USE OF INSTRUCTIONAL TECHNOLOGY IN AGRICULTURAL EDUCATION IN NORTH CAROLINA AND VIRGINIA

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ABSTRACT

A variety of induction activities are being provided to beginning teachers by school district personnel. Little evidence exists concerning the frequency and impact of delivery of selected forms of assistance. This study involved 64 beginning secondary agricultural education teachers from three consecutive cohorts. Results of this study show that teacher induction programming that was frequently provided for beginning teachers by school personnel did not address the largest share of the forms of assistance that resulted in a major impact upon the experience of the beginning teachers. The initial five forms of assistance that had a major impact upon the experience of beginning teachers were: an adequate supply of instructional materials, parental support for the program, availability of purchasing information, planning time, and an extra planning period. Mean impact scores were not affected by gender, level of stress, origin of preservice education, and size of school. The researcher concluded that school district personnel need to secure input from beginning teachers to inform induction programming efforts.

INTRODUCTION

United States agriculture is one of the most productive systems in the world. The leading position of the United States in agriculture can be attributed in part to its infrastructure for developing and delivering new technologies. Agricultural education in secondary schools is part of the infrastructure of this remarkable system. With this technological change, researchers have suggested that perhaps curriculum development initiatives and educational delivery approaches in local schools have not kept pace with the rate of technological change that the agricultural industry has experienced over the past decade (National FFA Organization, 1999). For agricultural education to remain viable, new ways need to be generated to deliver instruction in the total secondary agricultural education program (National Research Council, 1988).

Instructional technology can help keep educational programs aligned with new developments in agriculture. Instructional technology is a division of the body of knowledge known as

"educational technology." Educational technology is the "overall methodology and set of techniques employed in the application of instructional principles" (Cleary, 1976, p. 1). Instructional technology is the media born of the communication revolution which can be used for instructional purposes. It includes television, videotapes, computers, data lines, and other media (Commission on Instructional Technology, 1970). The day is near when every child will be able to stretch a hand over a keyboard and reach every book ever written, every painting ever painted, and every symphony ever composed (Clinton, 1998).

Integration of instructional technology into the public school has become a priority in many states. For example, in North Carolina (NC) state educational leaders recognized the need to infuse instructional technology into the public school with a focus on technology-supported classrooms. Priority was given to integrating instructional technology into competency-based programs in career and technical education, including agricultural education. The vision is for all students to be enabled by technology to solve problems, improve productivity, and gain skills necessary to become contributing members of their community and life-long learners (North Carolina Department of Public Instruction, 1999).

Policymakers in Virginia (VA) recognized instructional technology as a systematic treatment of information in a specialized way to achieve a specific purpose - a means to enable all students to learn to their potential. The Virginia plan included teacher training, support services, pilot programs, and guidelines to introduce and evaluate use of new instructional technologies (Virginia Department of Education: Division of Technology, 1996).

Instructional Technology Historical Perspectives

Educational innovations can impact what to learn, how to learn, and with whom to learn (Williams, 2001). Instructional technology can be traced back to World War II when the government produced thousands of military training films. Other learning materials such as still photographs, audio recording, filmstrips, transparencies, and slides were also used for instruction as well to achieve specific outcomes in military personnel (Anglin, 1995). Behaviorist theory guided such competency-based training programs (Simonson & Thompson, 1997).

In the 1950s, universities started creating courses in audiovisual production. Colored slides (35mm) and easy-to-use cameras gained popularity. Mechanical systems such as LeRoy and Letterguide were commonly used in lettering posters and displays. The 1960s and 1970s saw increased use of 35mm slides and the carousel projector. The thermal process and later the electrostatic process made it easy to create transparencies from a typed page (Pett & Grabinger, 1995).

The 1980s marked the progression from hand to computer media in instructional technology. VCRs, videodiscs, and laser printers emerged, and personal computers began to appear in schools, offices, and homes. Additional developments in the 1990s included scanners, CD-ROMs, digital cameras and the Internet. Computers have revolutionized the classroom by allowing for interactivity and creating a more learner-centered environment (Pett & Grabinger, 1995). Cognitive theory is practiced when instructional technology, especially computer technology, is used to facilitate learner interaction with the subject matter (Simonson & Thompson, 1997).

