

AN ASSESSMENT OF PENNSYLVANIA SECONDARY AGRICULTURE TEACHERS' PERCEPTIONS OF AND USE OF THE INTERNET

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Abstract

Perceptions of and use of the Internet by agriculture teachers in Pennsylvania were assessed. A descriptive survey was used to collect data from 205 secondary agriculture teachers. Teacher use of the Internet and perceptions of factors encouraging and discouraging the use of the Internet were measured using Likert-type scales. Findings indicated that factors discouraging Internet use were not related to teachers' actual use of the Internet. Factors encouraging Internet use included comfort with computer use, willingness to invest time learning, support, and access to computers with the Internet. Based on the findings, it was recommended that school sites seek funding or increased Internet access, in-services, and access to Internet "mentors."

Introduction/Theoretical Framework

Technologies that mold today's society are quickly entering the educational arena. A key product of the technological revolution, the Internet, is gaining momentum as a valued medium throughout all levels of education. Realizing the growing impact of the Internet in facilitating communications and information dissemination, leadership in funding and legislation from local to national levels has been widespread (Clinton, 1997).

One major event, *Net Day 97* (April 5, 1997), is an example of efforts to secure Internet access in schools across the U.S. Coordinators of Net Day brought volunteers together to retrofit K-12 institutions with donated material.

A statewide initiative promoting the adoption of the Internet is Pennsylvania's *Link to Learn Project*. Over a three-year period, Link-to-Learn will provide \$121 million to the educational community to develop a "network of networks" called the Pennsylvania Educational Network (PEN). In the first year, 1997, the basic education component of Link to Learn targeted \$33.3 million to K-12 schools. This effort will prepare schools to connect to the PEN through personal computers, educational software, local area networks, and professional development (Project Link to Learn, 1997).

Getting schools online is only part of the solution to promoting Internet use and integration. In a 1995 address to educators, U.S. Secretary of Education Richard Riley said, "Few educators have adequate experience with or understanding of technology to make full use of its potential" (Reinventing Schools, 1996). Presently, efforts are being initiated throughout the country to develop teachers' Internet usage skills through activities, including workshops and in-service training. However, Hall and Hord (1987) stated that, "Historically, teachers have all too often been provided with workshops, materials and other resources based on the needs of others rather than on an understanding of teachers' needs" (p. 5). The authors further emphasized that understanding teacher attitudes and skills should be the precursor to planning and providing support activities. In as much, support activities for teacher education of the Internet have increased as its values were realized.

The Internet and other telecommunication media have been found to add value to programs in K-12 schools. Terrell, Dringus, and Rendulic (1995) recognized that technology integration can alter traditional teaching methods such as the lecture format. They stated: "technology allows us to break this mold in order to allow our teachers to use their human expertise where it is most needed" (p. 3). Other studies highlight the value of the Internet in overcoming barriers in education that are caused by factors of rurality (Barker, 1997; Rogan, 1995).

Resources available through Internet use have drawn urban and rural schools closer. Barker (1997) discussed how the Internet is improving the educational opportunities of rural students. He found that the Internet provides students with access to:

- networking and collaboration through worldwide electronic mail, distribution lists, and group mail;
- numerous databases and electronic bulletin boards through which users can exchange information in the form of text, audio, and graphic formats;
- collaborative investigation allowing students to investigate problems and issues and share products across geographic and political boundaries; and
- resources ranging from curricula to exemplary classroom activities.

Furthermore, research on Internet use by math and science teachers in rural schools found reductions of isolation and increased perceptions of a global community (Rogan, 1995).

As programs benefit through improved teaching, the use of the Internet has been found to provide expanded learning opportunities in the most remote locations. In a study of telecommunications technologies in Alabama schools, Doucet (1995) concluded that due to advanced telecommunications use, rural and isolated schools are no longer at a disadvantage. "Global awareness" is becoming a relevant phrase to all students with Internet access. Use of media such as the World Wide Web (WWW) and e-mail allows current international updates and cross-cultural discussions (Wishnietsky, 1993; Harris, 1994; Internet Archaeologist, 1997).

