

# **ATTITUDES TOWARD AND STAGES OF ADOPTION OF INFORMATION TECHNOLOGY BY AGRI-SCIENCE TEACHERS IN TEXAS**

Steve Frazee, Texas Tech University  
Davin Frazee, Texas Tech University  
Matt Baker, Texas Tech University  
Lance Kieth, West Texas A&M University

## **Abstract**

The purpose of this study was to assess Texas Agri-Science teachers' attitudes toward and stages of adoption of information technologies such as computers for professional productivity, computers for classroom use, electronic mail, and the Internet. The study also determined what relationships, if any, existed between demographic and program variables with teachers' attitudes and stage of adoption. Rogers' (1995) Diffusion of Innovations Theory was used to guide the study.

The subjects had favorable attitudes toward all forms of information technology, with the highest attitude toward the Internet. They also perceived themselves in advanced stages of adoption of information technologies. The study participants also supported on-line activities such as FFA contest registration and award applications. High correlations were discovered between computer anxiety, computer importance, computer use outside the classroom, and home access with attitudes and adoption.

The adoption of computers, electronic mail, and the Internet has reached critical mass among selected Texas Agri-Science teachers. Results of the study have implications for the education, implementation of on-line activities, and communication with Texas Agri-Science teachers for stakeholders in the field.

## Introduction

The exponential growth of technology over the past decade has changed our world forever. Without computers, electronic mail, and the Internet many of us would not be able to perform everyday duties and tasks. The computer has permeated our professional and private lives by making communication, word processing, presentations, and many other tasks as simple as point and click. Phrases like “www,” “hotmail,” and “dot-com” and exchanging electronic mail addresses are now commonplace, as web sites give us the most current, extensive source of information available.

New technologies hold a great promise for improvements in the field of agricultural education. Technology, in the form of computers and the Internet within the classroom, has been shown to increase student performance and provides the teacher with powerful tools for information gathering, communication, and presentation (Sion, 1998; Lewis, 1998; Baker & Blue, 1999).

Evidence that Agri-Science teachers in Texas have adopted computers and information technology has been unreported in the literature over the past decade. A study by Brown, Townsend, and Carnes (1985) found that 19.7% of Texas Agricultural Science Teachers used microcomputers in their programs and a similar study by Cepica et al., (1984) reported that 26.73% of Texas Agri-Science teachers used computers for their classes. More recently, a nationwide survey of Agriculture teachers reported that 72.08% used computers in their programs, but only 26% of all the teachers had a computer with a modem (Birkenholz & Stewart, 1991). A brief investigation into the *2000-2001 Directory of Agricultural Science Teachers* (TEA, 2000) shows that roughly 51% of all Texas Agri-Science teachers reported their email addresses in the directory. Compared to 29% (TEA, 1999) the previous year and 5% (TEA, 1998) during the 1998-99 school year, this indicates that Texas Agri -Science teachers are quickly adopting and using electronic mail technology at increasing rates.

Harris (1997) suggested that teacher adoption of information technology could be better understood in the context of the Diffusion of Innovations Theory. Everett Rogers' (1995) Diffusion of Innovations Theory has been used for many years to explain the adoption of innovations such as information technology, and is utilized to guide this study. The innovation-decision process is an information-seeking and information-processing activity in which an individual obtains information in order to decrease uncertainty about the innovation. Potential adopters must learn about the innovation (Knowledge Stage) through the different communication channels; next they must be persuaded of the value of the innovation (Persuasion Stage); they then must decide to adopt it (Decision Stage); the innovation must then be implemented (Implementation Stage); and finally, the decision must be reaffirmed or rejected (Confirmation Stage).

Russell (1995) proposed that adult learners pass through six stages of technology adoption. He suggested that learners could begin at any stage and progress at their own rates. With Rogers' (1995) model in mind, Russell presented stages of technology adoption with email as a base. Russell's research found the stages of (1) awareness, (2) learning the process, (3) understanding the application of the process, (4) familiarity and confidence, (5) adaptation to other context, and (6) creative applications to new contexts. Table 1 exhibits the similarities between the two researchers' stages of adoption as used for this study.

Table 1: Rogers' and Russell's Stages of Adoption

Rogers' Stages	Russell's Stages
I. Knowledge Stage	Stage 1: Awareness
II. Persuasion Stage	Stage 2: Learning the Process
III. Decision Stage	Stage 3: Understanding and Application
IV. Implementation Stage	Stage 4: Familiarity and Confidence
V. Confirmation Stage	Stage 5: Adaptation to other contexts
	Stage 6: Creative application

Source: Based on Rogers' (1995) and Russell's (1995) Stages of Technology Adoption.