The availability of modern instructional technology to secondary school agricultural education teachers and students is a national concern (Layfield & Scanlon, 1999; Miller & Miller, 1998; Nordheim & Connors, 1997; Thompson & Connors, 1998). Nordheim and Connors (1997) found that a majority of secondary agriculture teachers in the northwest region had access to computers. Thompson and Connors (1998), in a study of Internet use by vocational education teachers in Idaho, found that 44% of teachers could gain access to the Internet both at school and at home. Of access locations at school, the library was highest, followed by computer lab, classroom, and office (Thompson & Connors, 1998). Murphy and Terry (1998) identified interactive computer software programs, presentation software, interactive CD-ROM programs, email, computers in the classroom, LDC panels and projectors, CAD programs, video tapes, interactive video, the Internet, and two-way interactive television as instructional technologies that show promise for secondary school agricultural education programs.

Computers can be used in the design, delivery, and evaluation of teaching and learning (Anglin, 1995). "Computerized instruction should be included in secondary school agricultural education programs to teach computer literacy, a needed skill in agricultural occupations, and to enhance student learning" (Rodenstein & Lambert, 1982, p. 41). Miller and Kotrlik (1987) found that agricultural education teachers used computers mostly to manage grades, classes, and teaching materials. In contrast, ten years later Nordheim and Connors (1997) found that the majority of teachers used computers for instructor-related tasks such as writing tests, creating class assignments, grading, writing correspondence, and developing curriculum. The other major uses of the computer were FFA related activities: FFA Program of Activities, FFA mailings, and FFA news articles.

Nordheim and Connors (1997) studied types and frequency of software used by agricultural education teachers. The categories of software programs used included: word processing, graphics, spreadsheet, data base, financial, Internet navigator, drafting (CAD), and grading. The majority of teachers reported daily use of word processing software, database programs, and the Internet, compared to weekly use of spreadsheet and graphic presentation software.

Thompson and Connors (1998) conducted a study on use of the Internet by career and technical education teachers in Idaho. The majority of teachers reported using email "quite regularly" in their programs. Vocational teachers reported using the Internet "sometimes" for professional development, classroom instruction, and lesson planning. Holton and Newman (1996) suggested using the Internet in secondary agricultural education programs and the FFA as a source of instructional material, a research tool, a public relations tool to communicate accomplishments, and a means for students to share information about what they are learning.

Trotter (1998) encouraged schools to clarify their goals for using instructional technology. Thompson and Connors (1998) stated that instructional technology has produced a paradigm shift in education from a teaching model (the teacher as the source of knowledge that is to be given to the student) to a learning model (knowledge as constructed and discovered). Business leaders and parents see instructional technology mainly as a tool to prepare students for the workplace, while educators see it as motivating students and encouraging more higher cognitive learning. Instructional technology is also seen as a means to foster educational reform, such as making classrooms more student centered or changing the way teachers teach and the way students learn (Trotter, 1998). Instructional technology can be used in conjunction with experiential education - e.g., supervised agricultural experience programs that help learners

form their own meaning of the world around them, applying threads of constructivism (Simonson & Thompson, 1997).

Murphy and Terry (1998) conducted a nationwide study on the potential positive effects that electronic communication, information, and imaging technologies have on agricultural education instruction. Findings tended to clustered in four areas: (1) an increase in the availability of educational opportunities, (2) improved information for teachers and students, (3) more effective instructional materials, and (4) more convenient delivery methods for teachers. Combining the problem-solving approach to teaching commonly used in agricultural education with the use of instructional technology provides systems theory practicality (Simonson & Thompson, 1997).

