\bar{X}$	1999 Anticipate Using $\bar{X}$
	For Individual Instruction (continued)			
Satellite receiver (Downlink/DTN)	1.22	1.64	1.94	2.52
Interactive video	1.19	1.54	1.62	2.33
Digital still camera	--	--	1.82	2.72
Carousel slide projector	2.71	2.87	2.64	2.55
Overhead projector	2.39	2.46	2.76	2.59
Audiocassette player	2.52	2.62	1.95	1.93
Filmstrip projector	2.54	2.56	1.84	1.75

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study"by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.
[b]Responses were coded: 1 = never, 2 = little, 3 = some, 4 = much, and 5 = regularly.

projector, audiocassette player and filmstrip projector have declined in use. The increase in use of technology with students on an individual basis when comparing 1989 to 1999 data suggests there will be a continued expansion in this area.

Research Question 5

The fifth research question (To what extent educational materials and equipment are used in the secondary agricultural programs) was addressed by calculating the

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

mean scores of the use of each individual piece of equipment. The 1989 study by Birkenholz, Stewart, and Craven indicated that word processing packages appeared to be the most commonly used type of program, with telecommunications packages being used the least. The 1999 study indicates that word processing remains the most commonly used type of educational program. Slightly increased is the use of spreadsheet package(s) and database management package(s). Filmstrips, audiocassette tapes, and 16mm films are now used the least. The 1989 study by Birkenholz, Stewart, and Craven reported the mean usage of telecommunications package(s) to be 1.47 per program. The 1999 study mean has increased to 2.35 per program. The use of grade book software has increased from a mean of 2.34 per program in 1989 to a mean of 3.12 per program in 1999. Tutorial programs, drill and practice programs, simulation programs, decision aid programs and test item bank programs all show a decline in mean scores (Table 9).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 9

Extent to which Educational Materials are Used by Teachers in Secondary Agricultural Programs

Material	$\bar{X}$	
	1989[a]	1999
Spreadsheet package(s)	2.34[b]	2.78[b]
Word processing package(s)	3.04	4.17
Database management package(s)	2.24	2.45
Telecommunications package(s)	1.47	2.35
Tutorial programs	2.27	2.14
Drill and practice programs	2.32	2.15
Simulation programs	2.23	2.18
Decision aid programs	2.18	1.90
Grade book programs	2.34	3.12
Test item bank programs	2.24	2.14
Videotapes	3.33	3.99
Information database services	1.67	1.76
Filmstrips	2.91	1.88
Audiocassette tapes	2.69	1.76
Transparencies	3.12	3.06

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 9 (continued)

Material	$\bar{X}$	
	1989[a]	1999
Slides	3.16	2.53
16mm films	2.84	1.26

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.
[b]Responses were coded: 1 = never, 2 = little, 3 = some, 4 = much, and 5 = regularly.

Research Question 6

Research question 6 (What selected features of a computer accessed database are preferred) was addressed by determining the percent of preference for each feature offered. Table 10 shows the comparison change by percentages between 1989 and 1999. All areas showed an increase except for paying an hourly connection rate. The 1989 study by Birkenholz, Stewart, and Craven reported the percentage of preference for lesson plans was 80%. In 1999 this had increased to 88%. Annual and monthly fees have risen slightly. The greatest increase by preference of features offered occurred with the use of information about agricultural markets, news reports and instant access. In 1989 agricultural markets were recorded to have a preference of 66%. In 1999 this had grown to 81%. News reports increased from 60 to 81% and instant access to information from 73% in 1989 to 89% in 1999.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 10

Agricultural Programs Preferring Selected Features of a Computer Accessed Database Information System

(1989 N = 254) (1999 = 183)

Feature	Percent Responding Yes	
	1989[a]	1999
Lesson plans	80	88
Annual fee	46	58
Monthly fee	15	17
Hourly connection fee	22	12
Agricultural markets	66	81
News reports	60	81
Instant access to information	73	89

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.

Research Question 7

Responses to research question 7 (What type of instructional materials are preferred by the agricultural teachers) were stated as percentages. Table 11 indicates there was limited progress in preference of instructional materials. There was a decrease in the use of audiocassette tapes, 16mm films and filmstrips. The 1989 study by

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 11

Agricultural Programs Preferring Selected Types of Instructional Materials

(1989 N = 254) (1999 N = 183)

Material	Percent Responding Yes	
	1989[a]	1999
Instructor's guide with lesson plans	93	94
Evaluation materials (test and quizzes)	89	91
Videotapes	83	82
Student references	84	81
Assignment sheets	83	83
Audiocassette tapes	56	36
Transparency masters	89	77
Directions for lab activities	88	91
Computer software	82	84
Slide sets	69	62
Competency lists	76	73
16mm films	43	13
Filmstrips	51	20

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Birkenholz, Stewart, and Craven reported the use of audiocassette tapes was preferred by 56% of the agricultural teachers. In 1999 this had dropped to 36%. The 1989 report indicated that 43% used 16mm films. In 1999 this had declined to 13%. Also, the use of filmstrips had fallen from 51% to 20% in 1999.

Research Question 8

Research question 8 (What is a reasonable price range for materials) responses are displayed in Table 12. As was reported in the 1989 study by Birkenholz, Stewart, and Craven, the current findings of this study showed most agricultural teachers were willing to pay $0-50 for materials. In the $51-100 range a decline occurred in the number of teachers willing to pay this price in 1999; however almost all who responded were willing to pay more than reported in 1989. The teachers were willing to pay more than in 1989 for spreadsheet and telecommunication package, presentation graphics, tutorial, drill and practice, and simulation programs. Also in the $51-100 range, 1999 teachers were willing to pay more for grade book programs, test item bank programs, videotapes and filmstrips. In the area of microcomputers and accessories, the 1999 study respondents were willing to pay almost double or more for word processing and telecommunication package, presentation graphics, tutorial programs, drill and practice programs, simulation programs, grade book programs and test item bank programs. Some decline in willingness to pay for materials for the 1999 teachers in the $51-100 category occurred with slides (2"x2") (set of 80), 16mm films and transparencies; this also reoccurred for these items in the $100+ category. Overall, respondents in 1999 were willing to pay more for materials.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 12

Agricultural Programs Responses to a Reasonable Price Range for Materials

Material	Percent					
	$0-50[b]		$51-100[b]		$100+[b]	
	1989[a]	1999	1989[a]	1999	1989[a]	1999
Spreadsheet package(s)	42	48	21	32	7	8
Word processing package(s)	37	45	27	36	9	16
Database management package(s)	36	42	27	30	7	8
Telecommunications package(s)	31	43	20	32	6	10
Presentation graphics	36	42	22	31	3	5
Tutorial programs	52	49	16	28	0	5
Drill & practice programs	59	46	11	29	0	4
Simulation programs	47	46	18	30	1	4
Decision aid programs	43	46	20	29	2	2
Grade book programs	53	46	12	19	1	2
Test item bank programs	50	48	16	18	1	2
Videotapes	61	63	19	20	1	1
Information database services	45	53	10	13	2	1
Filmstrips	70	55	7	25	0	0
Audiocassette tapes	69	71	5	9	1	0

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 12 (continued)

Material	Percent					
	$0-50[b]		$51-100[b]		$100+[b]	
	1989[a]	1999	1989[a]	1999	1989[a]	1999
Transparencies	71	72	4	10	0	0
Slides (2"x2") (set of 80)	61	77	16	8	1	0
16mm Films	49	68	18	5	3	3

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.
[b]1989 inflation value of a dollar in 1998 would be $1.35 as calculated by Inflation Calculator of Mississippi State University.