Computer uses in agricultural education have been supported for years; additionally, use with students in agricultural education have also increased (Zidon, 1985; Raven & Welton, 1989). Researchers throughout agricultural education support the Internet as a creative tool for student activities (Murphy & Terry, 1995; Layfield & Bowen, 1995; Talbert, 1995). In an analysis of the World Wide Web, Raven and Settle (1995) discussed how interest in and use of the medium are increasing: "The implications for how agricultural education is taught and delivered are profound" (Raven & Settle, 1995, p. 11).

In light of growing interest in the Internet, recent studies have investigated teachers' perceptions and uses of the medium. In a study of agriculture teachers in the Northwest, Nordheim and Connors (1997) found that 75% of the teachers were in agreement that the Internet should be used in instruction. However, only 41.8% of the respondents reported use of the World Wide Web to access information. Similarly, Layfield and Scanlon (1998) reported in a national study of agriculture teachers, that 41% use the Internet in their curriculum. Additionally, a study of agricultural educator Internet use in Idaho determined a need for personal training and technical support (Thompson & Connors, 1998).

Purpose and Objectives

The overall purpose of the study was to determine the Internet use in secondary agricultural programs in Pennsylvania. Objectives of the study were to:

1. Describe the demographic profile of ag teachers;
2. Describe the use of the Internet in secondary agricultural education programs;
3. Determine factors that encourage and discourage the use of the Internet by ag teachers;
4. Determine differences, if any, between users and non-users of the Internet and factors that encourage or discourage use of the Internet by ag teachers; and
5. Determine differences, if any, between demographic characteristics (age, gender, highest education level, years taught, etc.) and factors that encourage or discourage use of the Internet by ag teachers.

Methods and Procedures

The design for the study was a descriptive survey research. The population for the study consisted of all secondary agriculture teachers currently teaching in Pennsylvania. The frame was obtained from the 1997-98 Directory of Agricultural Education in Pennsylvania, prepared by the Department of Agricultural and Extension Education at The Pennsylvania State University, in cooperation with the Bureau of Vocational-Technical Education, Pennsylvania Department of Education. This Directory listed a total of 251 agricultural teachers. A random sample of 205 was selected using the formula (3% sampling error and 3% margin of error) provided by Krejcie and Morgan (1970).

The researchers developed an instrument designed to accomplish the study purposes and objectives. The instrument contained three sections: 1) demographic/program characteristics, 2) Internet use by agricultural teachers, 3) 30 questions related to factors that encourage and discourage use of the Internet by ag teachers. These 30 questions were measured on a five-point, Likert scale (1=strongly disagree to 5=strongly agree). Face and content validity of the instrument was established using a five-member panel of experts from the Departments of Agricultural and Extension Education and Workforce Education. A pilot test of the instrument was also conducted using 30 vocational teachers at the Dauphin County Technical School. The reliability of the instrument was found to be acceptable ($\alpha=.81$ for encouraging factors and $.82$ for discouraging factors).

Data were collected via mail to agriculture teachers selected for the study. A cover letter, number coded instruments, and a stamped self-addressed envelope were mailed to the sample. After two weeks, total of 116 teachers responded for a return rate of 57 percent. Two follow-ups in the form of post card and telephone calls yielded an additional 45 responses for a total of 161 (78.5%). The 116 early and 45 late respondents were compared on key variables (encouraging and discouraging factors) as per procedures suggested by Miller and Smith (1983). No significant differences were found between early and late respondents and as such the data were generalized to the population of agriculture teachers in Pennsylvania. Data were summarized using descriptive and inferential statistics.

Results

Objective 1: Demographic Profile of Teachers

A majority of the teachers (63%) were in the age group of 31-50 years, followed by 19% in 51-60 years category, and 16% in 21-30 years category. Seventy-eight percent of the teachers were male. Regarding educational level, 53% reported bachelor's degree, followed by master's (42%) and 5% doctorate. Thirty-nine percent of the teachers reported over 21 years of teaching secondary agriculture followed by 32% (0-10 years), and 30% (11-20 years). Agriculture was the primary curriculum taught for 31% of the teachers, followed by horticulture (22%), agri-science (19%), ag mech (10%), natural resources (6%) and animal science (3%).