Theoretical Framework

Simonson and Thompson (1997) stated that theories serve two purposes: (1) Provide a direction for future research, and (2) Provide direction to the practice of a profession. Theories are not rigid, but continually progress as new research findings are introduced to a given body of knowledge. Scientists continually strive to improve upon theories, which are used as guides for research. Through this process scientists endeavor to develop new laws that can be adopted to solve problems within the field of study (Simonson & Thompson, 1997).

Simonson and Thompson (1997) indicated that theories can provide direction to the practice of a profession. In the field of instructional technology several theories guide the focus of research and practice: behaviorism, systems theory, cognitive theory, and constructivism.

According to Simonson and Thompson (1997) behaviorism has historically had the greatest theoretical impact upon instructional technology especially in the area of computer based instruction (CBI). In education, behaviorists believe that the learner's current mental state is a precursor to behave. Behaviorists believe that the goal of any educational activity is to produce desirable behaviors in students. With the utilization of instructional technology such as in CBI, any effective educational activity should change the student in some observable way. "After completing a lesson, students should be able to do something that they could not do, or could not do as well, before the lesson" (Simonson & Thompson, 1997, p. 36). Systems theory continues this discussion of instructional technology's theoretical base.

Generally defined, systems theory concerns the organization and structure of entire organisms. Systems theory was created early in the 20th century as a result of increased support and acceptance of science and the scientific method. In the field of education, the development of the systems approach gave the systems theory practicality. The systems approach is based on the following ideals (Simonson & Thompson, 1997, p. 39):

- The systems approach applies to learning a method of logical problem solving similar to the scientific method.
- Instruction designed using the systems approach is self-correcting and uses logical methods of decision making.
- Instruction developed using the systems approach applies rational procedures for designing instructional programs that ensure the attainment of specific behavioral objectives.

· The systems approach incorporates ways of looking at complex organizational problems that take into account contingencies.

Instructional technology in relation to the systems approach is an integral component of the educational process. Instructional technology can aid in the development of logical problem solving approaches, and can also help in the attainment of specific behavioral objectives.

In addition to the Systems theory, the Cognitive theory has greatly impacted the field of instructional technology. "Educational psychologists and learning theorists are moving away from the behaviorist approach and have advocated a closer look at the internal processes that occur in learners during instruction" (Simonson & Thompson, 1997, p. 41). Traditionally, behavioral psychologists have ignored the cognitive changes that occur in learners during the teaching process, arguing that it is impossible to measure and predict the mental changes that occur within the human brain. Cognitive psychologists, however, argue that the learner deserves a greater degree of autonomy and initiative to the learner (Simonson & Thompson, 1997). Cognitive theory is mainly concerned with the conceptualization of students' learning processes, with special interest on the way information is received, organized, retained, and used by the brain. Cognitive theory, in relation to instructional technology, can be seen in the area of CBI, which requires lessons to be organized and delivered in a way that complements the cognitive structure and level of sophistication of the learner. Cognitive theorists are more concerned with the content of instruction, instead of the outcomes of instruction that is found in the behaviorists movement. In the area of instructional technology, the cognitive theory can best be demonstrated with Hypermedia, a computer-based instructional approach. Hypermedia is a nonlinear and nonsequential tool used by cognitive scientists to examine how students interact with instruction during the process of learning (Simonson & Thompson, 1997). "The way students use hypermedia gives insights into the structure of thinking and how learning occurs" (Simonson & Thompson, 1997, p. 42).

The field of instructional technology has additional roots in the constructivist school of thought. Constructivism an offshoot of the cognitive theory was founded on the belief that "there is a real world that is experienced but that meaning and understanding of the world are imposed by the person" (Simonson & Thompson, 1997, p. 43). Constructivists believe that learners construct their own meaning from instructional activities and real world experiences. Through experience meaning is gained. Through experiential learning systems such as CBI, learners can form their own meanings of the world around them (Simonson & Thompson, 1997).

