

COMPUTER TECHNOLOGY USE BY CALIFORNIA AGRICULTURAL TEACHERS



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Introduction

While studies have been done to assess the level of computer use in secondary agriculture programs (Birkenholz & Stewart, 1991; Miller & Kotriik, 1987; Raven & Welton, 1989), a number of factors have changed in California and the rest of the world to make this data dated. In the past five years changes in computer use in the general population and in California secondary schools have had a negative effect on the usefulness of previous studies. The Internet has grown geometrically since 1995 and this growth has changed information delivery in a substantial way.

Other influential factors include the fact that computer costs have continued to decrease while processing power has increased and computer use by the general population has increased. A study of the U.S. population by Kominski and Newburger (1999) found that from 1993 to 1997 people 18 years and older with access to a home computer grew from 18% to 47%. Use of the Internet for the same group has grown from 0% to 22%. For people with a bachelors degree or higher, access to a home computer grew from 16.4% to 63.2% and Internet access grew from 0% to 34%.

Programs within California that provide technology in the classroom such as the Digital High School Initiative and the California Technology Assistance Project (CTAP) have been increasing computer access in California secondary schools at a rapid rate. In California, between 1996-1997 and 1999-2000 the number of computers in secondary schools grew from 14.5 for every 100 students to 23.4 for every 100 students, and Internet access grew from 1.2 sites (connections) for every 100 students to 4.2 sites for every 100 students. California schools with agriculture programs have significantly less access to the Internet ($t=2.43, p < .05$) and computer resources ($t=2.18, p < .05$) when compared to secondary schools without agriculture programs (see Table 1) (California Department of Education, 2000b). Based on this data there is a concern that agricultural teacher and student access to computers could be lagging the state as a whole.

Table 1 -- Computer resources in California secondary schools

	Schools without agriculture programs			Schools with agriculture programs		
	1996-1997	1999-2000	Change	1996-1997	1999-2000	Change
Computers per 100 students	15	25	66%	12.8	17.7	38%
Internet Sites (connections) per 100 students	1.3	4.4	238%	0.7	3.2	357%

In Missouri a survey of beginning agricultural teachers placed “using computers in the classroom” ninth in a list of 50 inservice needs (Garton & Chung, 1996). The 15% growth of California agriculture programs since 1995 and the replacement of teachers due to attrition have precipitated the hiring of many new teachers. This suggests the need for inservice in the area of computer technology.

Purpose and Objectives

The purpose of this survey was to determine how California secondary agricultural teachers and students are using computer technology. The survey was conducted in the second year of development of a statewide web site (<http://www.calaged.org>) that is delivering information to California agricultural teachers. One of the goals of this site is to replace print distribution of many publications such as curriculum, but the accessibility of the site by the state’s secondary agricultural teachers was unknown.

The study had the following objectives:

- 1) to determine the level of access teachers have to computers and the Internet, 2) to determine how teachers are using common software tools in support of their teaching, 3) to determine what level of access agriculture students have to computer technology in the classroom, and 4) what computer tools students are using as part of the agricultural curriculum.

Procedures

The population for this study was all of the 661 California secondary agricultural teachers. The survey instrument was mailed

to all secondary agricultural teachers with a return envelope and a follow-up reminder post card was sent three weeks later. The survey was anonymous and no attempt was made to code the survey forms. 303 surveys were returned (46% of the population).

The instrument was created as a single page form with 37 items. In order to improve the response rate the form was kept short and the completion time was expected to be less than 15 minutes. Four items were open ended, twenty-four items used a five point Likert scale, and the remaining questions had specific answers (i.e., Yes/No, Male/Female). Questions using a Likert scale were not numbered on the instrument. The instrument was tested for face and content validity by a review panel consisting of state department of education staff and teacher educators. A number of questions were re-worded as a result of this review.

To determine if the sample was representative of the population, gender and California’s six regions were used to perform a Chi square analysis to compare the sample population to the state population. The data for the statewide population was collected by the California Department of Education (California Department of Education, 2000a). No differences were found between the sample and entire population at the $p < .05$ level. The California Department of Education reported in the 1996-1997 report that regionally, average years of teaching experience varied between 8-14 years (California Department of Education, 1998). The mean years of experience for this study varied by region from 10-16 years (see Table 2).

Internal consistency (Cronback’s Alpha)

was calculated for questions in the area of teacher software use and student software use, yielding an alpha of .87.