Objective 2: Internet Use in Secondary Agriculture Programs

Internet use by teachers and students in secondary agriculture programs are shown in Table 1. There was an even split in teachers regarding the use of Internet in secondary agriculture programs with 50% using it and 50% not using it in their programs. For students' use, Internet use was categorized into World Wide Web (WWW) and e-mail use. As shown in Table 2, agriculture teachers reported that students used both WWW and e-mail for agricultural research information. Students used WWW for References (38%), current event awareness (34%), FFA information (30%), and global awareness (14%). Students used e-mail for visiting resource persons (14%), and FFA correspondence (12%). Overall, students used more of WWW than e-mail. An overwhelming majority of teachers (85%) indicated that their FFA chapter does not have a Homepage on WWW. Similarly, as high as 97.5% of the teachers reported that they do not teach students to develop WebPages (Table 1).

Table 1
Internet Use in Secondary Agricultural Education Programs

Internet Use	Yes		No		Total	
	F	%	f	%	f	%
Internet use by Teachers						
Use Internet in agriculture program	76	50.3	75	49.7	151	100.0
WWW Use by Students						
Agricultural research	70	43.5	91	56.5	161	100.0
References	62	38.5	99	61.5	161	100.0
Current events awareness	55	34.2	106	65.8	161	100.0
FFA information	49	30.4	112	69.6	161	100.0
Global awareness	22	13.7	139	86.3	161	100.0
Downloading educational programs	16	9.9	145	90.1	161	100.0
E-mail Use by Students						
Agricultural research	28	17.4	133	82.6	161	100.0
Visiting with resource persons	23	14.3	138	85.7	161	100.0
FFA correspondence	19	11.8	142	88.2	161	100.0
Mailing lists	11	6.8	150	93.2	161	100.0
Global awareness	11	6.8	150	93.2	161	100.0
Keypal correspondence	6	3.7	155	96.3	161	100.0
FFA Chapter has a Homepage WWW?	23	14.6	134	85.5	157	100.0
Do you teach students to develop WebPages?	4	2.5	155	97.5	159	100.0

Objectives 3 and 4: Encouraging and Discouraging Factors

Data summarized in Table 2 show the mean scores and standard deviations for factors that encourage and discourage use of the Internet by agriculture teachers. The top five encouraging factors were: "feel comfortable using computers (4.14), followed by "willing to invest time to learn the Internet" (4.00), "having technical support staff knowledge of the Internet" (3.78), "having access to colleagues who have extensive Internet training" (3.66), and "having access to a computer lab with Internet capabilities (3.39). The statements receiving the lowest mean scores were: "have more than one computer with Internet access in my classroom" (1.71) and "school district provides incentives to participate in Internet training (2.22).

Regarding discouraging factors (Table 2), none of the teachers indicated "agreement" to factors that discourage Internet use. Mean scores for all the 13 discouraging factors were below three points on a five-point scale.

Table 2
Means and Standard Deviations for Encouraging and Discouraging Factors (n=161)

