Instructional Technology Utilization and Availability in North Carolina and Virginia Secondary Agricultural Education Programs

Antoine J. Alston
North Carolina A&T State University

W. Wade Miller
Iowa State University

Introduction/ Rationale

The United States leads the world in agricultural productivity and research. According to Reinventing Agricultural Education for the Year 2020 (a visioning and planning initiative of the National FFA Organization, 1999), the United States leading position in agriculture "lies in part because of its infrastructure for developing and delivery technology, including agricultural education programs in our public schools" (National FFA Organization, 1999). This network of scientist and educators has served the country well, but has begun to show a degree of wear, a great deal of this concerns the rapid pace of change that comes with technological innovation. Current curriculum development initiatives and educational delivery approaches in local school districts around the nation have not kept pace with the rate of technological change that the United States has experienced over the past decade (National FFA Organization, 1999). "Rather than reacting to change as it comes "a passive approach" the agricultural education community must take a proactive stance and look ahead to develop a cohesive vision of its preferred future decade" (National FFA Organization, 1999). The National Research Council (1988) in the book Understanding Agriculture, emphasized that in order for agricultural education to remain viable educators should emulate the best current programs while generating new ways to deliver agricultural education.

The integration of instructional technology into the secondary level of public education has become a major priority of both the North Carolina Department of Public Instruction and the Virginia Department of Education. The Six-Year Educational Technology Plan for Virginia (1996-2000) emerged out of the awareness that technology is not simply equipment, but a systematic treatment of information and instructional content in a specialized way to achieve a specific purpose. Technology according to Virginia's plan is not an end or goal in itself, but a means to achieve the goal of enabling all students to learn to their potential (Virginia Department of Public Education: Division of Technology, 1996). "Teachers must be trained, support services must be provided, pilot studies must be initiated, equipment must be updated and maintained, guidelines must be developed, new technologies must be introduced, and an on-going program of evaluation must be established" (Virginia Department of Public Education: Division of Technology, 1996). Policy-makers in North Carolina also recognize the importance and urgent need for instructional technology infusion into the public educational system (K-12). In 1995, educators in North Carolina, initiated a five-year plan entitled the Long-Range Technology Plan in order to address the need for instructional technology infusion in public education throughout the state (Milken Exchange, 1999). In the Long Range State Technology

Plan (1999) it states that the classroom is the "focal point" for teaching and learning; therefore, the standard for creating technology-supported schools should be centered on it. Two important factors will characterize a technology-supported classroom in North Carolina: 1. Equipped with diverse options for teaching and learning that only technology can offer or make possible, and 2. Managed by a knowledgeable, skilled, and motivated teacher who is both comfortable and creative with technology (North Carolina Department of Public Instruction, 1999).

The North Carolina Technology Commission considers vocational education under which agricultural education is classified, a high priority division for instructional technology infusion. Competency based programs in vocational education will involve instructional technologies in order to prepare students for employment in emerging occupations, for participation in advanced or highly-skilled post secondary education, and with lab experiences that assist them in making informed decisions and in the application of practical life skills (North Carolina Department of Public Instruction, 1999). The North Carolina School Technology Commission's vision for North Carolina students is that "all students will be enabled by technology to solve problems, improve their productivity, and gain the skills necessary to become contributing members of their community and life-long learners" (North Carolina Department of Public Instruction, 1999). With this vision in mind North Carolina secondary agricultural educators must prepare themselves for this emerging wave of change. For both the states of North Carolina and Virginia instructional technology infusion into agricultural education is vital.

