

**Microcomputer Use in Vocational Agriculture
Programs in the United States**

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The number of vocational agriculture programs with microcomputers continues to increase as this technology gains support from school systems and as a result of the Carl Perkins Vocational Education Act. This occurrence is logical and necessary since agricultural applications for computers are constantly being developed and implemented. As more agriculture departments obtain computers, the question arises as to what should be taught with and about the machines.

Research and evaluation of microcomputer use in education is extensive but has been restricted largely to the computer's use in academic subjects. Taylor (1980) outlined three basic areas for microcomputer use in education--as a tutor, as a tool and as a tutee. Using the computer as a tutor refers to presentation of instructional units by the machine, a procedure commonly referred to as computer-aided instruction (CAI). The instructional management tasks such as materials preparation, word processing and data base use are examples of the computer's use as a tool. The third area of computer use, as a tutee, involves students learning the language of the machine and having them "teach" the computer to perform desired functions.

Two of the three previously mentioned microcomputer uses have been addressed in agricultural education research. Neason and Miller (1982) indicated that the microcomputer's most profitable use was as a management tool. Specific uses of this type noted by McGrann (1980) include decision making, education, communication, data gathering, data analysis, monitoring, evaluation and data retrieval and storage.

The second microcomputer use employed by agricultural educators is using the machine as a tutor. Hudson (1980) specifically addressed computer aided instruction in agricultural education. He found that major uses included drill and practice, tutorial use, simulations, games, testing and recording data. In a later study, Hudson (1983) compiled a list of 50 microcomputer use skills needed by agricultural computer users.

Utilizing Hudson's (1983) list of competencies, Sutphin (1984) surveyed New York vocational agriculture teachers to determine their opinion of the relative importance of these skills as well as the teachers' actual level of microcomputer usage. Information regarding other computer use factors was also obtained.

In another study of computer competencies needed by vocational agriculture teachers, Miller and Foster (1985) asked Iowa and Nebraska vocational agriculture teachers to classify 50 microcomputer competencies. The teachers classified 24 of the 50 competencies as important.

While these studies have addressed microcomputer usage and the importance of specific microcomputer use skills at the state level, several needs still exist. These include a need to determine how microcomputers are being used in vocational agriculture programs across the United States and a need to determine the current level of use of the microcomputer in vocational agriculture programs in the United States. This study was designed to make these determinations.

Purpose and Objectives

The purpose of this study was to determine the competencies deemed most important for practical microcomputer use by secondary vocational agriculture teachers in the United States and to determine the current uses of microcomputers. The objectives were:

1. Determine the extent to which microcomputers are used in secondary vocational agriculture programs in the United States.
2. Determine vocational agriculture teachers' perceptions of the importance of selected microcomputer use competencies in vocational agriculture programs.
3. Determine if differences exist between the demographic characteristics of those teachers who had microcomputers in their vocational agriculture departments and those who did not. The demographic characteristics used in this analysis were years teaching experience, age, number of students in high school, number of students in the vocational agriculture program, and the teacher's opinion of the school board's and principal's support for computer use.

Procedures

The population ($N = 12,500$) consisted of all secondary vocational agriculture teachers in the United States as listed in the 1984 Agriculture Teacher's Directory (Henry, 1985). Cochran's sample size formula (Snedecor & Cochran, 1980) was used to select a minimum returned sample size of 173. Since this was a national study, a systematic random sample of 312 was used in anticipation of a low response rate. A response rate of 212 (68.4%) was realized after two mailings and a telephone follow-up. Analysis of variance was used to determine if differences existed among the demographic characteristics of the three groups of respondents (2 mailouts and 1 telephone follow-up). Since no differences were found, it was determined that the respondents were representative of the population and the data were combined.

A questionnaire based on instruments developed by Sutphin (1984) and Hudson (1983) was developed to secure the information needed for the study. The instrument was field tested using 15 vocational agriculture teachers. Changes indicated by the field test were incorporated into the instrument. Instrument reliability was assessed using Cronbach's alpha and resulted in estimates of $r = .86$ for the Likert-type scale items rated according to the respondent's level of agreement and $r = .91$ for the Likert-type scale items rated according to the importance of selected competencies. Data analysis were conducted with the SPSS^X statistical analysis program (SPSS, 1983) and included descriptive statistics and inferential t -tests ($\alpha = .01$).