Research Question 9

Research question 9 (What barriers have prevented the utilization of educational technologies) results are presented in Table 13. As similarly reported in the 1989 study by Birkenholz, Stewart, and Craven, the utilization of educational technologies in the classroom's greatest barrier were the lack of funds. This remains an impediment for today's teachers. Lack of technology expertise of teachers has declined slightly but still remains an important factor. Respondents indicated that the technology they currently have is even more outdated than it was in the 1989 study. Lack of materials was still a barrier but is not as predominant as it was in 1989. One bright finding of this study was that the lack of interest as a barrier has declined. Agricultural teachers as a group are

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 13

Percent of Agricultural Programs Responses to Barriers in Utilizing Educational Technology

Equipment	Lack of $		Lack of expertise		Technology outdated		Lack of materials		No interest		Unaware of technology		Materials outdated		Other	
	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99
Microcomputer	51	51	29	27	2	7	30	20	4	2	5	5	3	4	6	5
Microcomputer modem	59	49	27	26	1	4	5	4	10	5	6	2	2	2	6	5
Microcomputer printer	42	48	15	14	2	5	10	7	4	0	2	2	4	0	4	2
Overhead computer projection screen	63	61	12	14	0	2	4	2	11	4	8	2	1	3	3	1
LCD panel	--	65	--	17	--	4	--	1	--	11	--	8	--	1	--	1
Amplified telephone	46	41	15	14	0	3	2	1	26	26	17	8	0	0	4	4
VCR player/recorder	37	26	1	5	0	3	8	5	0	1	0	0	2	5	4	5

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 13 (continued)

Equipment	Lack of $		Lack of expertise		Technology outdated		Lack of materials		No interest		Unaware of technology		Materials outdated		Other	
	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99
Satellite receiver	67	58	11	14	1	3	3	2	14	8	8	5	1	0	3	2
Interactive video	51	56	17	23	0	1	2	2	16	7	20	9	1	1	2	2
Carousel slide projector	18	16	0	1	5	24	7	4	2	2	0	0	12	8	4	2
Digital still camera	--	63	--	17	--	1	--	2	--	4	--	4	--	0	--	2
Audiocassette player	15	14	1	2	7	33	7	3	6	12	1	0	11	8	4	2
Filmstrip projector	17	14	1	2	11	39	5	3	4	15	0	0	14	12	4	2

(table continues)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Table 13 (continued)

Equipment	Lack of $		Lack of expertise		Technology outdated		Lack of materials		No interest		Unaware of technology		Materials outdated		Other	
	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99	89[a]	99
Opaque projector	15	17	2	2	17	33	2	2	19	17	2	1	8	8	3	2
16mm film projector	17	14	0	3	13	42	8	2	2	18	1	0	13	11	1	1

[a]All references to the year 1989 are from the study of "Use of Educational Technology in Agricultural Education: A National Study" by R.J. Birkenholz, B.R. Stewart and J. Craven. The study was prepared for the National FFA Board of Directors. Permission was given by Robert J. Birkenholz for the adaptation of this study.

more interested in technology. Materials being outdated has not changed greatly and teachers still feel this area needs to be addressed.

Research Questions 10 & 11

The results for research questions 10 and 11 (Technologies used simply as informational media or incorporated as an instructional pedagogy) results are presented in Table 14. In using technology as an informational media only, 38% responded "yes" while 62% responded "no." When using technology for problem solving, cognitive thinking skills and incorporating it into their teaching style (pedagogy), 90% responded "yes," with 10% "no." Two respondents declined to answer these two questions.

Table 14

Use of Technology in the Classroom as Information Media or as a Pedagogical Technique (n=181)[a]

Item	Yes		No	
	n	%	n	%
Technology as information media only	69	38	112	62
Technology used for problem solving, cognitive thinking skills and incorporated into their teaching style	162	90	19	10

[a]Two respondents did not answer this question.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

CHAPTER V: SUMMARY, FINDINGS, COMPARISONS, CONCLUSIONS AND RECOMMENDATIONS

Summary

In this era of technological advances, the processes educators use to complete their work are evolving rapidly. Agricultural education programs must strive to remain current in training their students to enter the changing workplace. Many secondary agriculture programs are endeavoring to accomplish this, as evidenced through the results of this study, by increasing the use of technology in the classroom. However, not all schools are addressing the advancements in technology or its use in the workplace. Some programs have neglected entirely the opportunity to advance into the new technological era. Schools not addressing the integration of technology into their curriculum might even jeopardize their accreditation status in the future. This could occur, no doubt, both at the secondary and post secondary levels.

Some students in agricultural education are being given the opportunity to learn computer technology in other areas of the schools, such as computer laboratories. Several respondents wrote comments that a school computer lab was available for class work. Four respondents reported that they did not have any computers in their agricultural departments, but these respondents did have the older, traditional equipment, and they answered applicable questions in the survey instrument. The 1989 study by Birkenholz, Stewart, and Craven provided the basis for this present study, which explained and compared the movement of technology use over the last ten years. The

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

intent of this comparison study was to determine if secondary agricultural education programs have stayed current with the newer technologies and were using them in a pedagogically appropriate fashion. A further intent was to explore the use of these technologies in preparing students to enter the workplace. The use of the Geographical Information System (GIS) and the Global Positioning System (GPS) are just two of the emerging technologies that are being introduced in agriculture classrooms. Schools should consider preparing students for these and other futuristic technologies. In the balance of this chapter results, comparisons, conclusions and recommendations will be presented.

Results and Comparisons

Eleven research questions provided the foundation for this comparison study.

1. Types of instructional equipment inventoried in the agricultural education programs?

The instrument asked 18 questions to determine the inventories of instructional equipment. Table 15 presents those items inventoried in 1999 that were reported at a 50% or higher level by the agricultural programs. Comparisons of inventories with the 1989 study by Birkenholz, Stewart and Craven are also found in this table. The overall findings indicate a measurable increase, especially in the use of microcomputers and accessories. A decrease occurred only in the inventory of filmstrip projectors.

Three other areas, in addition to those listed in Table 15, that have increased in inventories and are important to this study are: (a) computer projection units, with an increase from 6.3% in 1989 to 13.8% in 1999; (b) the introduction of the LCD Panel, 6.6% in 1999; and (c) the addition of the Digital Still Camera 25% in 1999. These

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

changes in the use of technology equipment by the agricultural teachers portends an even greater expansion over the next 10 years.