Theoretical Framework

"Computerized instruction should be included in secondary vocational agriculture programs to teach computer literacy, a needed skill in agricultural occupations, and to enhance student learning" (Rodenstein & Lambert, 1982, p. 41). Research on how agricultural education teachers utilize computer technology in their programs is essential to the overall vitality of the agricultural education profession. Miller and Kotrlik (1987) found that agricultural education teachers mainly used computers to manage grades, classes, and teaching materials. In contrast, Nordheim and Connors (1997) found the majority of agricultural education programs in the northwest using computers for instructor related task such as writing tests, creating class assignments, student grades, correspondence, and curriculum development. 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) also surveyed northwest agricultural education teachers to determine the types of software used in agricultural education programs and their frequency of use with each type of software. The categories of software included: word processing, graphics presentations, spreadsheet programs, data base programs, financial software, Internet navigators, drafting programs, and course grading software. The majority of programs utilized some form of word processing software (Word Perfect, MS Word), with a great majority (57%) indicating daily use of the word-processing software. Microsoft PowerPoint (31%) was the most utilized graphics program, in comparison to 8% who used Word Perfect Presentations. On the average, agriculture teachers reported weekly use of graphics presentation software. Microsoft Excel was the major spreadsheet program utilized (35.6%), with the majority of agriculture programs reporting weekly use of spreadsheet programs. Microsoft Access was the most utilized database

program with the majority of programs (26%) reporting daily use of database programs. Netscape Navigator was the most used Internet software (36.7%), with the overwhelming majority of agriculture programs reporting using the Internet daily.

Thompson and Connors (1998) conducted a study on the use of Internet by vocational education teachers in Idaho. The majority of teachers (40.3%) reported having used email "quite regular" in their programs. Vocational teachers reported using the Internet "sometime" for personal development, classroom instruction, and lesson planning in their programs. Holton and Newman (1996) suggested four ways in which the World Wide Web could be utilized in secondary agricultural education programs and the FFA: 1. As a source of instructional material to be used by the instructor in program planning, 2. As an instructional aid that provides research training for the students, 3. As a public relations tool that allows the placing of accomplishments and/or useful information on line for others to access, and 4. As a means for agricultural education programs and students to share information about what they are doing and learning.

In addition to instructional technology utilization, access to technology has become a major area of concern in the agricultural education community. In President Clinton's 1998 State of the Union Address, he stated that the day is not far off that 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). Access to instructional technology is a major concern of agricultural educators and administrators nationwide (Miller & Miller, 1998; Nordheim & Connors, 1997; Layfield & Scanlon, 1999; Thompson & Connors, 1998). Nordheim and Connors (1997) in a study of Northwest agriculture teachers found that the majority of secondary agriculture programs had access to computers. In relation to Internet technology access, secondary agricultural education programs are becoming increasingly connected to the Internet. Thompson and Connors (1998) in a study of Internet use by vocational education teachers in Idaho found 44% of teachers could gain access to the Internet at both school and at home. "Of the access locations at school, the library was highest at 77%, followed by the computer lab at 73%, their classroom (62%), and their office at 32%" (Thompson and Connors, 1998, p. 289).

Purpose and Objectives

The purpose of this descriptive/correlational study was to evaluate instructional technology availability and use in secondary agricultural education curricula in North Carolina and Virginia. Objectives of the study were:

1. To determine the frequency of utilization of various forms of instructional technology in secondary agricultural education curricula.

2. To determine the access agricultural education teachers have to various forms of instructional technology in their facilities.

3. To determine the perceptions of agricultural education teachers toward the implementation and utilization of various forms of instructional technology in secondary agricultural education curricula.

4. To determine the demographic and program characteristics of secondary agricultural education teachers in North Carolina and Virginia.

Methodology

An instrument was developed by the researcher based on the objectives of the study. Questions were adapted and modified from previous studies by the Instructional Technology Department of the Kansas City Public School District (1997), and Murphy and Terry (1998). Additional questions were added by the researcher to meet the research objectives. The completed instrument consisted of four sections, with section one consisting of two subsections. The sections were titled: Section I: (A) instructor's utilization of instructional technology tools, (B) student' utilization of instructional technology tools, Section II: access to selected instructional technology, Section III: priority of major goals for the use of computer technology, and Section IV: demographic and program variables. Sections one through three contained Likert-type items, while section four contained a mixture of open-ended questions and Likert-type items. The validity of the instrument was established by means of content and face validity. A panel of experts constituting the researchers graduate committee analyzed the instrument for content validity. Face validity was established during a pilot study consisting of 40 Iowa secondary agriculture teachers. On April 15, 1999, 40 Iowa secondary agriculture teachers were mailed a preliminary survey and given two weeks to complete and return the survey. After two weeks sixteen surveys had been returned. After all pilot surveys had been collected, instrument reliability was determined by utilizing Chronbach's Coefficient Alpha. Chronbach's Coefficient Alpha for sections one through three was .79, .87, and .75 respectively. After the reliability level was determined, a few questions were deleted and others adjusted.

