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

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Abstract

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

Introduction

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

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

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

Theoretical Framework

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

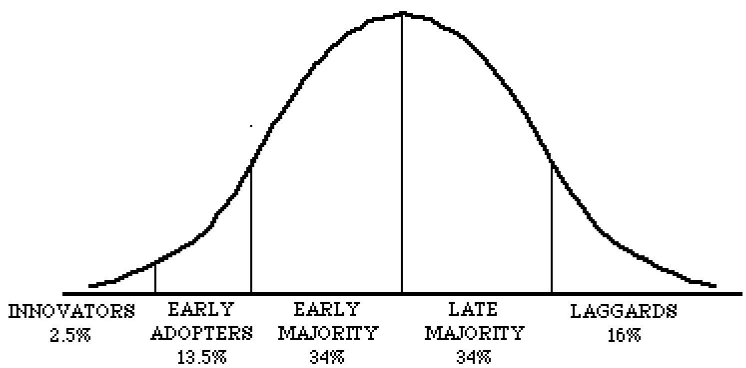

Figure 1. Bell shaped curve showing categories of individual innovativeness and percentages within each category

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

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

Purpose and Objectives

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

Methodology

An instrument was developed by the researcher based on the objectives of the study. Questions were adapted and modified from previous studies by the Instructional Technology Department of the Kansas City Public School District (1997), and Murphy and Terry (1998). Additional questions were added by the researcher to meet the research objectives. Additional questions were added by the researcher to meet the research objectives. The completed instrument consisted of six sections, with sections one, three, four, and six consisting of two subsections each. The sections were titled: Section I.: (A) instructor's utilization of instructional technology tools, (B) student's utilization of instructional technology tools; Section II.: access to selected instructional technology; Section III: (A) computers in your classroom and home, (B) priority of major goals for the use of computer technology (this subsection consisted of six mini-sections); Section IV: (A) benefits of instructional technology, (B) barriers to instructional technology; Section V.: instructional technology's future role in agricultural education; and Section VI.: (A) personal characteristics, (B) program characteristics. Sections one, two, three, four, and five contained Likert-type items, while section six contained a mixture of open-ended questions and Likert-type items. The validity of the instrument was established by means of content and face validity. A panel of experts with experience in instructional technology analyzed the instrument for content validity. Face validity was established during a pilot study consisting of 40 Iowa secondary agriculture teachers. On April 15, 1999 40 Iowa secondary agriculture teachers were mailed a preliminary survey and given two weeks to complete and return the survey. After two weeks sixteen surveys had been returned. After all pilot surveys had been collected; instrument reliability was determined by utilizing Chronbach's Coefficient Alpha. Chronbach's Coefficient Alpha for sections one through five where .76, .80, .75, .89, and .84 respectively. After the reliability level was determined, a few questions were deleted and adjusted. In order to allow for correlational analysis, variables in each section of the survey, particularly subsections, and mini-sections of the survey were summated to form twelve different constructs in order to allow for comparisons with selected demographic and program variables.

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

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

Findings

Objective One

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

Objective Two

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

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

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

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

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

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

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

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

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

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

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

**p = <.05 (Pearson)*

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

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

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

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

Table 5 shows Pearson correlations between years of teaching secondary agriculture and selected instructional technology variables. Variables ranged in magnitude from negligible to low. One significant relationship was found between years of teaching secondary agriculture and selected instructional variables. The fewer years a person has been teaching secondary agricultural education, the more likely they are to place a priority on using publication/information production software for daily instructional activities. Overall the amount of years a person has been teaching secondary agricultural education has little association with selected instructional technology variables.

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

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

**p = <.05 (Pearson)*

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

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

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

**p = <.05 (Pearson)*

Table 7 shows the Pearson correlations between FFA membership and selected instructional technology variables. Pearson correlations ranged in magnitude from negligible to low. Two significant relationships were found between FFA membership and selected instructional technology variables. Specifically, the less an agriculture program's FFA membership was, the more likely the agriculture teacher was to use graphing software in their daily instructional activities. Additionally, the less a program's FFA membership was, the more likely the agriculture teacher was to utilize content area tutorials or drill and practice software. Additionally, the less a program's FFA membership was, to utilize content area tutorials or drill and practice software.

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

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

**p = <.05 (Pearson)*

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

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

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

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

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

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

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

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

Conclusions

In relation to the association between program characteristics/demographic variables and selected instructional technology variables in secondary agricultural education curricula in North Carolina and Virginia, associations ranged in magnitude from low to negligible. This finding indicates that the selected demographic and program variables are very weak characteristics to be utilized in developing an instructional technology profile of secondary agricultural education programs in North Carolina and Virginia. In relation to the diffusion of innovation theory, agricultural educators in this study seemed to exhibit characteristics of the late majority and laggard categories in relation to their instructional technology profile. Perhaps agricultural teachers in this study did not see the relative advantage and compatibility of instructional technology innovation, which are major components of the diffusion of innovation theory, components which could contribute to agricultural teachers becoming change agents, change aides, and opinion leaders in the profession.

Recommendations

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

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

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

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

Implications

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

References

Alston, Antoine, Miller, Wade. (January 2001) "Analyzing the barriers and benefits toward instructional technology infusion in North Carolina and Virginia secondary agricultural education curricula." *Journal of Southern Agricultural Education Research [CD-ROM]*

Dillman, D.A. (1978). *Mail and telephone surveys: The total design method.* New York: John Wiley & Sons.

Instructional Technology Department of the Kansas City-Kansas City Public School District. (1997) *Technology Survey Results*. Kansas City Public Schools Inc.

Krejcie, R.V. & Morgan, D.W. (1970) Determining sample size for research activities. *Educational Psychological Measurement,* 30. 607-610

Layfield, Dale K. & Scanlon, Dennis C. (1999). Agriculture teachers' use of the internet: facilitating factors. *Proceedings of the 53rd Annual AAAE Central Region Research Conference & Seminar in Agricultural Education*, St. Louis, MS.

Miller, Larry E. & Smith, Keith (1983). Handling nonresponse issues. *Journal of Extension* September/October Edition

National Research Council. (1998). *Understanding agriculture: New directions for education.* Washington D.C.: National Academy Press.

Nordheim, Gregory J. & Connors, James J. (1997). The perceptions and attitudes of northwest agriculture instructors towards the use of computers in agricultural education programs. *Proceedings of the 24th Annual National Agricultural Education Research Meeting.*, Nevada

North Carolina Agricultural Education Directory. (1998). Raleigh: NCSU Department of Agricultural and Extension Education

Rodenstein, J. & Lambert, R. (1982). *Microcomputers In Vocational Education: Handbook.* Madison, WI: University of Wisconsin-Madison, Vocational Studies Center. (Eric Document Reproduction Service No. ED 239 051)

Rogers, E.M. (1995). *Diffusion of Innovations* (4th ed), New York, NY: The Free Press

Simonson, Michael R. & Thompson, Ann (1997). *Educational Computing Foundations* Columbus, OH: Merrill/ Prince Hall

Thompson, Joseph C. & Connors, James J. (1998). Internet use by vocational education teachers in Idaho. *Proceedings of the 25th Annual National Agricultural Education Research Meeting*, New Orleans, LA

Virginia Vocational Agriculture Teacher's Association (1998). Richmond, VA: VDE