Table 15

Percent of Agricultural Education Programs that have Selected Technology Equipment Inventory (n=183)

	1989	1999
	% Equipment in inventory	% Equipment in inventory
Microcomputer	73	98
Microcomputer modem	26	81
Carousel slide projector	67	85
Printer	66	93
Filmstrip projector	61	53
Audiocassette player	56	59
Overhead projector	80	89
VCR/player recorder	35	85
Television	10	90

2. What types of microcomputers and disk drives are used?

The greatest change occurred in the types of computers used with the personal computers (PC) increasing in inventory from 28% in 1989 to 73% in 1999. A lower price range for the PCs partially accounted for this shift and PCs became more user friendly with the introduction of Windows. Apple computers (including Macintoshs) as

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

referred to in 1989 by Birkenholz, Stewart, and Craven, decreased in inventory from 64% in 1989 to 23% in 1999. Still in 1999, some schools continued to use only Macintoshs, while several used both. The inventory of the types of disk drives used is presented in Table 16.

Table 16

Comparison of Types of Disk Drives Used as Reported by Agriculture Education Programs

Disk Drives	1989			1999		
	n	Percent	$\bar{X}$	n	Percent	$\bar{X}$
3.5 inch (1.44MB)	66	26	1.5	166	92	1.26
5.25 inch (720K)	143	56	3.1	61	34	1.00
CD-ROM	--	--	--	171	94	1.20
ZIP	--	--	--	34	19	1.00
JAZ	--	--	--	1	.60	1.00

The use of the CD-ROM has had the greatest increase in usage, while the 5.25 inch floppy drive use has decreased the most. The ZIP drive with its 100 MBs of memory, showed a 19% increase in use, and will probably extend this growth in the next few years. Agricultural teachers are becoming increasingly cognizant of changes and are using the newer technologies in greater numbers.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

3. What are the online information services that agricultural education programs subscribe to?

The information service, AgriData, was reported in 1989 by Birkenholz, Stewart, and Craven to be used by 17% of the agriculture departments. In the 1999 study this percentage had dropped to 11%. Moderate increases were revealed in subscriptions to DTN at 11% and AG Ed Network at 15%. Over this same time most notable was the increase in the subscriptions to various Internet Service Providers (e.g. CompuServe and AOL). In 1989, 4% of the agricultural programs used this type of service; in 1999 35% had shifted to using this service. Many schools presently use an Internet service that is available for all classrooms, including agricultural education, at no charge to the local program.

4. Technologies used for administration, planning, individual instruction, group instruction; and the anticipated or future uses?

In the 1999 study, the use of the microcomputer, modem and printer, for administration and planning increased for current and anticipated use. The use of the conference telephone, VCR player/recorder and VCR camera showed minor increases. Mean scores of interactive video and the use of satellite receiver dishes have also increased. An increase in the digital still camera is projected when comparing the 1999 current usage mean of 1.82 to the anticipated usage mean of 2.72.

In comparing the results of the 1989 study by Birkenholz, Stewart, and Craven to the 1999 study for the current use of equipment for group instruction, the mean scores increased in all areas except for using the carousel slide projector, audiocassette player, filmstrip, 16mm and opaque projectors. These older types of equipment are outdated and

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

in many cases have been replaced. The use of the carousel slide projector has declined but it still remains a teaching tool. When comparing mean scores of current and anticipated usage, all scores have increased except in the area of the VCR player/recorder which had a slight decline of .01%.

5. To what extent educational materials and equipment are used in the secondary agricultural education programs?

Comparison of the two studies for question 5 was examined through the use of mean scores. The 1989 study by Birkenholz, Stewart, and Craven indicated that instructors, most frequently used the word processing computer software program (mean = 3.04), while telecommunications programs were used the least (mean = 1.47, Table 9). The 1999 study found that the word processing programs were still the most used (mean = 4.17) and that telecommunications programs had increased considerably (mean = 2.35, Table 9). Moderate increases in the use of spreadsheet package, grade book programs and videotapes were also found. A slight increase in the mean scores of the use for database management package and information database services occurred. The sharpest declines in usage of educational materials were for the use of slides and filmstrips (Table 9).

6. What features of a computer accessed database information system are preferred?

The 1989 study by Birkenholz, Stewart, and Craven reported that the majority of teachers reported that a computerized database should provide lesson plans (80%), instant access to information (73%), agricultural markets (66%) and news reports (60%).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

The 1999 study revealed remarkable increases in the use of agricultural market reports (81%), news reports (81%) and instant access to information (89%).

7. What types of instructional materials do agricultural teachers prefer?

The 1989 study by Birkenholz, Stewart and Craven reported that instructors strongly supported the development of a variety of support materials in future curriculum projects. The 1999 study found little change in what agricultural teachers need in terms of instructional materials (Table 11). There was a decline in three areas in 1999: audio-cassette tapes (dropped 20%), 16mm films (dropped 30%) and filmstrips (dropped 31%) (Table 11).

8. What is a reasonable price range for materials?

The 1989 study by Birkenholz, Stewart and Craven found that the majority of agricultural teachers were willing to pay $0-50 as a reasonable price for most technology materials (Table 12). This finding was also evident in the 1999 study; however there was an increase in what teachers were willing to pay for microcomputer software (Table 12).

9. What barriers have prevented the utilization of educational technologies?

In 1989 Birkenholz, Stewart, and Craven reported that the greatest barrier to the potential use of educational technology was a lack of funds. The 1989 study also showed a lack of expertise and available software materials were perceived as barriers to the use of microcomputers (Table 13). The 1999 study found the number one barrier to utilizing technology remained the lack of funds. Most categories of barriers changed slightly but not significantly. Those areas demonstrating the greatest change were the barriers of outdated technology, lack of materials, no interest, and outdated software. Carousel slide

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

projector, audiocassette player, filmstrip projector, opaque projector and 16mm projector received the highest answer by respondents as being outdated (Table 13).

10 & 11. What the technology is being used as an informational media only, or if it has been incorporated into the agricultural teacher's pedagogy?

Birkenholz, Stewart, and Craven did not ask questions 10 and 11 in the 1989 study. The 1999 study discovered that of 112 respondents, 62% stated they used technology for informational media only while 69 (or 38%) stated they did not use it just for informational media (Table 14). When incorporating the use of technology into their teaching style and using it in a cognitive way, 162 (or 90%) answered "yes" to the question and 19 (or 10%) answered "no" (Table 14). Two respondents did not provide answers to either of these questions.