The population for this descriptive survey study consisted of secondary agriculture teachers in North Carolina and Virginia that were listed in the 1998-99 North Carolina Agricultural Education Directory (N = 370) and Virginia Vocational Agriculture Teacher's Association Directory (N = 313). Based on Krejcie and Morgan's (1970) formula for a 5% margin of error, a random sample of 242 would be required for a population of this size. As is the nature of survey research a certain loss rate can be expected. In an attempt to achieve the target sample size of 242, the researcher investigated the return rate of similar studies in agricultural education in the area of instructional technology. Thompson and Connors (1998) obtained a 70% return rate, Layfield and Scanlon (1999) realized a 46% return rate, Nordheim and Connors (1997) received a 72% return rate, and Miller and Miller (1998) obtained return rates of 73% and 66% respectively. After a thorough analysis of these studies the researcher concluded that 65% could be expected to be returned. In order to account for the potential loss rate, 380 agricultural teachers were sampled. This sample size was calculated by taking the desired return rate of 65% and the target sample size of 242 into account. Two hundred forty-two comprises 65% of 380; by utilizing this logic the researcher was more confident in obtaining the target return of 242 agricultural education teachers across both states. The Statistical Package for the Social Sciences, Personal Computer Version 7.0, and Microsoft Excel were used to generate random numbers for the sample selection. The stratified random sample was drawn from the population of agricultural education teachers in North Carolina (N = 370) and Virginia (N = 313). After the random numbers were generated 210 agricultural education teachers from

North Carolina and 170 from Virginia were selected for the study. Elements of Dillman's Total Design Method (1978) were utilized to achieve an optimal return rate. On May 21, 1999, 380 surveys were mailed to randomly selected teachers across the states of North Carolina and Virginia. Along with the survey, and return stamped envelope, teachers received a cover letter from the researcher and researcher's major professor outlining the purpose of the research. In addition to these materials, teachers from North Carolina also received a letter from the North Carolina - State Agricultural Education Director, in support of this research. Teachers in Virginia received a similar letter from the chairperson of the agricultural education department at Virginia Polytechnic and State University. After two weeks, 122 surveys had been received. A follow-up letter was mailed to non-respondents, after two more weeks 43 more surveys had been received. On June 17, 1999, 225 surveys were mailed to all non-respondents along with another cover letter and a return stamped envelope. Non-respondents were given a deadline of July 31, 1999 to return the survey.

By July 1, 1999, 40 more surveys had been received for a final return rate of 53% (200 surveys). Readers should note that even though only 200 surveys were returned of the 380 mailed, 200 comprised 83 % of the target goal of 242. This was considered highly acceptable by the researcher. Of the 200 surveys that were returned 195 were useable (NC = 85, VA = 110). Five surveys were lost due to frame error, and five surveys were returned unusable, mainly due to being incompletely filled out. Non-response error was handled by utilizing the "double-dip procedure" (Miller and Smith, 1983). Ten percent of the non-respondents were telephoned and asked selected questions from the survey. After this was accomplished t-test were conducted to compare the answers of respondents versus non-respondents, no statistically significant differences could be found between the two groups.

Findings

Table 1 presents the means, standard deviations, and rankings on the frequency of utilization of various forms of instructional technology by North Carolina and Virginia secondary agricultural education teachers. For purpose of data analysis readers should interpret the scales for tables 1 and 2 utilizing the following specifications: 1- 1.49 = none, 1.50 - 2.49 = 1- 30 minutes, 2.50 - 3.49 = 31 - 60 minutes, 3.50 - 4.49 = 61 - 90 minutes, 4.50 - 5.00 = more than 90 minutes. Videotapes and television were ranked the most high as being utilized between 1-30 minutes per day for daily instructional activities. Agriculture teachers in both North Carolina and Virginia also ranked desktop computers, compact disk, and laser printers as being utilized between 1-30 minutes per day for daily instructional activities. The Internet and email were also technologies ranked by agricultural education teachers as being utilized at least 1-30 minutes per day in North Carolina and Virginia.