The aforementioned theories form the foundation upon which instructional technology research and utilization are based. Behaviorism, with its emphasis on producing observable and quantifiable behaviors in the learner, is in direct contrast with the cognitive theory with its emphasis on the internal processes that occur in learners during instruction. Systems theory, with its emphasis on the natural order and rationality of the world, provides an organized way by which educational planners can design and implement instruction. Constructivism, with its emphasis on gaining meaning through experience, provides a student-centered theoretical foundation in which instructional technology can play an integral role.

Purpose and Objectives

The purpose of this study was to assess the availability of instructional technology tools and the use of instructional technology tools, including computer technology, in secondary school agricultural education programs in North Carolina and Virginia. The objectives were to:

1. Assess instructional technology tools available to teachers at their schools.
2. Determine instructional technology tools used by teachers.
3. Determine instructional technology tools used by students in learning.
4. Identify ways teachers used computer technology.

Methodology

The population for this descriptive study consisted of secondary school agricultural education teachers in North Carolina (N = 370) (North Carolina Agricultural Education Directory, 1998) and Virginia (N = 313) (Virginia Vocational Agriculture Teacher's Association, 1998). A proportional stratified random sample consisting of 210 teachers from North Carolina and 170 from Virginia was drawn (Krejcie & Morgan, 1970). Likert-type scales were used to measure teacher access to instructional technology tools, utilization of instructional technology by teachers and students, and ways in which teachers used computer technology. A panel of experts consisting of university professors in agricultural education determined the content and face validity. Additionally, a pilot test was conducted, and suggestions were incorporated into the final instrument.

The instrument was mailed to participants, with two follow-up mailings sent to nonrespondents. One hundred ninety-five usable surveys were received (NC = 85, VA = 110), for a return rate of 51%. Ten percent of the nonrespondents were telephoned and asked selected questions from the survey. T-tests revealed no significant differences (.05 level) between respondents and nonrespondents. The results of this study can only be generalized to secondary agricultural educators in North Carolina and Virginia. Cronbach alpha coefficients ranging from .61 to .79 were determined for the four measures. Descriptive statistics were used in analyzing the data.

Findings

Demographic Characteristics

Teacher and program characteristics are summarized as follows:

- 72% of NC and 75% of VA teachers were male.
- 40 was the mean age of teachers for both states.
- 53% of teachers had a master's or higher degree for both states.
- The mean number of years of teaching experience was 13 and 15 years for NC and VA teachers respectively.
- 25 hours of instructional technology training were completed by teachers in both states in past two years.
- 85% of NC and 83% of VA teachers had access to a computer at home.
- 63% of NC and 79% of VA teachers had access to the Internet at home.
- 101 for NC and 97 for VA was the mean enrollment in agricultural education programs.
- 77 for NC and 71 for VA was the mean FFA membership.

- the majority of home computers in both states was PC (IBM compatible).
- the majority of school computers in both states were PC (IBM compatible).
- the majority of agricultural education teachers in both states taught horticulture, agricultural mechanics, agricultural science, and animal science classes in grades 9-12.

Access to Instructional Technology Tools

Table 1 presents the means and standard deviations of teacher access to selected instructional technology tools. Videotape, television, desktop computer, CD-ROM, Internet, email, laser printer, and video camera had means of less than 2.50 on a 4-point scale, indicating that in both states these technology tools were located in the classroom or were adequately accessible in the building for use by teachers. Teachers in Virginia also had adequate access to full-page scanners, laptop computers, digital cameras, and computer projectors. Technologies not easily accessible to teachers in North Carolina (means of 2.50 and above) included: DTN (commercial agricultural information system which provides curriculum content for agricultural teachers), LCD panel, laser disk player, computer projector, laptop computer, digital camera and laser disk player. Only DTNs, LCD panels, and laser disk players were not easily accessible to teachers in Virginia.