Conclusions

The 1989 study reported that the total population of agricultural teachers nationwide were more likely to use microcomputer and related materials than those who actually participated in that study. The findings of this study revealed that there has been a tremendous change in the acquisition of technology for instruction in the secondary agricultural education programs. The incorporation into the teaching pedagogy of the instructors has also taken place. Unfortunately this has not occurred evenly in all programs in the United States. Some agriculture programs have made little progress in keeping stride with the changes that have occurred in teaching with technology and have inadequate inventories. Based on the changes that have occurred in the use of technology in the agricultural education programs over the past ten years, a continued increase in the use of technology should be expected.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

1. Both the 1989 study by Birkenholz, Stewart, and Craven and the 1999 researcher concluded that some secondary agricultural education departments may not maintain a state of the art inventory of instructional equipment.

2. The 1989 study of Birkenholz, Stewart, and Craven concluded that Apple compatible machines were the types most available for use in programs of agriculture followed by IBM compatible machines. Also the differences in operating systems within these groups of machines presented a challenge in preparing programs for the use by teachers. The 1999 study found a complete reversal of this with the IBM or Personal Computer being used by programs in the 1989 study. These computers have become more user friendly and present less of a challenge when using them.

3. The 1989 study by Birkenholz, Stewart, and Craven reported the extent of departmental control of instructional equipment did not appear to be a major factor governing its use for group instruction. The current data reported that this is true in 1999 and has been extended to include use for individual instruction, administration and planning.

4. The 1989 study by Birkenholz, Stewart, and Craven reported that agriculture teachers were more likely to use microcomputer related materials than the teachers responding to the 1989 survey. The 1999 survey showed a considerable increase in the use of microcomputers by respondents; probability may be high that the most current agricultural educators use or anticipate using some type of microcomputer related equipment.

5. In 1989 Birkenholz, Stewart, and Craven established that microcomputers were primarily used for planning and administration rather than for instructional purposes

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

in programs of agriculture. In 1999 the trend had changed. Although microcomputers are still used for administration and planning, there has been a continued growth in their use for group and individual instruction.

6. Agriculture teachers' desire to increase their use of microcomputers for instructional purposes as reported in 1989 by Birkenholz, Stewart, and Craven continues today. The 1999 study revealed a continued increase in the inventory and use of microcomputers in all areas.

7. The 1989 study by Birkenholz, Stewart, and Craven reported that, although aware of the various types of new technology available for instruction, most programs of agriculture would focus on the use of video and microcomputer equipment in the next few years. The 1999 researcher found this conclusion to be valid, as the use of video by programs had increased by 50% and the use of microcomputers increased by 25%. The current study suggested a continued expansion in the use of microcomputer and accessories in all areas.

8. In 1989 Birkenholz, Stewart, and Craven concluded although technology was potentially available, database information systems were not likely to be effectively utilized as sources of information in agricultural education in the next few years. In the 1999 study it was evident that there was a notable increase in the use of database services. The Internet use increased by 31%; DTN increased by 11%; and the use of the Ag Ed Network increased by 15% . There was a notable increase in the use of databases for agricultural markets, news reports and instant access to information.

9. In 1989 Birkenholz, Stewart, and Craven reported that the use of satellite receivers was limited and would not likely play a major role in instruction in agricultural

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

education over the next few years. The 1999 researcher proved this conclusion invalid as there has been an increase of 32% of programs in the use of satellite dish receivers. This trend to acquire rapid current information should continue into the next decade. Many schools have found it is cheaper to own their own systems, especially in rural parts of the country. "New telecommunications technology meant rural schools could remain geographically isolated without becoming intellectually deprived. Small, rural school districts did not have to be consolidated before they could offer a full variety of services to students and community members" (Sullivan, Jolly, Foster, & Tompkins, 1994).

10. In 1989 Birkenholz, Stewart, and Craven showed that agriculture teachers desired to have a wide range of support materials available to supplement their instructional efforts. The 1999 researcher concluded that agriculture teachers still desire a large range of support materials; however there has been a significant decrease in the desire for audiocassette tapes, 16mm films and filmstrips.

11. In 1989 Birkenholz, Stewart, and Craven reported that agriculture departments would not invest major resources, $100 or more, in a single type of instructional material including microcomputer software. This trend has changed slightly. The 1999 study indicated agricultural education departments were willing to pay approximately the same in the $0-50 category, while the $51-100 and $100+ categories have increased.

12. The greatest barriers to the use of microcomputers in the 1989 study by Birkenholz, Stewart, and Craven were lack of funds, lack of expertise and limited available software. Although lack of funds in the 1999 study continued as the number one barrier, lack of expertise and lack of awareness of technology declined. Today's

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

agricultural education teachers are more aware and concerned about using technology as barriers have declined.

Recommendations

Based on the findings and conclusions of this study the following recommendations are proposed.

It is recommended that:

1. Agricultural educators identify procedures to overcome the barriers of limited funds which restrict the utilization of new educational technologies. Agricultural programs must address improving their inventory of technology as a higher priority and better prepare their students for the work force. It is also recommended that agriculture teachers work closely with school administrators and state staff in agricultural education in developing budgets that include adding technologies to their programs such as using the Carl D. Perkins Vocational Act.

2. Inservice programs be provided to develop instructors' expertise needed to utilize new educational technologies. Agricultural instructors should consult with the computer specialist identified by their school district as the mentor for technologies. Continued involvement in inservice and other technology training is also highly recommended.

3. Agricultural educators develop a variety of relevant and up-to-date support materials as a part of future curriculum development projects. It is also recommended that teachers become familiar with and purchase the software programs offered by the National FFA Organization and the National Council for Agricultural Education as well as the numerous educational software outlets available.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

4. Agricultural teachers utilize technology labs at their schools when they do not have computers in their departments.

5. Time, both in terms of training on how to use technologies and how to incorporate them into the curriculum as a pedagogy be increased as an important priority.

6. The state offices of vocational education increase their leadership in implementing educational technology in the agricultural education programs.

7. State agricultural education associations enhance their training opportunities for their members in the use and application of educational technology in the classroom.

8. Based on the changes that occurred in the use of technology in the agricultural education programs over the past ten years a continued increase in the use of technology should proceed. It is probable that the increased use of technology will expand at a faster rate than during the last ten years.

Future Research

If agricultural educators use these research results to help bring more technology into the agricultural classroom, then this study has been successful. Future research would validate whether changes have occurred and if the agricultural programs have made sufficient changes in using technology in the classrooms. The importance of using and teaching technology cannot be emphasized enough. Future research and a replication of this study should aid in the verification of this progress.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

REFERENCES

American Society for Quality/Gallup Survey. (1997). Information technology and product service quality: Consumer attitudes on quality in the age of the networked society. [On-line]. Available: http://www.asq.org/articles/qualityinnews/ 100197gallup.html

Ary, D., Jacobs, L. C., & Razavieh, A. (1996). Introduction to research in education (5th ed.). Fort Worth, Texas: Harcourt Brace College Publishers.

Atherton, J. C. (1994). Relationships between technology adoption decisions and selected characteristics of adult members of the South Carolina Young Farmer Education Association [CD-ROM]. (Doctoral dissertation, Clemson University, 1994). Abstract from: Proquest File: Dissertation Abstracts Item: 9419618

Birkenholz, R. J., Stewart, B. R., & Craven, J. (1989). Use of educational technology in agricultural education: A national study. A research report submitted to the National FFA Board of Directors, Alexandria, Virginia.