Table 2 shows the means, standards deviations, and rankings for the frequency of utilization North Carolina and Virginia secondary agricultural education students had in relation to selected instructional technology tools. Technologies such as videotape and television were ranked the most high as being utilized between 1-30 minutes per day by North Carolina and Virginia secondary agriculture students for instructional activities. Secondary agriculture students also ranked desktop computers as being utilized between 1 - 30 minutes daily in North Carolina and Virginia.

Table 3 presents the means, standard deviations, and rankings for statements related to the access North Carolina and Virginia secondary agricultural education teachers had in relation to selected instructional technology tools. For the purpose of data analysis readers should utilize the following specifications for interpreting the scale for table 3: 1 - 1.49 = Constant classroom access, 1.50 - 2.49 = No classroom access, but adequate access in my building, 2.50 - 3.49 = In building but not easily accessible to me, 3.50 - 4.49 = No access in building. Videotape, television, and desktop computers were considered to be the most accessible technologies for North Carolina and Virginia agricultural education teachers. Video cameras, CD-ROM, laser printers, the Internet, and email were technologies that were considered relatively accessible to North Carolina and Virginia agricultural education teachers.

Table 1. *North Carolina and Virginia Secondary Agricultural Education Teachers' Utilization of Instructional Technology Tools (n = 195)*

North Carolina				**Virginia**			**Total**		
Instructional Tool	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**
Videotape	1.89	.71	2	1.72	.73	2	1.79	.72	2
Television	1.71	.78	4	1.55	.75	4	1.62	.77	4
Video Camera	1.25	.49	8	1.21	.51	11	1.23	.50	9
Laser Disk Player	1.13	.43	12	1.38	.83	6	1.27	.70	7
Desktop Computer	2.21	1.07	1	1.87	1.15	1	2.02	1.13	1
Laptop Computer	1.18	.44	10	1.24	.51	9	1.21	.48	11
CD-ROM	1.55	.66	5	1.50	.82	5	1.52	.76	6
Digital Camera	1.15	.36	11	1.33	.61	7	1.25	.52	8
Full Page Scanner	1.22	.56	9	1.21	.49	11	1.22	.52	10
Laser Printer	1.52	.77	6	1.56	.91	3	1.54	.85	5
Computer Projector	1.25	.69	8	1.22	.56	10	1.23	.62	9
LCD Panel	1.27	.73	7	1.27	.60	8	1.27	.66	7
Internet	1.79	.99	3	1.72	.89	2	1.75	.93	3
Email	1.55	.78	5	1.50	.69	5	1.52	.73	6
DTN or Farm Dayta	1.22	.73	9	1.19	.44	12	1.21	.58	11

Note: Based on scale: 1 = none, 2 = 1-30 minutes, 3 = 31-60 minutes, 4 = 61-90 minutes, 5 = more than 90 minutes

Table 2. *North Carolina and Virginia Secondary Agricultural Education Student's Utilization of Instructional Technology Tools (n = 195)*

	North Carolina			Virginia			Total		
Instructional Tool	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**
Videotape	1.69	.62	1	1.65	.69	2	1.67	.66	2
Television	1.53	.65	4	1.57	.71	3	1.55	.68	3
Video Camera	1.15	.39	10	1.22	.50	8	1.19	.45	8
Laser Disk Player	1.07	.30	13	1.22	.55	8	1.15	.46	11
Desktop Computer	1.69	.86	2	1.67	.78	1	1.68	.81	1
Laptop Computer	1.16	.37	9	1.19	.39	10	1.18	.38	9
CD-ROM	1.39	.62	5	1.43	.64	4	1.41	.63	5
Digital Camera	1.06	.24	14	1.18	.47	11	1.13	.39	13
Full Page Scanner	1.16	.43	9	1.19	.44	10	1.18	.44	9
Laser Printer	1.31	.60	6	1.27	.56	7	1.29	.57	7
Computer Projector	1.11	.49	12	1.17	.47	12	1.14	.48	12
LCD Panel	1.19	.68	8	1.16	.42	13	1.17	.55	10
Internet	1.55	.78	3	1.41	.58	5	1.47	.68	4
Email	1.28	.75	7	1.38	1.11	6	1.34	.97	6
DTN or Farm Dayta	1.13	.51	11	1.21	.53	9	1.17	.52	10