Table 2 -- Teacher Demographics

Region	n	Gender			Age			Years of Teaching		
		F	M	Not Reported	Mean	n	S.D.	Mean	n	S.D.
Not Reported	6	1	4	1	45	3	17.3	21.3	3	16.8
Central	69	28	39	2	35.6	66	9.8	10.5	55	9.3
N. Coast	21	8	13		40.5	19	9.1	13.4	14	7.6
S. Coast	27	7	20		40.7	26	10.6	16	20	10.5
San Joaquin	73	27	45	1	37.7	69	10.6	10	58	9.6
Southern	50	27	23		39.1	49	10.1	10.6	43	8.8
Superior	57	21	35	1	41.5	56	10.6	14.9	42	10.4
Total	303	119	179	5	38.7	288	10.4	11.9	235	9.8

Limitations

The data in this study was self-reported. Lemke, et al (1998) suggests that self-reporting will overestimate computer use since use of computer technology has been equated with competency. Their study of grades 5-12 in Georgia and Florida found that 94% of teachers (n=84) reported using computer technology as part of their instruction yet only 4% were actually observed integrating computer technology into their instruction. No attempt was made to determine why teachers use (or do not use) computers or how they feel about using computer technology in the classroom.

Findings

The mean age of respondents was 39 with an average years of teaching experience of 11.8 years. Respondents ranged in age from 23 to 67 with a teaching experience range of zero years to 45 years. 40% of the respondents were female as compared to the population, which was 34% female (as of October of 1999).

The first objective was

to determine what level of access teachers have to computers and the Internet. In total, 98% of teachers had access to a computer at home or school. While a majority of teachers had access to PC's (92%), 40% had access to Macintosh computers. 90% reported having a computer at home. 90% had access to the Internet at home or school (see Table 3). 53% of teachers reported using email at least once a day and 17.5% reported that they did

not use email at all (see Table 4). Email responses varied from 0 times per week to 100 times per week and were grouped for analysis.

The second objective was to determine what software tools were being used by teachers. These questions were asked using a five point Likert scale ranging from Not at All to Frequently (coded 1 to 5 respectively). The two highest responses (4 and 5) were combined to report on regular use. 85% reported regular use of word processing software, 33% reported regular use of spreadsheet software, 18% for presentation software and 47% reported using the World Wide Web as a regular resource. 71% reported that they did not use web page creation tools. The mean responses are shown in Table 5.

A correlation analysis was used to test

Table 3 -- Teacher access to computer resources.

	Yes		No	
	Frequency	%	Frequency	%
PC at home	229	75.60%	74	24.40%
PC at school	257	84.80%	46	15.20%
Have PC*	280	92.40%	23	7.60%
Mac at home	67	22.10%	236	77.90%
Mac at school	102	33.70%	201	66.30%
Have Mac*	122	40.30%	181	59.70%
Have Computer **	298	98.30%	5	1.70%
Have Internet access at home	218	71.90%	85	28.10%
Have Internet access at school	229	75.60%	74	24.40%
Have Internet access*	277	91.40%	26	8.60%

* Includes home or school or both. ** Includes home, school, Mac, or PC

	Frequency	Percent
Don't Use (0 per week)	53	17.5
1-5 times per week	89	29.4
6-10 times per week	108	35.6
11 or more times per week	52	17.2
Total	302	99.7
Did not answer	1	0.3
	303	100

for interactions between variables including years of teaching. Years of teaching was found to be negatively correlated with use of computer tools to make handouts ($r=-.364, p<.01$) and the use of word processing software ($r=-.321, p<.01$). No relationship was found between department size (number of agricultural teachers at the school) and use of computer software.

To determine the source of computer knowledge, teachers were asked where they gained their knowledge of computers (see Table 6). Teachers reported being primarily self-taught and learning from their peers. Again, years of teaching was correlated with sources of learning computer technology and a strong correlation was found with knowledge gained from college classes ($r=-.617, p<.01$). Younger teachers reported having gained most of their knowledge from college courses. 28% of the teachers surveyed have taught five years or less. Based on review of degree requirements of the major California universities, most of this group was required to take at least one computer literacy course in college as part of their teacher preparation.

The third and fourth objectives were to determine what access secondary agriculture students had to computer technology and how

they were using computer technology in their programs. Table 7 shows that 74% of the teachers indicated that they had access to a computer lab and of those 87% (64% of total) indicated the lab was connected to the Internet. For this study a lab was defined as having at least one computer for every two students. Slightly over half of the teachers indicated that they had the means to use presentation software (LCD projector, large monitor, or other means) in the classroom.