Birkenholz, R. J., Stewart, B. R., McCaskey, M. J., Ogle, T. D., & Linhardt, R. E. (1989). Using microcomputers in education: Assessment of three teaching strategies. Journal of Agricultural Education, 30 (1), 51-59.

Camp, W. G. (1983). Microcomputers: A "byte" of the action. The Agricultural Education Magazine, 55 (7), 13-14.

Chrestman, C. V. (1996). Perceptions of Mississippi fortune 500 firms concerning skills and technology training needs for the 21st century [CD-ROM]. (Doctoral dissertation, The University of Mississippi, 1996). Abstract from: Proquest File: Dissertation Abstracts Item: 9601417

Daly, D. R. (1997). Technology financing no longer a pipe dream. School Planning & Management, 36 (12), 10.

Dell Computer Corporation. (1998). Creative Learning Systems, Inc. [On-line]. Available: http://www.dell.com/client/k12/dea_cls.htm

Dykman, A. (1998). When the school is a workplace. Techniques, 73 (2), 20-23.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Eckhouse, J. (1993, June 1). Internet: Millions of users plug in to hug computer network. San Francisco Chronicle, C1, C7.

Eighmy, M. A. (1996). Strategies for agricultural technology curriculum design in vocational education at the University of Minnesota [CD-ROM]. (Doctoral dissertation, The University of Minnesota, 1996). Abstract from: Proquest File: Dissertation Abstracts Item: 9537831

Gementiza, R. I. (1993). Evaluation of IRRI's training and technology transfer program in Asia: The case of Bhutan [CD-ROM]. (Doctoral dissertation, The University of Guelph (Canada), 1993). Abstract from: ProQuest File: Dissertation Abstracts Item: MM79023

Golden, B. (1997). Does your technology deliver? Techniques, 72 (7), 16-19.

Gore, A. (1998, May 15). The president's educational technology initiative. Available: http://www.whitehouse.gov/WH/EOP/edtech/html/edtech_f.html.

Green, B. J. (1994). The technical preparation of workforce 2000 [CD-ROM]. (Doctoral dissertation Seattle University, 1994). Abstract from: ProQuest File: Dissertation Abstracts Item: 9427415

Harvey, J. E. (1995). Planning and financing education technology. Santa Monica, CA: RAND's Critical Technologies Institute on behalf of the U.S. Department of Education. (ERIC Document Reproduction Service No. ED 392 407)

Henry, T. (1997). Schools struggle to utilize technology. USA TODAY. A3. Hill, R.B., & Wicklein, R.C. (1996). Technology education in transition: Perceptions of technology education teachers, administrators, and guidance counselors. Journal of Industrial Teacher Education, 33 (3), 6-9.

Hill, R. B. & Wicklein, R. C. (1996). Technology education in transition: Perceptions of technology education teachers, administrators, and guidance counselors. Journal of Industrial Teacher Education, 33 (3), 6-9.

Hinkle, D. E., Wiersma, W., & Jurs, S. G. (1994). Applied statistics for the behavioral sciences (3rd ed.). Boston, Massachusetts: Houghton Mifflin Company.

Hoerner, J. L. (1991). Tech prep and educational reform. Occupational Education Forum, 20 (1), 1-5.

Houghton, M. (1997). State strategies for incorporating technology into education. Washington, DC: National Governors' Association. (ERIC Document Reproduction Service No. ED 412 930)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

International Society for Technology Education. (1998). Recommended foundations in technology for all teachers and national standards for technology in teacher preparation. Available: http://www.iste.org/Resources/Projects/TechStandards/intro.html

Jackson, G. B., & Bowen, B. E. (1993). A conceptual model for effective planning and delivering distance education courses and program in agriculture. Proceedings in the 20th Annual National Agriculture Education Research Meeting. Nashville, TN.

Jostens Learning Corporation & American Association of School Administrators. (1997). Techniques, 72 (6), 11.

Kearsley, G. (1998). Online education: New paradigms for learning and teaching. Available: http://horizon.unc.edu/TS/vision/

Kercher, P. J. P. (1996). Participation and persistence in postsecondary vocational education: Disadvantaged adults served through a Carl D. Perkins project [CD-ROM]. (Doctoral dissertation, Montana State University, 1996). Abstract from: ProQuest File: Dissertation Abstracts Item: 9633821

Kerlinger, F. N. (1973). Foundations of behavioral research (2nd ed.). New York: Holt, Rinhart and Winston, Inc.

Klein, T., & Luft. V. D. (1997). The past 25 years: Dynamic changes in agricultural education. The Agricultural Education Magazine, 70 (3), 10-11,15.

Lankard, B. A. (1996). Restructuring and vocational education. Trends and issues alerts. (ERIC Document Reproduction Service No. ED 391 918)

Lovejoy, B. (1997). Techno challenges. Inside AVA, 72 (7), 58.

Lozada, M. (1997). The making of a high-tech high school. Techniques, 72 (5), 18-21.

Lua, M. (1995). Beyond American's view of educational technology: Our sister journal in Taiwan, Republic of China. Educational Technology Research and Development, 43 (4), 92.

Martin, R. A. (1997). Perceptions of agricultural educators regarding the role of agricultural mechanization in the secondary agricultural education curriculum [CD-ROM]. (Doctoral dissertation, Iowa State University, 1997). Abstract from: ProQuest File: Dissertation Abstracts Item: 9712598

Matrix Information and Directory Services. (1994, October). Austin, TX.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

McCafferty, D. (1998). Master your computer or flunk. USA WEEKEND, p. 28.

McCarney, B. J. (1987). Substitution and complimentarity in education: An approach to education reform. Journal of Agricultural Education, 18 (1), 68-70.

Mihalevich, J. R. (1989). Gazing into the crystal ball of ed technology in the 90s. Access: Missouri School Boards Association's Technology Services, 11 (7), 3.

Miller, C., & Kotrlik, J. W. (1986). Microcomputer use in vocational agriculture programs in the United States. Seeking Solutions for Tomorrow's Challenges: Proceedings of the Thirteenth Annual National Agricultural Education Research Meeting, 167-174.

Miller, G., & Doerfert, D. L. (1995). Teaching through fiber-optics telecommunications technology: Possibilities and priorities for agriculture. Anaheim, CA: Proceedings of the 1995 Annual National Convention of the Association for Educational Communications and Technology. (ERIC Reproduction Document Service No. ED 383 328)

Mirdamadi, M. (1995). The relationship between computer anxiety and degree of infusion of computer technology among secondary agriculture teachers in Kansas [CD-ROM]. (Doctoral dissertation, Kansas State University, 1995). Abstract from: ProQuest File: Dissertation Abstracts Item: 9517479

Mississippi State University. (1999). Inflation calculator. [On-line]. Available: http://www.msstate.edu/listarchives/afrigeneas/199801/msg0000.4.html

Na, S. I. (1993). Variables associated with attitudes of teachers toward computers in Korean vocational agriculture high schools [CD-ROM]. (Doctoral dissertation, The Ohio State University, 1993). Abstract from: ProQuest File: Dissertation Abstracts Item: 9325563

Naisbitt, J., & Aburdene, P. (1990). Ten new directions for the 1990s Megatrends 2000. New York: William Morrow and Company, Inc.

