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Occupational Use of Microcomputers By Former Agriculture Students

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Several authors have written about approaches being implemented in colleges of agriculture to meet the computing needs of students. For example, Foster and Walker (1984) discussed how the University of Nebraska-Lincoln makes sophomores computer literate through a course about computer networks, programming, and commercial software. Other authors have written about microcomputers being integrated into existing courses. Russell (1985) explained that seniors in animal science at the University of Wyoming use microcomputers to make better management decisions. Weber, Young, and Pearson (1985) detailed how an advanced farm management course was revised to incorporate more computer instruction at Washington State University. Hsu and Hsu (1985) discussed how microcomputers are integrated into a landscape architecture course at Washington State University.

These examples indicate that universities are attempting to produce computer literate graduates. However, questions must be posed about whether these efforts provide computing skills students need to become successful professionals. A follow-up study of former students conducted by Reber and Kern (1985) provided such evidence about an approach implemented at the University of Missouri. Reber and Kern found that a new computing course increased both student interest and computing skills. They also found that 42% of the former students used their computing skills on the job. Although 60% planned to own a computer, only 12% already owned one.

Statement of the Problem

A course was implemented in 1981 at Mississippi State University to make agriculture graduates more effective computer users. To assess the effectiveness of that course, the following questions were formulated:

1. What are the characteristics of former students who use or do not use microcomputers in their occupations?
2. What factors discriminate between users and nonusers of microcomputers in their occupations?
3. What barriers inhibit the adoption of microcomputers in the former students' occupations?
4. What types of microcomputer software are used by former students in their occupations?

Population and Sample

All students enrolled in AEE 5203/7203 (Application of Microcomputer Technology to Agricultural and Extension Education) were included in the population. These students enrolled for three hours of undergraduate or graduate credit in the semester length course. The course included 30 contact hours of lecture and 30 hours of laboratory activities using microcomputers. Course content focused on how to use microcomputer hardware and a variety of software. Students used more than 15 agricultural programs distributed by the Mississippi Cooperative Extension Service. Almost 50% of the class time was used teaching BASIC programming the first two years the course was taught. As the course evolved over the years, the amount of BASIC programming decreased to 25% and was replaced by instruction on electronic spreadsheets and word processing. Students were also taught how to access agricultural computer networks such as AGNET and AgriData.

Students representing almost all of the agriculture majors at Misissippi State University enrolled in the course. Most were U.S. citizens; however, for this study all international students were excluded to avoid comparisons across various cultures and nations. With this limitation, the target population of 324 students was stratified by sex and level of credit sought before a random sample of 150 students was selected.

Data Collection

A questionnaire to collect the data was content validated by a panel of faculty who had expertise in both technical agriculture and computer science. Course records provided the grades students earned in the course, the level of credit sought, and their sex.

Three scales developed by Cantrell (1982) and modified by Mitchell (1985) were used to assess potential barriers to former students using computers in their occupations, their attitudes toward computers, and software they used in their occupations. The barriers scale included nine items rated from one (Small Problem) to 10 (Large Problems). Zero indicated a barrier was not a problem. The attitudes scale included 12 items rated from Strongly Disagree (1) to Strongly Agree (8). The software scale included eight common types of software rated from Not Used Extensively (1) to Used Extensively (10). Zero meant a piece of software was not being used. To distinguish between occupational users and non-users, the former

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students responded (yes/no) to the question: Do you use a microcomputer in your occupation? A pilot test indicated the questionnaire could be clearly understood and that the three scales had acceptable reliability (Cronbach's alpha reliability coefficients included .71 for the barriers scale, .68 for the attitudes scale, and .89 for the software scale).

Data were collected between July 15 and August 31, 1985 from 128 of the 150 former students included in the sample. The respondents and the 22 nonrespondents were compared on three characteristics: their sex, grade earned in the course, and level of credit sought. The two groups were similar ($p \blacktriangleright .05$) on all three variables.

Findings

Objective 1: Characteristics of Users and Non-users

Table 1 lists some of the characteristics of the 128 former students responding to the questionnaire. Slightly over 60% used microcomputers in their occupations. Women comprised one-third of the sample and also one-third of both the users and nonusers. Although slightly over half had taken the course for graduate credit, almost two-thirds of the users had been enrolled as graduate students. Areas of employment of the former students included agribusiness (15%), vocational agriculture teaching (15%), Cooperative Extension (20%), other teaching (20%), and other (30%). Respondents who were still full-time students or unemployed were included in the Other category. Occupational users averaged almost seven hours of microcomputer use per week whereas nonusers reported little use (.15 hours per week). Although both users and non-users had a positive attitude toward computers, users were significantly more positive ($t = -4.15$, d.f. = 124, $p \blacktriangleleft .05$).

Table 1. Selected Characteristics of Former Students Who Used or Did Not Use Microcomputers in Their Occupations