Factors	Mean	SD
Encouraging Factors		
I feel comfortable using computers	4.14	1.01
I am willing to invest my time in learning to use the Internet	4.00	0.97
I have technical support staff knowledgeable of Internet at my school	3.78	1.26
I have access to colleagues who have extensive training on the Internet	3.64	1.26
I have access to a computer lab with Internet capabilities	3.47	1.57
I have administrative support to attend Internet inservices	3.39	1.22
I work with colleagues who use the Internet in their classrooms	3.12	1.43
I have had training needed to use the Internet	2.99	1.49
At home I have access to the Internet	2.96	1.88
My school district has an ongoing plan for staff development on the Internet	2.94	1.44
I have reliable Internet access	2.89	1.62
I have the equipment needed in my classroom to access the Internet	2.83	1.78
I have access to Internet training through my professional association	2.67	1.34
My school district provides incentives to participate in Internet training	2.22	1.28
I have more than one computer with Internet access in my classroom	1.71	1.39
Discouraging Factors		
My administrators do not provide time to learn about using the Internet	2.93	1.34
Well-designed curriculum resources are not available on the Internet	2.83	1.07
I have difficulties getting online	2.73	1.38
I do not have access to formal technical Internet support at my school	2.70	1.45
I don't have opportunities to attend inservices on using the Internet	2.68	1.31
My school does not have enough phone lines to use the Internet	2.66	1.51
I am concerned about damaging a computer with Internet files	2.24	1.16
I have a modem, but it is too slow to use the Internet	2.18	1.16
I do not know how to operate software needed for Internet access	2.12	1.18
I do not have the patience necessary to work with the Internet	2.04	1.14
The Internet access I have is not user friendly	2.02	1.00
I am not computer "literate" enough to use the Internet	1.94	1.12
I tried using the Internet and was unsuccessful	1.76	1.00

*Mean computed on a scale that ranged from 1 "strongly disagree" to 5 "strongly agree"

Table 3 displays ANOVA results for encouraging factors by agriculture teachers who were Internet users or non-users. Nine of the 15 encouraging factors showed significant differences ($p < .05$ and $p < .001$ levels) between users and non-users (Table 3). For all the nine encouraging factors, Internet users were significantly higher in agreement than non-users. However, there were no significant differences between users and non-users of the Internet for the other six encouraging factors (Table 3).

ANOVA results for discouraging factors by agriculture teachers who were Internet users or non-users are shown in Table 4. Seven of the 12 discouraging factors showed significant differences ($p < .05$ and $p < .001$) between users and non-users (Table 4). For all the eight discouraging factors, non-users of the Internet were significantly higher in agreement than users. However, there were no significant differences between users and non-users for the other five discouraging factors (Table 4).

Objective 5: Demographic Differences

ANOVA was conducted to determine difference between Internet users and non-users and their demographic characteristics (age, gender, educational level, and years of teaching experience). No significant differences were found between any of the encouraging and discouraging factors and age, gender, and years of teaching experience. However, significant differences ($p < .05$ and $p < .001$) were found between educational level and two encouraging factors (Table 5). For the two encouraging factors, teachers with masters degree were significantly higher in agreement than teachers with a bachelors degree.

Table 3
Anova Results for **Encouraging** Factors by Internet Use (n=161)

Factors	Use Internet			Do not use			Mean Diff.	F-Value
	N	Ma	SD	N	Ma	SD		
I have the equipment needed in my classroom to access the Internet	76	3.58	1.63	75	2.03	1.57	1.55	36.14**
I have reliable Internet access	76	3.60	1.49	74	2.11	1.41	1.50	40.74**
More than one computer with Internet access in my classroom	76	2.17	1.69	75	1.15	0.46	1.02	20.82**
I have had training needed to use the Internet	76	3.50	1.39	73	2.38	1.43	1.12	23.91**
My school district has an ongoing plan for staff development on the Internet	76	3.07	1.50	74	2.74	1.38	0.33	2.18
My school district provides incentives to participate in Internet training	76	2.16	1.37	74	2.23	1.19	-.07	.126
I have access to a computer lab with Internet capabilities	76	3.89	1.47	74	2.99	1.59	0.91	13.44**
I have technical support staff knowledgeable of	76	4.03	1.23	75	3.60	1.24	0.42	4.53*
I feel comfortable using computers	76	4.43	0.77	75	3.83	1.18	0.60	13.99**
I have access to Internet training through my professional association	73	2.64	1.37	74	2.57	1.33	0.07	0.18
I am willing to invest my time in learning to use the Internet	74	4.12	0.91	75	3.85	1.03	0.27	2.83
At home I have access to the Internet	76	3.26	1.90	75	2.61	1.82	0.64	4.79*
I have access to colleagues who have extensive	76	3.75	1.20	75	3.48	1.32	0.27	0.18
I have administrative support to attend Internet inservices	73	3.36	1.31	74	3.35	1.21	0.01	0.004
I work with colleagues who use the Internet	76	3.51	1.35	75	2.64	1.42	0.87	15.39**