National Association of Agricultural Educators, Inc. (1998). Agricultural educators directory. Greensburg, PA: Delmar Publishers.

National FFA Agricultural Computing Service. (1985). Vo-ag departments with computers. Unpublished manuscript, National FFA Center, Alexandria, VA.

National FFA Organization. (1997). Official FFA manual of the national organization for agricultural education students (1997-98 ed.). Alexandria, VA: National FFA Center.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

National Research Council. (1988). Understanding agriculture: New directions for education. Washington, DC: National Academy Press.

Newsom-Stewart, M., & Sutphin, D. (1994). Teacher development for ATP 2000. Project report 1993-1994. Cornell University Ithaca, NY: Department of Education.

Phipps, L. J., & Osborne, E. W. (1988). Handbook on agricultural education in public schools (5th ed.). Danville, IL: The Interstate Printers & Publishers, Inc.

Pisapia, J. (1994). Restructuring schools with technology. Research brief #10. Metropolitan Educational Research Consortium, Richmond, VA. (ERIC Reproduction Document Service No. ED411362)

Potosky, A. (1997). Buffet-style learning. Techniques, 72 (2), 40-43.

Reeves, T. C. (1996). Technology in teacher education: From electronic tutor to cognitive tool. Action in Teacher Education, XVII (4), 74-78.

Reynolds, P. (1998). The North Star Approach to technology planning. [On-line]. Available: http://www.ncsu.edu/meridian/feat2-2/feat2-2.html

Riley, R. W. (1998). Technology and education: An investment in equity and excellence. National Press Club, Washington, DC [On-line]. Available: http://www.ed.gov./Speeches/980729.html

Ritchie, D. (1996). The administrative role in the integration of technology. NASSP Bulletin, 80 (582), 42-52.

Rosenfeld, S. A. (1986). Changes and choices: A review of technology's impact on vocational education in the high school. Technology, the Economy, and Vocational Education. Washington, DC: Carnegie Forum in Education and the Economy.

Salant, P., & Dillman, D. A. (1994). How to conduct your own survey. United States of America: John Wiley & Sons, Inc.

Satchwell, R., & Dugger Jr., W. E. (1995). Our challenge: Technology for all Americans. Journal of Industrial Teacher Education, 32 (2), 93-94.

Schlosser, C., & Anderson, M. (1993). Distance education: Review of the literature. Ames, IA: Iowa State University, College of Education.

Schumacher, L. G. (1997). Agricultural systems management/technology programs. The Agricultural Education Magazine, 69 (6), 10-12.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Scott, C. R. (1993). A descriptive analysis of the public agricultural research and extension systems in Jamaica: A case study [CD-ROM]. (Doctoral dissertation, The Ohio State University, 1993). Abstract from: ProQuest File: Dissertation Abstracts Item: 9325585

Seguin, C. A. (1998). Teacher use of the electronic information highway (Internet) for curriculum and instruction and professional activities [CD-ROM]. (Doctoral dissertation, University of South Dakota, 1998). Abstract from: ProQuest File: Dissertation Abstracts Item: 9801585

Stone, J. R., III. (1996). When opportunity flees. Vocational Education Journal, 71 (2), 26-29.

Sullivan, M., Jolly, D., Foster, D., & Tompkins, R. (1994, May). High-tech harvest. The Executive Educator, 16, 36-39.

Underwood, T. D. (1995). The relationship of educational technology and applied academics to the development of critical thinking skills among vocational and comprehensive school students in Oklahoma [CD-ROM]. (Doctoral dissertation, Oklahoma State University, 1995). Abstract from: ProQuest File: Dissertation Abstracts Item: 9525445

United States Congress, Office of Technology Assessment. (1995). Teachers and technology: Making the connection, OTA-HER-616. Washington, DC: U.S. Government Printing Office.

United States Department of Labor. (1991). What work requires of schools: A SCANS report for America 2000. Secretary's Commission on Achieving Necessary Skills, Washington, DC

Vernon, S. J. (1992). A comparison of participants in the national FFA computers in agriculture award program to participants in the national FFA agriscience student recognition program [CD-ROM]. (Doctoral dissertation, Texas A&M University, 1992). Abstract from: ProQuest File: Dissertation Abstracts Item: 9206570

Vidaurreta, P. M. (1996). Local community involvement in determining work skills that support high school business curriculum development [CD-ROM]. (Doctoral dissertation, University of Southern California, 1996). Abstract from: ProQuest File: Dissertation Abstracts Item: 9625039

Vo, C. D. (1997). This is agriculture? Techniques, 72 (4), 30-33.

Vojtek, R., & Vojtek, R. (1997). Are schools ready for the technology age? Journal of Staff Development, 18 (2), 60-61.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Vore, J. B. (1997). A curriculum for industrial/technical education for high school teachers in the state of Arkansas [CD-ROM]. (Doctoral dissertation, University of Arkansas, 1997). Abstract from: ProQuest File: Dissertation Abstracts Item: 9700328

White, R. W. (1994). Perceptions of directors, administrators, and staff development personnel as to the importance of selected cooperative extension staff development areas and topics in the United States [CD-ROM]. (Doctoral dissertation, Mississippi State University, 1994). Abstract from: ProQuest File: Dissertation Abstracts Item: 9415179

Zidon, M. (1991). Computers in high school agriculture programs: A national study of need, use, and value [CD-ROM]. (Doctoral dissertation, Iowa State University, 1991). Abstract from: ProQuest File: Dissertation Abstracts Item: 9035134

Zidon, M. G., & Luft, V. D. (1986). Assessment of the use of microcomputers in North Dakota secondary vocational agriculture departments. Seeking Solutions for Tomorrow's Challenges: Proceedings of the Thirteenth Annual National Agricultural Education Research Meeting (pp. 49-56).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

APPENDICES

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Appendix A

Technology in Secondary Agricultural Education Program Survey Cover Letter

January 20, 1999

TO: Selected Teachers of Agricultural Education

RE: National Study on Technology

You have been selected as a member of a national panel to participate in a study of the use of educational technology in secondary agricultural education programs in the United States. This study is an adaptation of the 1989 study by Robert Birkenholz and Bob Stewart which was conducted for the National FFA Organization. The information you provide will be used as a guide to examine the changes in the use of technology in our programs over the last ten years. This information will be shared at a national level in a future professional journal.