Adoption of the computer and Internet by Texas educators has increased over the past decade, with contributions from many factors. One of the most contributing factors is the increased access to information and communication technology such as electronic mail, discussion groups, newsgroups, and the Internet. Research shows that increased access dismantles some of the differences between the novice and expert users that become barriers to the use of information technology (Mitra, Steffensmeier & Lenzmeier, 1999).

Research also reports that the comfort with the use of computers is related to the use of computers (Gilmore, 1995; Mitra, 1994). The increased access to information technology and the popularization of the home personal computer (U.S. Department of Commerce, 1998) have led to the increased comfort levels over the last decade. The increase in use and computer knowledge has also been a major factor in reducing computer anxiety that serves as a barrier to information technology (Craib et al, 1994).

Researchers (Nantz & Wilkins, 1995; Herling, 1995) have positively correlated the connection between technology use and attitude toward technology. The U.S. Department of Commerce (1998) found level of education and Internet usage highly correlated and that Internet usage rose with age until people reached their senior (55+) years. The Department of Commerce study also found gender differences in access to the Internet and electronic mail use. This "gender gap" is supported by research that cites media stereotyping for a difference in technology use (Knupfer, 1998; Shashanni, 1994). However, the most recent studies report no differences in information technology use between genders (U.S. Department of Education, 2000).

Despite technologies available in schools, many teachers report little or no use of computers for instruction (Pellegrino & Altman, 1997). Cost and "don't want to" have been identified as leading reasons for not accessing the Internet (U.S. Department of Commerce, 1998). Reliability, price, size, and complexity are identified as drawbacks to computer systems (Baker & Blue, 1999). The location of computers within schools (Becker, 1998) and the "computer control issue" have also been identified as barriers to integration (Liu, Macmillan & Timmons, 1998). Teacher training and computer background also has an effect on the adoption of information technology (Mitra et al, 1999; Liu et al, 1998; Pellegrino & Altman, 1997).

### **Purpose/Objectives**

The new technological age has made it important for Agricultural Science teachers to possess high levels of competency with information technology in the classroom. Evidence that Agri-Science teachers in Texas have adopted information technology, such as the Internet and electronic mail, has been unreported in the literature. Information regarding the teachers' attitudes toward and adoption of computers and related technologies should be helpful in

creating improvements to agricultural education programs, teacher education programs, as well as in designing future in-service topics to meet the needs of the teachers. Communication between Agri-Science teachers could also be enhanced by improving the communication with stakeholders such as university faculty, extension personnel, industry specialists, community contacts, as well as other Agri-Science teachers through the use of electronic mail and the Internet.

The following objectives were developed in order to accomplish the purpose of this study:

1. To determine the attitudes of Texas Agri-Science teachers toward the use of information technology including: (a) computers for professional productivity (CPP), (b) computers for classroom use, (c) electronic mail (email), and (d) Internet (WWW).
2. To determine the relationship between the Agri-Science teachers' attitude toward information technology (CPP, CCU, email, WWW) and selected demographics including: (a) age, (b) teaching experience, (c) level of education, (d) computers in Agri-Science classroom, (e) computers in personal office, (f) school classification (size/enrollment), (g) computer use outside of class, (h) computer use inside of class, (i) Internet home access, (j) computer anxiety, and (k) computer importance.
3. To determine at which stage of adoption of information technology (PC, email, WWW) Texas Agri-Science teachers perceive themselves.
4. To identify potential barriers to Texas Agri-Science teachers' adoption of information technology.
5. To determine Texas Agri-Science teachers' support of online activities including: (a) FFA contest registration, (b) FFA Award Applications, (c) FFA rosters, (d) stock show registration, and (e) research questionnaires.

### **Methods/Procedures**

The researcher utilized a non-experimental quantitative research design for this descriptive correlational study (Ary, Jacobs & Razavieh, 1996). The target population included secondary Agri-Science teachers in Texas for the 2000-2001 school year (n = 1,524). The accessible population included the Texas Agri-Science teachers provided by the *Texas Teachers of Agricultural Science & Technology Directory* published by the Texas Education Agency (TEA, 2000) for the 2000-2001 school year. A systematic random sample (n = 310) was selected (Krejcie & Morgan, 1970) from the assessable population according to population size.