Table 1

Access to Instructional Technology Tools by Teachers

Technology Tools	North Carolina (n = 85)		Virginia (n = 110)		Totals (n = 195)	
	Mean	SD	Mean	SD	Mean	SD
Videotape	1.20	.65	1.36	.71	1.29	.69
Television	1.19	.65	1.30	.58	1.25	.61
Video Camera	2.20	1.03	2.02	.95	2.10	.99
Laser Disk Player	2.79	1.13	2.57	1.10	2.67	1.12
Desktop Computer	1.25	.60	1.52	.82	1.40	.74
Laptop Computer	2.75	1.19	2.42	1.24	2.56	1.23
CD-ROM	1.62	.94	1.79	1.01	1.72	.98
Digital Camera	2.81	1.11	2.36	1.16	2.56	1.15
Full Page Scanner	2.58	1.15	2.29	1.09	2.42	1.12
Laser Printer	2.01	1.12	2.02	1.11	2.02	1.11
Computer Projector	2.78	1.12	2.39	1.10	2.56	1.12
LCD Panel	2.95	1.12	2.62	1.21	2.76	1.18
Internet	1.81	.98	1.80	.97	1.81	.97
Email	1.99	1.10	1.71	.92	1.83	1.01
DTN or Farm Dayta	3.02	1.23	2.75	1.36	2.87	1.31

Scale: 1 = Constant classroom access. 2 = No classroom access, but adequate access in my building. 3 = In building but not easily accessible to me. 4 = No access in building.

Use of Instructional Technology Tools by Teachers

The data in Table 2 illustrates that desktop computers, videotapes, and the Internet were the instructional technologies most used by teachers in both states, with means ranging from 1.72 to 2.21 on a 5-point scale. However, the relatively large standard deviations (1.07 for NC and 1.15 for VA) for desktop computers indicate a wide variation in responses. Teachers in both states used only seven of the 15 instructional technology tools (those with total means ranging from 1.50 to 2.49) one to 30 minutes per day. The most frequently used tools were desktop computer, videotape, the Internet, television, laser printer, email, and CD-ROM. The remaining eight technologies studied were used less or were not used on a daily basis. Least used in North Carolina were laser disk player, digital camera, and laptop computer; in Virginia, least used were DTN, full-page scanner, and computer projector. The lack of use of some technologies may be attributable to the lack of access to these technologies.

Table 2

Use of Instructional Technology Tools by Teachers

Technology Tools	North Carolina (n = 85)		Virginia (n = 110)		Totals (n = 195)	
	Mean	SD	Mean	SD	Mean	SD
Videotape	1.89	.71	1.72	.73	1.79	72
Television	1.71	.78	1.55	.75	1.62	.77
Video Camera	1.25	.49	1.21	.51	1.23	.50
Laser Disk Player	1.13	.43	1.38	.83	1.27	.70
Desktop Computer	2.21	1.07	1.87	1.15	2.02	1.13
Laptop Computer	1.18	.44	1.24	.51	1.21	.48
CD-ROM	1.55	.66	1.50	.82	1.52	.76
Digital Camera	1.15	.36	1.33	.61	1.25	.52
Full Page Scanner	1.22	.56	1.21	.49	1.22	.52
Laser Printer	1.52	.77	1.56	.91	1.54	.85
Computer Projector	1.25	.69	1.22	.56	1.23	.62
LCD Panel	1.27	.73	1.27	.60	1.27	.66
Internet	1.79	.99	1.72	.89	1.75	.93
Email	1.55	.78	1.50	.69	1.52	.73
DTN or Farm Dayta	1.22	.73	1.19	.44	1.21	.58

Scale: 1 = No time. 2 = 1-30 minutes. 3 = 31-60 minutes. 4 = 61-90 minutes. 5 = more than 90 minutes.

Use of Instructional Technology Tools by Students in Learning

Table 3 presents means and standard deviations pertaining to student use of selected instructional technology tools in learning as reported by teachers. In both states, students used only desktop computer, videotape, and television (those with means ranging from 1.50 to 2.49) from one to 30 minutes daily. In addition, North Carolina students used the Internet one to 30 minutes per day. The remaining 11 technologies were used less or were not used on a daily basis. The three technologies used the least by students in North Carolina were digital camera, laser disk player, and computer projectors; in Virginia, they were LDC panel, computer projector and digital camera were least used by students.