Your response is vital! Please take a few minutes to complete the questionnaire and return in the postage paid envelope provided. The questionnaire has an identification number for mailing purposes only. This is done so we can check your name off the mailing list, your name will never be placed on the questionnaire itself and questionnaires will be destroyed after the study is completed.

It is important that the completed form be returned by February 5, 1999 so the information can be summarized and a report prepared for publication in the fall of 1999. Thank you for providing the information requested.

Sincerely,

Dr. David Whaley, Program Chair
Agricultural Education
Colorado State University

T.W. "Jeff" Jeffery
Graduate Student/Study Coordinator
Colorado State University

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Appendix B

NATIONAL STUDY OF INSTRUCTIONAL TECHNOLOGY IN SECONDARY AGRICULTURAL EDUCATION

I. EQUIPMENT INVENTORY - Record the number of units in the appropriate blank for each of the following items in your agriculture program.

Item:	Number:	Item:	Number
Microcomputer	_____	Microcomputer Modem	_____
Microcomputer printer	_____	Computer Projection Unit	_____
Audiocassette Player	_____	LCD Panel	_____
Amplified Telephone	_____	VCR Player/Recorder	_____
VCR Camera	_____	Satellite Receiver Dish (DTN, etc.)	_____
Interactive Video	_____	Carousel Slide Projector	_____
Overhead Projector	_____	Digital Still Camera	_____
16mm Film Projector	_____	Film Strip Projector	_____
Opaque Projector	_____	Television	_____

Other technologies you have in your inventory that you use while teaching.

_____

II. MICROCOMPUTER INVENTORY

Number in Agriculture Department:		Disk Drives (check each type available that you use)
Personal Computer (DOS-Windows)	_____	_____ 3.5 inch (1.44MB)
Macintosh (MAC-OS)	_____	_____ 5.25 inch (720K)
Other	_____	_____ CD ROM (650MB)
	_____	_____ ZIP (100MB)
		_____ JAZ Drive (1GB)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

III. ADMINSTRATION AND PLANNING

Identify the extent to which you CURRENTLY USE and ANTICIPATE USING (within the next five years) the following types of educational technology for Administration and/or Planning in your local agricultural education program (i.e. developing lessons, grade reporting, writing tests, etc.)

	CURRENTLY USE					ANTICIPATE USING				
	Never	Little	Some	Much	Regularly	Never	Little	Some	Much	Regularly
Microcomputer	1	2	3	4	5	1	2	3	4	5
Microcomputer Modem	1	2	3	4	5	1	2	3	4	5
Microcomputer Printer	1	2	3	4	5	1	2	3	4	5
Conference Telephone	1	2	3	4	5	1	2	3	4	5
VCR Player/Recorder	1	2	3	4	5	1	2	3	4	5
VCR Camera	1	2	3	4	5	1	2	3	4	5
Satellite Receiver Dish (downlink) (DTN)	1	2	3	4	5	1	2	3	4	5
Digital Still Camera	1	2	3	4	5	1	2	3	4	5
Interactive Video	1	2	3	4	5	1	2	3	4	5
Audiocassette Player	1	2	3	4	5	1	2	3	4	5
Other (specifiy)	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

IV. GROUP INSTRUCTION

Identify the extent to which you CURRENTLY USE and ANTICIPATE USING (within the next five years) the following types of educational technology for Group Instruction in your local agricultural education program?

	CURRENTLY USE					ANTICIPATE USING				
	Never	Little	Some	Much	Regularly	Never	Little	Some	Much	Regularly
Microcomputer	1	2	3	4	5	1	2	3	4	5
Microcomputer Modem	1	2	3	4	5	1	2	3	4	5
Microcomputer Printer	1	2	3	4	5	1	2	3	4	5
Computer Projection Unit	1	2	3	4	5	1	2	3	4	5
LCD Panel	1	2	3	4	5	1	2	3	4	5
Amplified Telephone	1	2	3	4	5	1	2	3	4	5
VCR Player/Recorder	1	2	3	4	5	1	2	3	4	5
VCR Camera	1	2	3	4	5	1	2	3	4	5
Satellite Receiver Dish (downlink)(DTN)	1	2	3	4	5	1	2	3	4	5
Interactive Video	1	2	3	4	5	1	2	3	4	5
Digital Still Camera	1	2	3	4	5	1	2	3	4	5
Carousel Slide Projector	1	2	3	4	5	1	2	3	4	5
Overhead Projector	1	2	3	4	5	1	2	3	4	5
Audiocassette Player	1	2	3	4	5	1	2	3	4	5
Filmstrip Projector	1	2	3	4	5	1	2	3	4	5
16mm Film Projector	1	2	3	4	5	1	2	3	4	5
Opaque Projector	1	2	3	4	5	1	2	3	4	5
Other (specifiy)	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

V. INDIVIDUAL INSTRUCTION

Identify the extent to which you CURRENTLY USE and ANTICIPATE USING (within the next five years) the following types of educational technology for Individual Instruction in your local agricultural education program?

	CURRENTLY USE					ANTICIPATE USING				
	Never	Little	Some	Much	Regularly	Never	Little	Some	Much	Regularly
Microcomputer	1	2	3	4	5	1	2	3	4	5
Microcomputer Modem	1	2	3	4	5	1	2	3	4	5
Microcomputer Printer	1	2	3	4	5	1	2	3	4	5
Computer Projection Unit	1	2	3	4	5	1	2	3	4	5
LCD Panel	1	2	3	4	5	1	2	3	4	5
VCR Player/Recorder	1	2	3	4	5	1	2	3	4	5
VCR Camera	1	2	3	4	5	1	2	3	4	5
Satellite Receiver Dish (downlink)(DTN)	1	2	3	4	5	1	2	3	4	5
Interactive Video	1	2	3	4	5	1	2	3	4	5
Digital Still Camera	1	2	3	4	5	1	2	3	4	5
Carousel Slide Projector	1	2	3	4	5	1	2	3	4	5
Overhead Projector	1	2	3	4	5	1	2	3	4	5
Audiocassette Player	1	2	3	4	5	1	2	3	4	5
Filmstrip Projector	1	2	3	4	5	1	2	3	4	5
Other (specifiy)	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5
_____	1	2	3	4	5	1	2	3	4	5

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

VI. DATABASES

A. Do you presently subscribe to any of the following information services?

	Yes	No		Yes	No
AgriData	____	____	Internet Service Provider (Compuserve, AOL, etc.)	____	____
AGNET	____	____	The Source	____	____
AgLine	____	____	USDA Online	____	____
ACRES	____	____	Instant Update	____	____
Grassroots	____	____	CMN	____	____
Data-Line	____	____	AgriStar	____	____
RFD-TV	____	____	TELPLAN	____	____
Other (specify)			DTN	____	____
_____	____	____	Ag Ed Network	____	____
_____	____	____	_____	____	____
_____	____	____	_____	____	____