Mean computed on a scale that ranged from 1 "strongly disagree" to 5 "strongly agree"

** p <.001; * p < .05

Conclusions and Recommendations

The following conclusions and recommendations were made based on the findings of the study:

Factors encouraging and discouraging Internet use by agriculture teachers using and not using the Internet were examined in the third objective. Means for all factors proposed as discouraging Internet use were in the "not a factor" range scores. Therefore, discussion will focus on factors proposed as encouraging Internet use.

The study found that teachers using the Internet scored five statements that encouraged use with high means. The five highest mean scores of statements encouraging Internet use by agriculture teachers (indicating agreement) were:

1) "I feel comfortable using computers." Teachers who use the Internet found that they feel comfortable enough using the computer to learn additional programs, such as the Internet. This finding suggests that agriculture teachers' highest personal inhibitor is the fear of lacking substantial computer knowledge. Specifically, if teachers fear using the computer, they most likely will not begin to seek assistance for using the Internet in their teaching. It is therefore recommended that administrators identify those teachers with low computer skills and provide in-service opportunities on basic computing to ease possible apprehensions. Additionally, administrators may also foster teacher comfort of computers by assigning "mentors," as support mechanisms.

The second variable of the factors encouraging Internet use was: 2) "I am willing to invest my time in learning to use the Internet." Strategies to elicit teacher paradigms toward investment of time to learn to use the Internet should be considered by school administrators. If "company" time is provided for teachers to initiate interest in the Internet, possibly follow-up with personal time will occur. Therefore, it is recommended that school administrators provide substantial time for teachers to learn to use the Internet. Extra time may be provided in the form of specific Internet days during in-service periods, or supplemental pay for weekend in-service attendance.

Table 4
Anova Results for **Discouraging Factors** by Internet Use (n=161)

Factors	Use Internet			Do not use Internet			Mean Diff.	F-Value
	N	Ma	SD	N	Ma	SD		
I don't have opportunities to attend inservices on using the Internet	76	2.63	1.32	72	2.74	1.31	-0.11	0.23
My administrators do not provide time to learn about	76	2.87	1.43	72	3.00	1.26	-0.13	0.35
I have difficulties getting online	75	2.11	1.16	72	3.35	1.31	-1.24	37.01**
Well-designed curriculum resources are not available	75	2.83	1.12	69	2.81	1.02	0.01	0.007
I am concerned about damaging a computer with Internet files	76	2.04	1.05	71	2.45	1.25	-0.41	4.68*
I tried using the Internet and was unsuccessful	76	1.57	0.90	73	1.97	1.04	-0.41	6.53*
My school does not have enough phone lines to use the Internet	76	2.25	1.43	71	3.11	1.48	-0.86	12.89**
I have a modem, but it is too slow to use the Internet	76	2.09	1.20	68	2.26	1.13	-0.17	0.78
I am not computer "literate" enough to use the Internet	75	1.64	0.88	74	2.27	1.26	-0.63	12.51**
I do not have the patience necessary to work with the Internet	75	1.91	1.09	72	2.21	1.19	-0.30	2.57
I do not know how to operate the software needed for Internet access	76	1.70	0.88	73	2.53	1.29	-0.84	21.51**
The Internet access I have is not user friendly	75	1.85	0.99	69	2.19	0.99	-0.33	4.09*

Mean computed on a scale that ranged from 1 "strongly disagree" to 5 "strongly agree" ** p <.001; * p < .05

Table 5
Anova Results for Encouraging Factors by Highest Education Level (n=161)