Table 3

Use of Instructional Technology Tools by Students in Learning

Technology Tools	North Carolina (n = 85)		Virginia (n = 110)		Totals (n = 195)	
	Mean	SD	Mean	SD	Mean	SD
Videotape	1.69	.62	1.65	.69	1.67	.66
Television	1.53	.65	1.57	.71	1.55	.68
Video Camera	1.15	.39	1.22	.50	1.19	.45
Laser Disk Player	1.07	.30	1.22	.55	1.15	.46
Laptop Computer	1.16	.37	1.19	.39	1.18	.38
CD-ROM	1.39	.62	1.43	.64	1.41	.63
Digital Camera	1.06	.24	1.18	.47	1.13	.39
Full Page Scanner	1.16	.43	1.19	.44	1.18	.44
Laser Printer	1.31	.60	1.27	.56	1.29	.57
LCD Panel	1.19	.68	1.16	.42	1.17	.55
Internet	1.55	.78	1.41	.58	1.47	.68
Email	1.28	.75	1.38	1.11	1.34	.97
DTN or Farm Dayta	1.13	.51	1.21	.53	1.17	.52

Scale: 1 = No time. 2 = 1-30 minutes. 3 = 31-60 minutes. 4 = 61-90 minutes. 5 = more than 90 minutes.

Ways Teachers Used Computer Technology

Table 4 presents means and standard deviations of the use of computer technology by teachers in secondary school agricultural education programs. Word processing was the only technology used by teachers in both states that had a mean of 3.70 (mid-point on a 5-point scale) or higher. For North Carolina teachers, Internet research had the second highest mean (3.14). Ratings by North Carolina teachers were generally higher than those by Virginia teachers; however, all of the 13 uses studied, except word processing and Internet research, had means below 3.00, the lower end of the five-point scale. North Carolina teachers had highest means for word processing, Internet research, tutorials or practice, and databases; Virginia teachers had highest means for word processing, tutorials or practice, spreadsheets, Internet research, and databases. Lowest ratings for both states were observed for chat rooms and discussion groups.

Table 4

Ways Teachers Used Computer Technologies

Computer Utilization Categories	North Carolina (n = 85)		Virginia (n = 110)		Totals (n = 195)	
	Mean	SD	Mean	SD	Mean	SD
Internet Research	3.14	1.08	2.46	1.32	2.76	1.26
CD-ROM Software	2.74	1.10	2.29	1.28	2.49	1.22
Reference Software	2.81	1.19	2.27	1.19	2.51	1.20
Email	2.65	1.37	2.26	1.47	2.43	1.44
Chat Rooms	1.42	.73	1.33	.76	1.37	.74
Discussion Groups	1.76	1.10	1.48	.82	1.61	.96
Databases	2.76	1.51	2.39	1.29	2.55	1.40
Spreadsheets	2.39	1.29	2.48	1.27	2.54	1.24
Graphing Software	2.16	1.16	1.83	1.03	1.97	1.10
Word Processing	3.73	1.29	3.70	1.44	2.66	1.32
Web Page Production	2.25	1.19	2.23	1.32	2.24	1.27
Draw/Paint Programs	2.26	1.26	2.33	1.38	2.30	1.33
Content area tutorials or drill and practice	2.76	1.28	2.57	1.35	2.66	1.32

Scale: 1 = Very Low Priority. 2 = Low Priority. 3 = Moderate Priority.
4 = High Priority. 5 = Very High Priority.

Conclusions, Implications, and Recommendations

Secondary-school agricultural education teachers and students in North Carolina and Virginia have access to a variety of instructional technology tools, including computer technology, in either the agricultural education classroom or school building. Tools accessible to teachers in both states were television, videotape, desktop computer, CD-ROM, Internet, email, laser printer, and video camera. In addition, teachers in Virginia had access to full-page scanner, laptop computer, digital camera, and computer projector. The technologies accessible in this study were similar to ones found in Layfield and Scanlon, (1999); Miller and Miller, (1998); Nordheim and Connors, (1997); and Thompson and Connors, (1998).