Results

Thirty-nine percent of the respondents indicated that they had computers located in their vocational agriculture department. Forty-nine

additional respondents (23%) indicated that they used computers located either in school, at home or some other location such as a college, which increased the proportion of teachers using computers to 62%. An average of 1.6 computers per department was reported by those departments with computers. Apple was the main brand of computer reported by the teachers as being in their departments (64.7%) followed by TRS-80 (14.3%) and Atari (9.8%), with a variety of other brands accounting for the remaining 11.2%. Apple and TRS-80 were also the main brands that were available to the respondents at home and in their school. Twenty respondents indicated that they expected to acquire their first or an additional microcomputer for their vocational agriculture department within the coming year.

Hardware and software availability factors were addressed by those respondents who were using computers. The respondents agreed with only one of the seven statements in this area. They gave a rating of 3.95 (agree) to the statement that the types of computers that can do the operation needed are available. The ratings on all other factors fell between 2.5 and 3.5 on the scale which was interpreted as undecided. These data are presented in Table 1.

Table 1

Computer Hardware and Software Available for Teachers Using Microcomputers (n = 132)

Availability Factor	Mean ^a	S.D.
Types of computers that can do the operations needed are available	3.95	1.19
Program management software is available	3.31	1.29
Agricultural software is available	3.29	1.23
Software needed for instruction is available	3.24	1.22
Adequate access to computers for needs is available	3.11	1.36
Adequate numbers of computers for needs are available	3.03	1.31
Multiple copies of software needed for instruction are available	2.88	1.30

^a1 = strongly disagree; 5 = strongly agree.

Teachers were asked about their use of computer-aided instructional practices. As the data in Table 2 indicate, the largest percentage of teachers used the computer for problem solving. This practice was used an average of 8.2 hours per month by over half (78 out of 132) of the teachers who used computers. Other computer-aided instructional practices used were educational games (7.33 hours), tutorial presentations (7.51 hours) and simulations (5.15 hours). The latter practices were used by fewer teachers.

Computer-aided instructional management practices such as instructional materials preparation, word processing and data base use were employed equally as often by teachers. An average of 64 of the 132 teachers using computers employed these practices for 9.5 hours each

Table 2

Average Monthly Use of Computer-Aided Instruction and Computer-Aided Program Management by Students and Teachers (n = 132)

Practice	Hours Used					
	By Students			By Teachers		
	Mean	S.D.	n	Mean	S.D.	n
<u>Computer-aided instruction</u>						
Problem solving	9.27	10.8	85	8.22	10.2	78
Tutorial presentation	9.23	11.0	70	7.51	8.8	61
Simulations	6.73	2.4	51	5.15	5.5	46
Educational games	9.88	17.1	50	7.33	15.5	27
Communicating with other computers	8.46	8.5	11	10.07	15.1	15
Other uses	11.30	5.2	3	9.38	12.9	8
<u>Computer-aided management</u>						
Instructional materials preparation	9.34	9.5	41	10.03	11.3	66
Word processing	10.29	10.0	34	10.05	9.5	66
Data base use	7.80	6.4	25	8.59	6.7	61

Note. One month designated as 20 school days.

month. Average hours of student use was also approximately 9 hours per month; however, fewer students used these practices than did teachers. These data are also presented in Table 2.

Twenty computer use competencies were rated by respondents as to their importance. Those found to be most important were use of the keyboard, disk drive and printer, all hardware use competencies. Using software to maintain records ranked fourth followed by identification of agricultural and home use software and use of agricultural and home use software. These data are presented in Table 3.

The data in Table 4 reveal that approximately 40% of the teachers who had used computers could use agricultural software, word processors and spreadsheets while only 28.7% could use data bases. The percent of teachers who taught the use of these programs and the percent of their students who could use these programs ranged from 2.4 to 29.5%.

Inferential t-tests were used to determine if significant differences existed between those teachers who had computers in their departments and those who did not. No significant differences existed for the variables age, years of teaching experience, number of students in the school and number of students in the vocational agriculture department. Significant differences did exist for two variables. Those teachers who had computers perceived that their school board and principal supported

Table 3

Teachers' Opinions of Importance of 20 Microcomputer Use Competencies
(n = 128)