Note: Based on scale: 1 = none, 2 = 1-30 minutes, 3 = 31-60 minutes, 4 = 61-90 minutes, 5 = more than 90 minutes

Table 3. *North Carolina and Virginia Secondary Agricultural Education Teachers' Access to Selected Instructional Technology Tools (n = 195)*

	North Carolina			Virginia			Total		
Instructional Tool	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**
Videotape	1.20	.65	13	1.36	.71	13	1.29	.69	12
Television	1.19	.65	14	1.30	.58	14	1.25	.61	13
Video Camera	2.20	1.03	7	2.02	.95	8	2.10	.99	6
Laser Disk Player	2.79	1.13	4	2.57	1.10	3	2.67	1.12	3
Desktop Computer	1.25	.60	12	1.52	.82	12	1.40	.74	11
Laptop Computer	2.75	1.19	5	2.42	1.24	4	2.56	1.23	4
CD-ROM	1.62	.94	11	1.79	1.01	10	1.72	.98	10
Digital Camera	2.81	1.11	3	2.36	1.16	6	2.56	1.15	4
Full Page Scanner	2.58	1.15	6	2.29	1.09	7	2.42	1.12	5
Laser Printer	2.01	1.12	8	2.02	1.11	8	2.02	1.11	7
Computer Projector	2.78	1.12	5	2.39	1.10	5	2.56	1.12	4
LCD Panel	2.95	1.12	2	2.62	1.21	2	2.76	1.18	2
Internet	1.81	.98	10	1.80	.97	9	1.81	.97	9
Email	1.99	1.10	9	1.71	.92	11	1.83	1.01	8
DTN or Farm Dayta	3.02	1.23	1	2.75	1.36	1	2.87	1.31	1

Note: Based on 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

Table 4 presents the means, standard deviations, and rankings for statements related to the priority of major goals for the use of computer technology, in relation to the daily instructional activities of secondary agricultural education programs in North Carolina and Virginia. For purpose of data analysis readers should interpret the scale for table 4 utilizing the following specifications: 1 - 1.49 = Very Low Priority, 1.50 - 2.49 = Low Priority, 2.50 - 3.49 = Moderate Priority, 3.50 - 4.49 = High Priority, 4.50 - 5.00 = Very High Priority. North Carolina and Virginia secondary agricultural education teachers considered technologies such as word processing software, databases, reference software, spreadsheets, content area tutorial/drill and practice software, and the Internet to be essential tools for their daily instructional activities

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

Table 4. *North Carolina and Virginia Secondary Agricultural Education Teachers' Priority of Major Goals for the Use of Computer Technology (n = 195)*

	North Carolina			Virginia			Total		
Computer Utilization Categories	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**	**Mean**	**SD**	**Rank**
Information access and research:	3.14	1.08	2	2.46	1.32	4	2.76	1.26	2
Internet Research CD-ROM	2.74	1.10	5	2.29	1.28	7	2.49	1.22	7
Software Reference Software	2.81	1.19	3	2.27	1.19	8	2.51	1.20	6
Communications Email	2.65	1.37	6	2.26	1.47	9	2.43	1.44	8
Chat Rooms Discussion	1.42	.73	12	1.33	.76	13	1.37	.74	13
Groups	1.76	1.10	11	1.48	.82	12	1.61	.96	12
Data/Information Analysis	2.76	1.51	4	2.39	1.29	5	2.55	1.40	4
Databases Spreadsheets	2.39	1.29	7	2.48	1.27	3	2.54	1.24	5
Graphing Software	2.16	1.16	10	1.83	1.03	11	1.97	1.10	11
Publication/Information	3.73	1.29	1	3.70	1.44	1	3.71	1.38	1
Production Word Processing	2.25	1.19	9	2.23	1.32	10	2.24	1.27	10
Web Page Production	2.26	1.26	8	2.33	1.38	6	2.30	1.33	9
Draw/paint programs									
Content area tutorials or Drill and practice	2.76	1.28	4	2.57	1.35	2	2.66	1.32	3

Note: Based on scale: 1 = Very Low Priority, 2 = Low Priority 3 = Moderate Priority, 4 = High Priority, 5 = Very High Priority