A researcher-modified version of the Teachers Attitude Toward Information Technology Questionnaire (Christensen & Knezek, 1996; TCET, 2000) was used to determine Texas Agri-Science teachers' attitudes toward information technology (CPP, CCU, email, WWW). Attitudes toward information technology was measured using Semantic Differential scales. Originally developed by Osgood, Suci, and Tannenbaum (1967), this instrument presents subjects with bipolar or two opposite adjective descriptors for that object. Several adjective pairs are combined to yield an overall score describing subjects' feelings toward the object.

The online version included a section with descriptions of Russell's (1995) Stages of Adoption of Technology and a place for subjects to indicate their self-perceived stage of adoption. The online version was adapted for use as a direct-mail questionnaire and descriptions for each stage were modified by the researcher to address the use of computers, electronic mail, and the Internet.

Face and content validity was achieved by field-testing the instrument among a sample of Texas Agri-Science teachers not included in the random sample (n = 23). Further editing and revision of the researcher-modified instrument was required. Using Cronbach's alpha, high reliability scores (>.90) were calculated on the attitude measurement scales from those participating in the field test.

The data collection procedure followed the Dillman (2000) model for mailed questionnaire administration. Useable questionnaires were returned by 218 of the respondents, for a return rate of 70.32%. Early and late respondents were compared as recommended by Miller and Smith (1983) to control for non-response error. Differences were detected between early and late respondents, restricting the generalizability of the findings to the accepting sample.

Descriptive statistics were used to summarize and analyze the data using SPSS (Version 10.0). Correlations were described using the Davis convention (Davis, 1971).

### Results/Findings

Results of the semantic sub-scales revealed that Texas Agri-Science teachers had favorable attitudes toward all different forms of information technology. The most positive attitude reported was toward the Internet (M = 5.87). All sub-scales scores are reported in Table 2.

Table 2: Attitude Scores Toward Different Forms of Information Technology

Information Technology	n	Mean	Standard Deviation
Computers for Professional Productivity (CPP)	213	5.41	1.13
Computers for Classroom Use (CCU)	214	5.56	1.17
Electronic Mail (email)	213	5.28	1.46
Internet (WWW)	210	5.87	1.08

Note: Score range of 1 to 7, with 7 being the most favorable score possible

Very high correlations were found between attitude toward computers for professional productivity (CPP) and both computer anxiety (r=.72) and computer importance (r=.71). Substantial correlations also were shown toward the other three attitudinal scales and computer anxiety (CCU r=.62, email r=.63, WWW r=.55) and computer importance (CCU r=.63, email r=.58, WWW r=.57). A substantial correlation (r=.50) was found between the attitude toward the Internet and home access to the Internet. Moderate correlations were also found between computer use outside of the classroom and computers for professional productivity (r=.31) and computers for classroom use (r=.30). Correlations between attitudinal scales and selected demographics are reported in Table 3.

Table 3: Summary of Correlation Between Attitudinal Scales and Selected Variables

Selected Demographics	CPP	CCU	Email	WWW
Age (r)	-.16	-.18	-.14	-.19
Teaching Experience (r)	-.19	-.22	-.13	-.22
Level of Education (r <sub>s</sub> )	.03	-.05	-.04	-.02
Computers in Ag-Science classroom (r <sub>phi</sub> )	.50	.41	.54	.46
Computers in personal office (r <sub>phi</sub> )	.45	.40	.45	.39
School Classification (r <sub>s</sub> )	.03	.07	.06	.02
Hourly computer use outside of class (r)	.31	.30	.28	.24
Hourly computer use inside of class (r)	.29	.24	.23	.20
Internet Home Access (r <sub>phi</sub> )	.41	.48	.48	.50
Computer Anxiety (r)	-.72	-.62	-.63	-.55
Computer Importance (r)	.71	.63	.58	.57

Note: \* Correlation significant at .05 level (2-tailed), r = Pearson product moment correlation coefficient, r<sub>phi</sub> = Point Biserial coefficient, r<sub>s</sub> = Spearman rank-order correlation coefficient

Respondents were given explanations of Russell's Stages of Technology Adoption within the instrument and asked to respond with their own stage of adoption of computers, email, and the Internet. The six stages are arranged with Stage 1: Awareness being the stage of least adoption, to Stage 6: Creative Application being the highest stage of adoption.

Respondents reported having the highest level of adoption of the Internet (4.28) and the lowest adoption of email (4.03). Agri-Science teachers' mean stage of adoption and standard deviations are reported in Table 4.