Factors	Bachelors			Masters			Mean Diff.	F Value
	N	Ma	SD	N	Ma	SD		
I have the equipment needed in my classroom to access the Internet	82	2.38	1.68	73	3.34	1.77	-0.96	6.40**
I have reliable Internet access	82	2.55	1.52	73	3.27	1.66	-0.73	4.15*
I have more than one computer with Internet access in my classroom	82	1.48	1.11	74	1.97	1.60	-0.49	2.55
My school district has an ongoing plan for staff development on the Internet	82	2.70	1.41	73	3.21	1.44	-0.51	2.47

Mean computed on a scale that ranged from 1 "strongly disagree" to 5 "strongly agree" ** p <.001; * p < .05

The third and fourth highest factors encouraging Internet use were grouped due to their commonality in nature. The variables were: 3) I have technical support staff knowledgeable of the Internet at my school, and 4) I have access to colleagues who have extensive training on the Internet. Both variables reflect the need for support when using the Internet. An obvious conclusion related to "support" is that if agriculture teachers have access to colleagues with extensive training on the Internet they are more likely to adopt and integrate the Internet in their programs. Specifically, if agricultural educators are to be expected to utilize the Internet, support from innovators is necessary. Hence, it is recommended that school administrators select teachers that colleagues respect to send for in-service training on the Internet and techniques for providing support.

The final variable encouraging Internet use was 5) "I have access to a computer lab with Internet capabilities." Specifically, this study found that teachers who do not have direct and easy access to the Internet in their schools will not be adopters and users of the Internet. Hence, it is recommended that school administrators seek funding through grants (E-rates), donations, and business partnerships to increase access points (including labs) to the Internet in their schools.

These findings suggest the need for continued Internet inservice activities for agriculture teachers. Pennsylvania's Center for Professional Personnel Development in Agricultural Education has been instrumental in providing support of advanced instruction of technological innovations such as the Internet through inservices and coursework. Therefore, it is recommended that the Center develop a needs assessment to determine inservice and coursework required to maintain agriculture teacher's integration of technology in the classroom. The Center should take a leading role in emphasizing the use of technologies in secondary school agriculture programs.

Findings from this study indicate that use of the World Wide Web is minimal. It is recommended that efforts to increase student use of the World Wide Web be implemented by school administrators, teacher educators, and agricultural curricula suppliers. School-based grant writers and teachers should be encouraged to submit proposals for World Wide Web access and support. Compensation time should be provided for those “innovators” seeking inservice support or time for grant writing.

This study also indicated those teachers with higher educational levels had higher agreement on having access to Internet-related equipment. Teachers with more experience or advanced degrees may have additional opportunities for access to funding or administrative support. The Pennsylvania educational system has widely supported continuing education for teachers (i.e. advanced degrees, inservices). It is recommended that the Pennsylvania Association for Agricultural Educators (PAAE) support continued lobbying for state funds regarding professional development.

Teacher educators can also impact teacher use of the World Wide Web. Inservice activities and graduate coursework involving the World Wide Web may assist teachers to become more acquainted with the medium. Departmental information related to teachers and teaching issues might be posted on the World Wide Web, urging teachers to become more familiar with the medium. It is also recommended that teacher educators use the World Wide Web throughout preservice activities with undergraduates. Additionally, teacher educators are encouraged to assign student teachers activities involving use of the World Wide Web.

This study also identified FFA chapter ownership of pages on the World Wide Web. A total of 11% of the agriculture teachers indicated that their FFA chapter has a Webpage. It can be concluded that FFA chapters are not using the World Wide Web as a communication medium. Therefore, it is recommended that use of web authoring tools become more accessible and the Center provide inservices related to Webpage development. National FFA inservice activities might also include topics related to building effective homepages. Furthermore, it is recommended that teachers use the model provided by the National FFA for effective uses of World Wide Web homepages.

The findings from this study guided the researchers to make the following recommendations for future research:

1. Future researchers should periodically replicate this study in a longitudinal format to determine if an increase in agriculture teachers’ stages of concern has occurred.
2. Future studies should investigate the impact of Pennsylvania’s Link-to-Learn program on student learning through the Internet.
3. Future studies should examine what level of Internet activity in agricultural education has the highest impact on student achievement.
4. Future studies should investigate the teaching/learning process as it relates to the Internet.

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