Competency	Mean ^a	S.D.	Rank
<u>General knowledge</u>			
Use an operator's manual	3.89	.98	7
Define microcomputer terminology	3.35	1.05	13
Identify networking opportunities in the community	2.92	1.01	15
Perform maintenance on computers	2.25	1.12	20
<u>Hardware use</u>			
Use the keyboard	4.22	.87	1
Use the disk drive	4.16	.86	2
Use the printer	4.12	.82	3
Demonstrate microcomputer operation	3.77	.97	8
Communicate with other computers	3.06	1.16	14
Use the cassette recorder	2.74	1.26	16
Describe the difference among brands and models	2.72	.88	17
Use the graphics tablet	2.60	1.03	19
<u>Software use</u>			
Use software to maintain records	3.98	.89	4
Use agricultural/home use software	3.92	.89	5
Identify agricultural/home use software	3.92	.96	6
Evaluate agricultural/home use software	3.69	.98	9
Use computer as a word processor	3.52	1.00	10
Organize a software library	3.42	1.03	11
Identify modifications needed in software	3.38	1.08	12
Write a program using BASIC or other language	2.69	1.25	18

^a1 = no importance; 5 = essential.

the use of computers to a greater extent than those who did not have computers. These data are presented in Table 5.

Conclusions and/or Recommendations

1. The percentage of teachers who have computers in their vocational agriculture departments does not appear to be as high as the percentage reported by the National FFA Agricultural Computing Service (1985) which reported that 51% of the programs in the nation had computers. This study found that only 39% of the teachers in the sample had computers. In order for teachers to provide up-to-date programs for their students, state staff personnel should increase their efforts to provide or encourage local school districts to provide computers for vocational agriculture departments.

2. Vocational agriculture departments were more likely to have computers if the principal and school board supported the use of

Table 4

Computer Program Use by Vocational Agriculture Teachers Who Use Micro-computers (n = 132)

Program type	Percent of teachers who can use program ^a	Percent of teachers who teach program use ^a	Mean percent of students who can use program ^b
Agricultural software	42.6	29.5	18.3
Spreadsheets	41.1	19.0	9.0
Word processing	40.2	12.9	6.9
BASIC for programming	30.6	14.3	8.3
Data base management	28.7	6.7	2.4

^aTeachers were asked to check all items that they used or taught the use of. ^bTeachers were asked to indicate the percent of their students who could use each program listed.

Table 5

T-tests of Demographic Characteristics by Whether Respondents Had a Computer in the Vocational Agriculture Department

Variable	Teachers with computers			Teachers without computers			t
	Mean	S.D.	n	Mean	S.D.	n	
Years vo-ag teaching experience	12.3	8.0	78	12.4	9.2	126	.07
Teacher's age	37.8	9.7	83	38.7	11.5	126	.55
Number of students in high school	661.9	607.8	81	644.6	590.3	123	.20
Number of students in vo-ag program	85.0	53.6	81	85.4	67.3	126	.05
Your school board supports the use of computers ^a	4.2	.79	82	3.7	.92	125	3.93*
Your principal supports the use of computers ^a	4.3	.77	82	3.8	.91	125	3.73*

^aTeachers responded to this item on a 5 point Likert-type scale with 1 = strongly disagree and 5 = strongly agree.

*p<.001.

computers. State staffs should take this factor into consideration if they wish to increase the number of computers used in local vocational agriculture programs.

3. Computers currently in vocational agriculture programs are used more for instructional management (as a tool) than they are for tutorial or direct instructional purposes. Existing research findings on how to incorporate the computer into the instructional environment effectively should be used by teacher educators and state supervisors to aid teachers in using the computer to improve instructional effectiveness. Additional research should be conducted into how the computer can best be used in the instructional (classroom and laboratory) environment in vocational agriculture programs so that teachers can be better prepared to use them for instructional purposes.

4. Since most vocational agriculture departments had Apple (64.7%) and TRS-80 (14.3%) computers, teacher inservice and pre-service training activities should be conducted using one or both of these brands of computers unless evidence exists that these data are not valid for a particular state. This recommendation will remain in effect until these brands are no longer the main computers in use. (It should be noted that the National FFA Agricultural Computing Service has indicated that they will support MS-DOS computers in addition to these two brands.)

5. The use of microcomputers in vocational agriculture departments is still in its infancy stage as evidenced by the low number of departments with computers and the low level of usage of the computer for program management and instructional purposes. Kulik, Bangert and Williams (1983) found that high school students who supplement their learning through the use of microcomputers learn more and get better grades on tests and in courses. Due to the urgent need for vocational agriculture programs to be efficient and up-to-date in both program management and instructional techniques, the National Association of Supervisors of Agricultural Education and the American Association of Teacher Educators in Agriculture should form a joint task force for the purpose of accelerating the introduction and advancement of appropriate computer usage in local vocational agriculture departments.

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