Table 4: Summary of the Stages of Adoption of Information Technology

Information Technology	Mean Stage of Adoption	Standard Deviation
Personal Computer (PC)	4.07	1.34
Electronic mail (email)	4.03	1.46
Internet (WWW)	4.28	1.36

Note: Score ranges from 1 to 6, with 6 being the most advanced adoption stage

Over a quarter (25.56%) of respondents reported being in Stage 4 (Familiarity/Confidence) in the adoption of personal computers. Only 2.29% perceived themselves in the last stage of adoption. Frequency and percents are provided in Table 5.

Table 5: Summary of Personal Computer Stages of Adoption

Personal Computer (PC) Stage of Adoption	Frequency	Percent	Cumulative Percent
Stage 1: Awareness	5	2.29	2.29
Stage 2: Learning	23	10.55	12.84
Stage 3: Understanding/Application	48	22.02	34.86
Stage 4: Familiarity/Confidence	56	25.69	60.55
Stage 5: Adaptation	47	21.56	82.11
Stage 6: Creative Application	39	17.89	100.00

More respondents (26.15%) perceived themselves in Stage 4: Familiarity/Confidence of electronic mail adoption than in any other stage. Only 7.34% of respondents perceived themselves in the lowest stage of adoption. Table 6 summarizes responses to Agri-Science teachers' electronic mail stage of adoption.

Table 6: Summary of Electronic Mail Stages of Adoption

Electronic Mail Stage of Adoption	Frequency	Percent	Cumulative Percent
Stage 1: Awareness	16	7.34	7.34
Stage 2: Learning	19	8.72	16.06
Stage 3: Understanding/Application	36	16.51	32.57
Stage 4: Familiarity/Confidence	57	26.15	58.72
Stage 5: Adaptation	51	23.39	82.11
Stage 6: Creative Application	39	17.89	100.00

The modal stage of adoption of the Internet was Stage 5: Adaptation (28.44%). Stage 1: Awareness was the lowest response (3.67%). Frequency and percentages are recorded in Table 7.

Table 7: Summary of Internet Stages of Adoption

Internet Stage of Adoption	Frequency	Percent	Cumulative Percent
Stage 1: Awareness	8	3.67	3.67
Stage 2: Learning	16	7.34	11.01
Stage 3: Understanding/Application	36	16.51	27.52
Stage 4: Familiarity/Confidence	50	22.94	50.46
Stage 5: Adaptation	62	28.44	78.90
Stage 6: Creative Application	46	21.10	100.00

The open-ended question, "What factor most limits your use of information technology, such as computers, email, or the Internet?" solicited responses that were distributed into one of eight categories. The categories of barriers to adoption were: time, knowledge, availability, hardware/software problems, cost, interest, none, and other. Time was recorded as the most frequent response (41.51%) followed by knowledge (22.01%) and availability (19.50%). The frequencies and percentages of responses are found in Table 8.

Table 8: Potential Barriers to the Adoption of Information Technology

Barrier	Frequency	Percent
Time	66	41.51
Knowledge	35	22.01
Availability	31	19.50
Hardware/Software Problems	15	9.43
Cost	11	6.92
Interest	6	3.77
None	6	3.77
Other	7	4.40

Note: Multiple responses included, n = 159

Respondents were asked simple dichotomous questions on the instrument to determine their support of online activities such as online registration of stock show entries, online FFA contest registration, online FFA award applications, online FFA rosters, and research questionnaires via email or Internet.

A majority of respondents supported all online activities. FFA contest registration received the most support (85.58%), and online research questionnaires reported the least support (72.99%). Table 9 reports frequency and percent of responses.

Table 9: Summary of Agri-Science Teachers' Support of Online Activities

Online Activity	Percent Support
Online FFA Contest Registration *	85.58
Online FFA Award Applications *	81.40
Online FFA Roster **	82.71
Online Stock Show Registration *	78.14
Online Research Questionnaires ***	72.99

Note: \*n = 215, \*\*n = 214, \*\*\*n = 211

### Conclusions/Recommendations

The researchers would caution readers from over generalizing the results beyond the accepting sample. Based upon the findings of this study, several conclusions can be made:

1. Agri-Science teachers participating in the study have a positive attitude toward computers for professional productivity, computers for classroom use, electronic mail, and the Internet.
2. Home access plays a significant role in adoption of the Internet.
3. The time requirement of learning how to use information technologies serves as a significant barrier to adoption.
4. Teachers are aware and beginning to fully adopt information technologies.
5. Teachers support online activities such as online FFA contest registration, FFA rosters, FFA award applications, stock-show registration, and research questionnaires.
6. Teachers' attitudes toward information technology are negatively correlated with age and teaching experience.