Word processing was the most frequently integrated software with 57.8% responding that it was frequently used (a combination of the two highest responses). Also, 39.3% reported frequent use of the Internet/World Wide Web, 14.6% reported frequent use of spreadsheet software, and 11.9% reported frequent use of presentation software. There was a significant ($t=6.678, p<.001$) relationship between the ability to use presentation software in the classroom and use of presentation software by students. California has published free Future Farmers of America Record Book software and 19% reported frequent use; however 45% reported not using it. (see Table 8.)

Item	n	Mean	S. D.
Do you use a computer to create class materials (like handouts)?	303	4.29	1.06
Do you use a computer for classroom management activities like keeping grades or tracking R2 information?	303	3.8	1.48
Do you use the World Wide Web as a teaching resource?	303	3.4	1.29
What computer programs/tools do you use in your teaching for material preparation or instruction?			
Word processing (eg. MS-Word, Word Perfect)	303	4.49	1.00
Spreadsheets (eg. Quatro, Excel)	303	2.89	1.45
Internet / World Wide Web	303	3.46	1.28
Presentation Software (e.g. PowerPoint)	303	2.32	1.31
Web page editors (eg. FrontPage, etc.)	303	1.48	0.88

Table 6 -- How did you gain your knowledge of computers? Scale: Least (1) to Most (5)

	n	Mean	S. D.
Self Taught	303	4.1	1.23
Peers	303	3.28	1.28
College Courses	303	2.64	1.57
Other Inservice	303	2.27	1.32
District Courses	303	2.05	1.29

high and likely improving with the current emphasis by the state to increase the level of computer technology in secondary schools. As increased emphasis is placed on pre-service computer competency training it is even more important that these teachers begin practicing in an environment that

Table 7 -- Computer Technology Access in the Classroom

Item	Yes		No	
	Frequency	%	Frequency	%
Do you have the means to use presentation software (e.g. PowerPoint) in the classroom?	166	54.80%	137	45.20%
Do you have access to an instructional computer lab with the capacity of at least 1 computer for every 2 students?	223	73.60%	80	26.40%
If you have access to a lab is it connected to the Internet?	193	63.70%	30	9.90%

supports these skills. Certainly teachers must be comfortable in the use of computer technologies before they will integrate them into the classroom.

Teachers that reported having access to a computer lab were 2-3 times more likely to have their students frequently using computer programs as part of their instructional program. T-tests showed significant differences in mean responses for all computer programs ($p < .001$) except the FFA Record Book software when teachers with access to a lab were compared to those with lab access.

Conclusions

The results of this study show that most of California secondary agriculture teachers have access to and report using computer technology. Given the recent introduction of low cost personal computers and the relatively recent addition of computer literacy in pre-service agricultural education curriculums, correlations between use and age or years of teaching were not unexpected.

The availability of computer resources is

Since only 17% of teachers indicated that they do not use email at all, the future looks bright for email to become a major method of communication. However only 53% of teachers are currently using email regularly which highlights a disparity between access and actual use.

An important requirement of integration of computer technology into the agricultural curriculum is the ability of the teachers to use technology as part of their instruction. This includes not only the ability to demonstrate the use of computer technology, but also the ability to have students use it in a classroom setting. Access to computer labs did appear to be a limiting factor in the use of computer software by students.

Keeping financial records is primarily

Table 8 — What computer programs/tools do your students use as part of their instruction in your program? Scale: Not at All (1) to Frequently (5)

Computer Program	n	Mean	S. D.
Word processing	303	3.69	1.3
Internet/Web	303	3.08	1.38
FFA Record Book	303	2.22	1.35
Spreadsheet	303	2.19	1.24
Presentation	303	2	1.18

accomplished by the use of computers in the agricultural industry and the use of the FFA record book (paper and computer) is integrated into the majority of California agricultural programs. The lack of use of spreadsheet and record book software suggests the need for improvement in this area.

This study is important because it provides current data in the rapidly changing environment of computer technologies and their implementation in California secondary agricultural education. It also confirms a high level of personal access to the computer and Internet technology that is becoming an increasingly important means of communication and information dissemination.

Computer literacy is important to agricultural education because almost all facets of agriculture use computers. Some uses like record keeping are well established while others such as precision agriculture applications are new. Teaching students computer use in a computer class is akin to teaching students sawing; while the student may become proficient in sawing, they will not learn how to build. Students will better learn this technology if it is infused into the curriculum, not set apart in “computer classes.” In order to include it in the curriculum teachers must be

computer literate, be motivated to use the technology, and have the means to use it in the classroom.

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