Desktop computer, videotape, Internet, television, laser printer, email and CD-ROM were the instructional technology tools most used (1-30 minutes daily) by teachers in both states; desktop computer, videotape, and television were the most used by students. In addition, students in North Carolina used the Internet one to 30 minutes daily. These lists closely parallel the list of technologies identified by Murphy and Terry (1998) as showing promise for use in secondary school agricultural education programs. Thompson and Connors (1998); and Miller and Miller (1998 & 1999) found similar results from secondary agricultural education teachers regarding computer access.

Secondary school agricultural education teachers and students in North Carolina and Virginia had access to computer technologies, but the tools were not being used to the extent possible. Computer technologies were used to a greater extent in North Carolina than in Virginia, but the tool primarily used in both states was word processing. Frequent use of computers for word processing by agricultural education teachers also was a finding of Nordheim and Connors (1997). Miller and Kotrlik (1987); and Zidon (1985) found similar results in their studies of agricultural education teachers' computer utilization.

The goal of using computers in curriculum design, delivery, and evaluation advocated by Anglin (1995) was not widely observed. Likewise, state-level goals in North Carolina and Virginia to utilize instructional technology to enhance learning were not readily observable in the agricultural education programs in these states (North Carolina Department of Public Instruction, 1999; Virginia Department of Education, 1996). Perhaps additional time is needed for strategies such as teacher training, support services, and pilot programs related to instructional technology as described in the educational plans to have observable impact in local schools.

Desktop computer was the technology most used by students and teachers. Word processing was the primary way that teachers used the computer.

Agricultural education programs in North Carolina and Virginia should be used by state departments of education and other agencies as sites for pilot programs designed to integrate instructional technology into secondary school curricula. Teachers in these programs have access to a variety of instructional technology tools, including computer technology. The pilot programs should demonstrate how educational theory could be applied through use of instructional technology. (e. g., use of instructional technology, especially computer technology, to create a learning-centered environment that facilitates student interaction with relevant information through application of cognitive theory.)

State and local strategies to integrate computer technology into the agricultural education curriculum should be guided by educational theory, with goals to enhance the design, delivery, and evaluation of teaching and learning. (e. g., computers can be used to help students develop plans for SAEs – (Supervised Agricultural Experience) research related information, and maintain records of activities that reflect educational progress.)

Agricultural education teachers should focus goals for use of computer technology on improving student learning. Teacher in-service education programs should be planned and conducted for agricultural education teachers in North Carolina and Virginia with a focus on use of instructional technology tools, including computer technology, to enhance learning in the classroom and laboratory and in FFA and SAE.

The goals of the community, parents, and the school should be considered in state and local initiatives to integrate instructional technology, including computer technology, into the agricultural education curriculum. Involvement of stakeholders is needed to support educational innovation.

The aforementioned statements are supported by Layfield and Scalon (1999) who recommended several strategies for technology implementation in agricultural education. One strategy involved

providing inservice training workshops in relation to various technologies to provide teachers with skills to improve student learning. Another involved the assigning of mentors or fellow teachers competent in technology to serve as support mechanisms for teachers having trouble with the new technology. Layfield and Scalon (1999) suggested providing supplemental pay to teachers to attend weekend inservice training. The last recommendation involved school administrators seeking funding through grants, donations, and business partnerships to increase the amount of technological equipment in schools (Layfield and Scalon, 1999). Maney and Brooks (1996) suggest five strategies for technology adoption in education:

1. Get the commitment and support of the superintendent and board of education.
2. Generate and maintain community support by building partnerships and collaborative relationships with parents and other key community leaders.
3. Encourage building principals to take the lead in technology adoption.
4. Realize that teachers are key to technology adoption and take a slow approach to them.
5. Professional development is essential for successful technology adoption, without it, it is a waste of resources to purchase hardware and/or software.

Additional research in agricultural education instructional technology should perhaps be experimental in nature and focus upon how the use of instructional technology actually enhances learning. Special attention should be given to theory-guided initiatives and impact.

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