Based upon the findings of the study, several recommendations can be made:

1. Encourage the FFA and other organizations to implement online activities for Texas Agri-Science teachers.
2. Invite school administrators to allow/encourage Texas Agri-Science teachers to preview information technologies at home on a trial basis before implementing into the classroom.
3. Encourage teacher education programs will to prepare information technology workshops targeting older and more experienced Texas Agri-Science teachers.
4. Increase opportunities for technology training for Texas Agri-Science teachers, especially at their professional improvement conferences.
5. Seek and promote funding opportunities that will increase the number of computers available for classroom and home use by Texas Agri-Science teachers.

6. Encourage teacher education institutions to emphasize the integration of technology into instructional formats that utilize the Internet.
7. Promote the utilization of email and the Internet among stakeholders in Texas Agri-Science teachers for professional correspondence and dissemination of information such as research questionnaires.
8. Advocate replication of this study among different populations within the education discipline.
9. Encourage study of emerging technologies (Instant Messenger, DSL, etc.) and software used by Agri-Science teachers (PowerPoint, Word, etc).

### References

- Ary, D., Jacobs, L. C., & Razavieh, A. (1996). *Introduction to research in education* (5<sup>th</sup> ed.). Fort Worth, TX: Harcourt Brace College Publishers.
- Baker, R. J. & Blue, M. C. (1999). The cost-effective multimedia classroom. *T.H.E. Journal*, 17 (1), 46-50.
- Becker, H. J. (1998). Running to catch a moving train: Schools and information technologies. *Theory into Practice*, 37 (1), 20-30.
- Birkenholz, R. J & Stewart, B. R., (1991). The use of instructional technologies in agricultural education. *The Journal of Agricultural Education*. Summer 1991, 40-48.
- Brown, H. D., Townsend, J. D., & Carnes J. E. (1985). *Personnel training – secondary vocational agriculture teacher education*. College Station: Texas A&M University, Department of Agricultural Education. (ERIC Document Reproduction Service No. ED261 252).
- Cepica, M. J., Stockton, J., Eggenberger, L., Dillingham, J., Igo C. C. & Snodgrass, T. D. (1984). *Integration of computer related instruction in Texas vocational agriculture programs*. Lubbock: Texas Tech University. (ERIC Document Reproduction Service No. ED 256 943).
- Christensen, R. & Knezek, G. (1996). *Constructing the Teachers' Attitudes toward Computers (TAC) Questionnaire*. Paper presented to the Southwest Educational Research Association Annual Conference, New Orleans, Louisiana, January, 1996.
- Crable, E. A., Brodzinski, J. D., Scherer, R. F. & Jones, P. D. (1994). The impact of cognitive appraisal, locus of control, and level of exposure on the computer anxiety of novice computer users. *Journal of Educational Computing Research*, 10(4), 329-340.
- Davis, J. A. (1971). *Elementary survey analysis*. Englewood Cliffs, NJ: Prentice-Hall.
- Dillman, D. (2000). *Mail and Internet surveys: The tailored design method*. New York: John Wiley & Sons.

- Gilmore, A. (1995). Turning teachers on to computers: Evaluation of teacher development program. *Journal of Research on Computing in Education*, 27, 251-269.
- Harris, J. (1997). Who to hook and how: Advice for teacher trainers. *Learning and Leading with Technology*, 24(7), 54-57.
- Herling, T. (1995) *Resistance to the adoption of computer communication technology*. Paper presented at the Communication and Technology Division, International Communication Association annual meeting, Albuquerque, NM, May 1995.
- Knupfer, N. N. (1998). Gender divisions across technology advertisements and the WWW: implications for educational equity. *Theory into Practice*, 37(1), 54-63.
- Krejcie, R. V & Morgan, D. W. (1970) Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.
- Lewis, J. D. (1998). How the Internet expands educational options. *Teaching Exceptional Children*, 30(5), 34-41.
- Liu, X., Macmillan, R. B. & Timmons, V. (1998) Integration of computers into the curriculum: how teachers may hinder student's use of computers. *McGill Journal of Education*, 33(1), 51-69.
- Miller, L. E. & Smith, K. L. (1983). Handling non-response issues. *Journal of Extension*, 21, 45-50.
- Mitra, A. (1994). Instructor-effect in determining effectiveness and attitude toward technology-assisted teaching: Report of a case study. *Journal of Instruction Delivery Systems*, 8(3), 15-21.
- Mitra, A., Steffensmeirer, T. & Lenzmeier, S. (1999). Changes in attitudes toward computers and use of computers by university faculty. *Journal of Research on Computing in Education*, 32(1), 189-202.
- Nantz, K & Wilkins, N. (1995). Faculty use and perceptions of electronic mail: A case study. *Journal of Education for Business*, 70, 196-201.
- Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1967). *The measurement of meaning*. Urbana: University of Illinois Press.
- Pelligrino, J. W. & Altman, J. E. (1997). Information technology and teacher preparation: some critical issues and illustrative solutions. *Peabody Journal of Education*, 71(1), 89-121.
- Rogers, E. (1995). *Diffusion of innovations* (4<sup>th</sup> Edition). New York: The Free Press.