Conclusions

The majority of instructional technologies utilized in North Carolina and Virginia secondary agricultural education programs between 1 - 30 minutes per day were computer related technologies such as desktop computers, CD-ROM's, laser printers, Internet, and email. This would indicate that North Carolina and Virginia secondary agricultural education considered computer technologies to be an essential component of their daily instructional activities. Perhaps desktop computers were utilized for activities such as writing tests, creating class assignments, student grades, correspondence, and curriculum development. Technologies such as CD-ROM's and the Internet more than likely were utilized for research to develop curriculum materials for secondary agricultural education students. Email could have been utilized by secondary agricultural education teachers in North Carolina and Virginia to

correspond with other agriculture teachers, university agricultural education personnel, legislators, and agricultural businesses about issues concerning their respective secondary agriculture programs. Secondary agricultural education teachers in North Carolina and Virginia for daily instructional activities utilized other instructional technologies such as videotapes and television between 1 - 30 minutes. Technologies such as these were more than likely utilized by North Carolina and Virginia secondary agricultural education teachers to present programs concerning issues impacting the agriculture industry not only nationally but from the international perspective as well.

North Carolina and Virginia secondary agricultural education teachers indicated that their students utilized desktop computers between 1 - 30 minutes per day for instructional activities. The most interesting finding concerned Internet use. North Carolina secondary agricultural education students were more likely to utilize the Internet between 1 - 30 minutes per day for instructional activities, than Virginia secondary agricultural education students. Perhaps North Carolina secondary agricultural education teachers placed a higher priority upon Internet utilization for daily instructional activities than did Virginia secondary agricultural education teachers (Table 1). In relation to desktop computer utilization by North Carolina and Virginia secondary agricultural education students, more than likely the instructional task centered around word processing, database, spreadsheet, or content area tutorial/drill and practice software's (Table 4). Overall, North Carolina and Virginia secondary agricultural education teachers realized the importance of desktop computers for their students' daily instructional activities.

Overall, North Carolina and Virginia secondary agricultural education teachers had adequate access to the majority of instructional technologies surveyed. The greatest access centered around television and videotape. This is supported by the aforementioned findings of North Carolina and Virginia secondary agricultural education teachers and students' utilization of these instructional technologies. Perhaps this can also be attributed to the low cost of VCR's. Computer related technologies such as laser printers, desktop computers, email, Internet, and CD-ROM's were all adequately accessible to North Carolina and Virginia secondary agricultural education teachers. Again as with videotape and television this degree of access is supported by the amount of time North Carolina and Virginia secondary agriculture education teachers indicated utilizing these technologies.

North Carolina and Virginia secondary agricultural education teachers considered information access and research software such as the Internet and reference software to be a priority in their daily instructional activities. Perhaps North Carolina and Virginia secondary agricultural education teachers are utilizing the Internet and reference software for acquiring problem solving and decision-making skills. With the aim of education moving toward a constructivist environment, students should be provided with every opportunity to practice problem solving skills and decision-making skills teacher (Simonson & Thompson, 1997). Lastly content area tutorial/ drill and practice software was considered to be a priority in North Carolina and Virginia secondary agricultural education programs. Perhaps North Carolina and Virginia secondary agricultural education teachers understood the importance of repetition and practice in order for students to master the competencies as outlined in their respective curricula.

Recommendations

1. In order to improve access to the instructional technologies included in this research study, school administrators should provide adequate facilities so these technologies may be efficiently utilized. This can either be done through the construction of new facilities or the renovation of existing facilities.

2. North Carolina and Virginia secondary agricultural education teachers should educate school administrators and legislators concerning the need funding to equip their agriculture programs with the latest in instructional technology equipment. Constant classroom access to instructional technology is imperative for instructional technology to have a significant impact upon secondary agriculture students. Alternative funding for instructional technology should also be sought through local agricultural businesses.

3. Technologies such as the Internet, spreadsheets, databases, reference software, word processing software, live television, videotape, and content area tutorials/drill and practice software should be more actively utilized to encourage problem solving and critical thinking skills in relation to agricultural concepts in daily instructional activities. This utilization should be implemented with the aid of constructivist principles.

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