Variable	Users (n=77)	Non-Users (n=49)	All Cases (n=128)
Mean Age	34.2 (9.14 S.D.)	32.6 (12.5 S.D.)	33.1 (10.6 S.D.)
Sex			
Male	52 (67.5%)	32 (65.3%)	85 (66.4%)
Female	25 (32.5%)	17 (34.7%)	43 (33.6%)
Highest Degree			
No Bachelor's	11 (14.3%)	19 (38.8%)	32 (25.0%)
Bachelor's	30 (39.0%)	20 (40.8%)	50 (39.1%)
Master's	25 (32.4%)	10 (20.4%)	35 (27.3%)
Specialist/Ph.D.	11 (14.3%)	0 (0.00%)	11 (8.6%)
Present Position			
Extension	22 (28.6%)	3 (6.1%)	25 (19.5%)
Vo Ag Teacher	14 (18.2%)	5 (10.2%)	19 (14.8%)
Other Teacher	15 (19.5%)	10 (20.4%)	25 (19.5%)
Business	11 (14.3%)	9 (18.4%)	20 (15.6%)
Other	15 (19.5%)	22 (44.9%)	39 (30.1%)
Level of Credit			
Undergraduate	27 (35.1%)	31 (63.3%)	60 (46.9%)
Graduate	50 (64.9%)	18 (36.7%)	68 (53.1%)
Grade for Course (4.00 Scale Used)	3.56 (.57 S.D.)	3.27 (.64 S.D.)	3.44 (.61 S.D.)
Another Computer Course Taken			
Yes	17 (22.7%)	6 (12.5%)	23 (18.5%)
No	58 (77.3%)	42 (85.7%)	101 (81.5%)
Computer Owner			
Yes	27 (36.5%)	5 (10.2%)	33 (26.6%)
No	47 (63.5%)	44 (89.8%)	91 (73.4%)
Mean Hours Computers Used Per Week	6.84 (8.99 S.D.)	.15 (.59 S.D.)	4.22 (7.69 S.D.)
Attitude Toward Computers	79.5 (10.6 S.D.)	71.5 (10.4 S.D.)	76.4 (10.5 S.D.)

Objective 2: Discriminating Variables

Table 2 shows the results of a discriminant analysis performed to identify factors that would label occupational users and non-users. Five variables explained 33% of the variance in whether or not the former students used microcomputers in their occupations (Canonical R of .57 squared equals .33). The five variables collectively lowered the Wilks Lambda to .67. Whether or not former students participated in noncredit micromputer inservice activities explained 12% of the variance. Attitudes about computers explained an additional 9% of the variance. Other discriminating variables included owning a microcomputer (5%), having a B.S. or higher (4%), and final grade in AEE 5203/7203 (3%).

Table 2. Discriminant Analysis for Former Students Who Used Microcomputers in Their Occupations and Those Who Did Not

Function Derived	Eigenvalue	Canonical R	Wilks Lambda	Chi Square	d.f.	Sig.
ADOPT or NOT	.48	.57	.67	44.9	5	.0000

Discriminating Variables in Adopt Function	F to Enter[1]	Wilks[2] Lambda	Standardized Discriminant Coefficient
Attended a Microcomputer Inservice Activity	7.57	.88	.44
Attitude about Microcomputers	9.06	.79	.49
Owns a Microcomputer	6.19	.74	.40
Having a B.S. or Higher Degree	6.37	.70	-.41
Final Grade in Ag Ed Computer Course	4.98	.67	.37

[1]Only variables significant at the .05 level for 1 and 113 d.f. included in the discriminant function.

[2]Wilks Lambda interpreted as variance NOT explained as opposed to R^2 or variance explained in stepwise multiple regression analysis.

Objective 3: Barriers to Microcomputer Adoption

Occupational users listed microcomputers being used excessively by only a few colleagues (limiting access), hardware being too expensive, and inconvenient location of microcomputers as primary barriers to microcomputer use in their occupations. No access to microcomputers was the first barrier listed by non-users. Their second and third barriers were the same as those of users. Expensive software was the fourth ranked barrier for users. It was ranked 7th by nonusers. When ranking of the eight barriers were compared for users and non-users, no aggreement was found (Spearman's rho coefficient = -.18, $p \blacktriangleright .05$).

Table 3. Barriers to Microcomputers Being Adopted by Employees in Former Students' Place of Employment

Barrier	Users (n=77) Mean*	SD	Rank	Nonusers (n=49) Mean*	SD	Rank
Microcomputers used excessively by only a few colleagues	5.29	3.1	1	4.03	2.7	4
Hardware too expensive	5.25	3.1	2	5.78	3.2	2
Location of microcomputers not handy	5.22	3.6	3	5.61	3.5	3
Software too expensive	4.66	2.9	4	4.69	3.2	7
Lack of microcomputer teaching materials	4.57	2.9	5	5.11	3.1	6
Lack of administrative support	4.20	3.1	7	4.74	2.9	5
Good software not available	4.30	2.9	8	4.19	2.7	8
No access to a microcomputer	3.51	3.2	9	6.30	3.9	1

*Means based on scale of 0 = no problem, 1 = small problem, and 10 = large problem

Objective 4: Software Used in Occupations

The 77 occupational users of microcomputers were asked to indicate what software they were using in their positions. Ranked first was mailing list programs followed by software available from the Cooperative

Extension Service. Ranked third was word processing, and electronic spreadsheets ranked fourth. Table 4 lists the software being used, the extent of use, and the number of former students using each type of software.

Conclusions

Several conclusions are made based upon the findings of this study. Even though users and non-users were both positive about computers, the more former students used microcomputers in their occupations, the more positive their attitudes became. The results of the discriminant analysis indicate that participation in a microcomputer in-service activity is the major determinant of whether or not former students use microcomputers in their occupations. The types of software former students used in their occupations focused on computing applications rather than programming skills. Colleges of agriculture must assess whether the computing experiences their students receive are of the caliber and duration needed for occupational performance.

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Table 4. Software Used by Occupational Users in Microcomputers

Type of Software	Users (n=77) n	Mean	SD	Rank
Mailing list package	47	6.77	3.3	1
Extension software	53	6.55	3.1	2
Word processing	49	5.49	3.3	3
Electronic spreadsheets	44	4.77	3.3	4
Public domain packages	43	4.51	2.7	5
Testing, educational	30	4.50	3.2	6
Database management	40	3.98	3.2	7
Authoring package	30	3.27	3.0	8

*-Means based on Zero=Not Used, 1=Not Used Extensively, and 10=Used Extensively