- Russell, A. (1995). Stages in learning new technology: Naïve adult email users. *Computers in Education*, 25(4), 173-178.
- Shashanni, L. (1994). Socioeconomic status, parents' sex-role stereotypes, and the gender gap in computing. *Journal of Research on Computing in Education*, 26(4), 433-451.
- Sion, R.T. (1998). The sixth technological revolution shaping today's high school curriculum. *The Educational Forum*, 62(4), 316-322.
- Texas Center for Educational Technology. (TCET, 2000). *Research, technical reports, and dissertations*. Denton: University of North Texas, Texas Center for Educational Technology. (Online) <http://www.tcet.unt.edu>.
- Texas Education Agency (TEA). (1998). 1998-1999 *Directory: Texas Teachers of Agricultural Science & Technology*. Catalog No. 9000. College Station, Texas: Instructional Materials Service (IMS).
- Texas Education Agency (TEA). (1999). 1999-2000 *Directory: Texas Teachers of Agricultural Science & Technology*. Catalog No. 9000. College Station, Texas: Instructional Materials Service (IMS).
- Texas Education Agency (TEA). (2000). 2000-2001 *Directory: Texas Teachers of Agricultural Science & Technology*. Catalog No. 9000. College Station, Texas: Instructional Materials Service (IMS).
- U.S. Department of Education. (2000). National Center for Education Statistics. *Teachers' tools for the 21<sup>st</sup> century: A report on teachers' use of technology*. NCES 2000-102, Washington, DC:2000.
- U.S. Department of Commerce. (1998). National Telecommunications and Information Administration. Economics and Statistics Administration. *Falling through the net: Toward digital inclusion: A report on Americans' access to technology tools*. Washington, DC: October 2000.

## Attitudes Toward and Stages of Adoption of Information Technology by Agri-Science Teachers in Texas

David Lawver  
Texas Tech University

What are the attitudes of Texas Agri-Science teachers toward the use of information technology (computers for professional productivity, computers for classroom use, electronic mail, and Internet)? What are the relationships between Agri-Science teachers' attitudes and selected demographics (age, teaching experience, level of education, computer availability, school classification, computer use outside of class, computer use inside of class, Internet home access, computer anxiety, and computer importance)? At which stage of adoption do Texas Agri-Science teachers perceive themselves? What are potential barriers to Texas Agri-Science teachers' adoption of information technology? Are Texas Agri-Science teachers supportive of online activities like FFA contest registration, FFA award applications, FFA rosters, stock show registration, and research questionnaires? This study was well designed and carried out for which the authors are to be commended.

This descriptive correlational study was conducted during the 2000-2001 school year and utilized a random sample (310 of 1,524) of Agri-Science teachers from the state of Texas. Over 70% of the sample responded. The authors noted that there were differences between early and late respondents thus limiting generalizability. What differences were noted and what statistical procedure was used to analyze the difference? Additionally, the authors used a procedure recommended by Miller and Smith in 1983. Were other procedures considered for control of non-response error? Is this the most appropriate procedure for this study?

Generally speaking, this study confirmed that computer usage is becoming more and more prevalent in all aspects of Agricultural Education. Teachers have positive attitudes toward information technologies and are adopting information technologies. Time appears to be a limiting factor to full integration of information technology. Finally, teacher attitudes are negatively correlated with age and years of teaching experience.

Questions that come to mind concerning this research are:

- Why was Roger's model used rather than Russell's model?
- Does technology adoption lead to improvement in student performance/learning?
- What specific recommendations should be made to agriculture teacher educators concerning enhancement of information technology adoption by pre-service and in-service agricultural science teachers?
- Given the limitation of lack of generalizability of the findings, what should be done differently in future similar research?