B. What features of a computer-accessed database information system would you prefer? (Answer All)

	Yes	No
Lesson plans	____	____
Annual fee	____	____
Monthly fee	____	____
Hourly connection fee	____	____
Agricultural markets	____	____
News reports	____	____
Instant access to information	____	____
Other (specify)		
_____	____	____
_____	____	____

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

VII. EDUCATIONAL MATERIALS

A. Identify the extent to which you currently use the following types of educational materials.

B. Check the category below which you consider to be a reasonable cost for each type of educational material.

	Never	Little	Some	Much	Regularly	$0-25	$26-50	$51-75	$76-100	$100+
Microcomputer Related										
Spreadsheet Package (s)	1	2	3	4	5	____	____	____	____	____
Word Processing Package (s)	1	2	3	4	5	____	____	____	____	____
Database Management Package (s)	1	2	3	4	5	____	____	____	____	____
Tele-Communications Package (s)	1	2	3	4	5	____	____	____	____	____
Presentation Graphics	1	2	3	4	5	____	____	____	____	____
Tutorial Programs	1	2	3	4	5	____	____	____	____	____
Drill & Practice Programs	1	2	3	4	5	____	____	____	____	____
Simulation Programs	1	2	3	4	5	____	____	____	____	____
Decision Aid Programs	1	2	3	4	5	____	____	____	____	____
Grade Book Programs	1	2	3	4	5	____	____	____	____	____
Test Item Bank Programs	1	2	3	4	5	____	____	____	____	____
Other Materials										
Videotapes	1	2	3	4	5	____	____	____	____	____
Information Data Base Services (cost per month)	1	2	3	4	5	____	____	____	____	____
Film Strips	1	2	3	4	5	____	____	____	____	____
Audiocassette Tapes	1	2	3	4	5	____	____	____	____	____
Transparencies	1	2	3	4	5	____	____	____	____	____
Slides (2"x2") (set of 80)	1	2	3	4	5	____	____	____	____	____
16mm Film	1	2	3	4	5	____	____	____	____	____

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

VIII. CURRICULUM MATERIALS

Curriculum materials prepared for secondary agricultural educators should contain which of the following materials?

	Yes	No		Yes	No
Instructor's Guide with Lesson Plans	____	____	Directions for Lab Activities	____	____
Evaluation Materials (tests & quizzes)	____	____	Computer Software	____	____
Videotapes	____	____	Slide Sets	____	____
Student References	____	____	Competency Lists	____	____
Assignment Sheets	____	____	16mm Film	____	____
Audio-Cassette Tapes	____	____	Film Strips	____	____
Transparency Masters	____	____	Other Materials (specify)	____	

IX. BARRIERS

Check the following barriers which you feel have prevented you from utilizing each of the types of educational technology listed on the left below. Note: More than one barrier may be checked for each type of equipment.

	Lack of funds	Lack of expertise	Technology is outdated	Lack of software materials	No interest in equipment	Unaware of technology	Support materials are outdated	Other (specify)
Microcomputer	____	____	____	____	____	____	____	____
Microcomputer Modem	____	____	____	____	____	____	____	____
Microcomputer Printer	____	____	____	____	____	____	____	____
Overhead Computer Projection Screen	____	____	____	____	____	____	____	____
LCD Panel	____	____	____	____	____	____	____	____
Amplified Telephone	____	____	____	____	____	____	____	____
VCR Player/Recorder	____	____	____	____	____	____	____	____
Satellite Receiver Dish (downlink)(DTN)	____	____	____	____	____	____	____	____
Interactive Video	____	____	____	____	____	____	____	____
Carousel Slide Projector	____	____	____	____	____	____	____	____
Digital Still Camera	____	____	____	____	____	____	____	____
Audio Cassette Player	____	____	____	____	____	____	____	____
Filmstrip Projector	____	____	____	____	____	____	____	____
Opaque Projector	____	____	____	____	____	____	____	____
16mm Film Projector	____	____	____	____	____	____	____	____

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

X. Technology and Teaching

Definition of Informational Media as it applies to answering question 1

Students visualizing information, copying the information for their notebooks as an assignment or using it for a report. No problem solving or cognitive thinking skills are involved transmitting this information.

1. Are you using technology as an informational media only? (i.e. copying information, using information copied for a class report or for notebook reports)

Yes____ No____

Definition of teaching style (pedagogy), using technology as it applies to answering question 2

The teacher uses technology in such a way that the student is required to use problem solving techniques, cognitive thinking skills, and determine solutions to a problem.

2. Have you incorporated the use of technology into your teaching style? (i.e. FFA leadership applications or record books, using the computer to solve problems and do research that will be shared in a cognitive way)

Yes____ No____

Additional comments:

The end - - Thank you for your response!

Dr. David Whaley, Program Chair
Agricultural Education
Colorado State University
111A Education Building
Fort Collins, Colorado 80523
(970) 491-5292

T.W. "Jeff" Jeffery
Graduate Student/Study Coordinator
Colorado State University
221 Education Building
Fort Collins, Colorado 80523
(970) 204-0378

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Appendix C

Survey Respondents Comments

1. Sounds like an interesting project!
2. Hey T.W. is this more fun than working in the shop? Not for me it isn't.
3. High school computer technology needs to be updated to college level.
4. The only thing that holds us back - deals with training workshops - no time.
5. Trying to develop technology to integrate it into teaching.
6. Great tools, not a substitute for great teaching.
7. I will be using more and more technology each year.
8. Too much emphasis on computers. We are more interested in the means rather than the end. We are being forced to use computers for tasks that are more prudently handled in other ways.
9. Most of our equipment needs repair, equipment was purchased - no funds were allocated to maintain this equipment over a 5-10 year span. My one computer is an IBM II - out of date wouldn't you say!!
10. National FFA Proficiency Applications on computer, email other schools.
11. Use both methods in my classes.
12. Sorry it took me so long. Our ag technology lab is a tremendous asset to our program.
13. Technology is the number "1" component to my ag program.
14. None, have a nice day!
15. Good survey/no time.
16. With more funding for technology...the sky is the limit!
17. Even though we only have one computer it is used by all of my students and has greatly enhanced my class.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

18. I am in an extremely poor school district. Grants have been sought but the money only goes so far and ag is a low priority.
19. I teach with the aid of all available technologies.

20. No thank you.

21. Students use the Internet and computer to track down information but also must do something with information to help inform and come up with solutions to problems for rest of class.

Comments related to Barriers

1. Lack of computers
2. Time for instruction
3. Time, time constraints
4. I want all new, my stuff is ancient.
5. Hard to use satellite receiver dish.

Technology Comments

1. Have access to, not in department.
2. Can check out what I want from school media library.
3. I make all current programs.

Technology Listed as Other

Scanner
T1 Line
Laser Disc Player
Palm Tops (1MG memory)
Large 36" Gateway Destination Computer
Geographical Positioning System (some have 2, some 6)
Laptop Computers

Comments relating to Internet

AG CAST (stock market)
AG News
Modem replaced by WAN
Ethernet cards - microfiber high speed service
Phone line not compatible
County has not put in phone line

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.