Computer Proficiency for Undergraduate Students in Agriculture

Victor A. Bekkum and W. Wade Miller

Abstract

Graduates from colleges of agriculture must have competence in the use of computers. Educators and industry personnel agree that computer proficiency is essential. How are colleges of agriculture meeting the computer education needs of their B.S. graduates? The objective of this paper is to report the results of a study to determine strategies for meeting computer proficiency in colleges of agriculture.

Introduction

Graduates from colleges of agriculture must have competence in the use of computers. A recent national study by Bekkum (1992) sought to assess the educational needs of B.S. graduates in agriculture. Human resource managers of companies in the agricultural equipment industry that employ these graduates throughout the nation were surveyed and without exception it was clear that computer application needs including word processing, spreadsheets, databases, and graphics are essential. They also identified use of computers in decision-making and computerized accounting systems as highly valued skills. Similar findings were determined for graduates emplo yed in other agricultural industries and businesses.

In 1989, the College of Agriculture Technology Advancement Committee at Iowa State University conducted a study of computing needs in the college. Five priority computing needs were identified for resident instruction as follows:

1. technical staff support,
2. adequately equipped microcomputer teaching laboratories,
3. providing adequate hardware (for faculty as well as students),
4. local area network systems, and
5. incorporation of computers into the curriculum.

Similar priority needs were also identified for research and extension programs. Although the report addressed the college's comput ing needs in general, no attempt was made to determine undergraduate student needs for computer proficiency.

Most journals in education and/or agriculture are incomplete today without an article describing the need for computers or a compute r program to assist in teaching in a specific discipline. Kazmer (1991) in a recent *NACTA Journal* stated; "Recognizing that computer literacy is as important today as the traditional '3 R's', the University of Connecticut recently included computing skills as a r equirement for graduation". Mogen (1993) described the need for computer-aided design in their landscape horticulture curriculum at Colorado State University. She stated; "The first goal is to teach CAD to landscape horticulture students". One of the underlying premises appears to be that students must possess basic computing skills.

The authors believe that meeting computer proficiency for students in undergraduate education in agriculture may be a challenge, especially in times of change and tight budgets. Hundreds, perhaps thousands of articles have been written to describe everything from computing concepts to computer applications but little has been done to address the needs for computing of undergraduate students in agriculture. To assess the current situation and identify strategies used in agriculture curricula across the nation, a study of colleges/schools of agriculture was undertaken.

Purpose of the Study

The purpose of the study was to identify strategies for meeting computer proficiency in agriculture colleges across the nation. More specifically the authors wanted to determine if colleges were requiring computer courses; and if so, the number of credits, number of courses, and at what level taught. They also sought to identify the providers of computing courses, including the college(s) and department(s), what units of instruction were taught, what teaching format was used, and the type of computer equipment used.

Methods and Procedures

A written survey was designed by the authors to collect the data previously described. The questionnaire was mailed on July 6, 1993 to deans of academic programs in schools and colleges of agriculture, agriculture and life sciences, or agriculture and natural resources as identified in the 1992

Bekkum is an associate professor in the Department of Agricultural and Biosystems Engineering, and Miller is a professor in the Department of Agricultural Education and Studies, Iowa State University, Ames, IA 50011.

Directory published by the National Association of State Universities and Land-Grant Colleges. Thr ee weeks later, a follow-up letter was mailed to non-respondents. A second follow-up letter and a copy of the questionnaire was mai led three weeks after the first follow-up. Eighty-three percent (59) of the deans of academic programs or their designee responded to the survey.

Findings

Computer Requirement

The majority of the colleges/schools reporting (55.9%) indicated there was no college-wide requirement in the area of computer educa tion (Table 1). However, a significant number, 26 of the 59 colleges (44.1 percent), did have a computer education requirement in p lace for all their students and approximately 20 colleges indicated that some departments had a computer education requirement in th eir undergraduate program.

Table 1. Number and percent of colleges/schools of agriculture with a computer education requirement. (N=59)

Course Requirement	Number	Percent
Yes	26	44.1
No	33	55.9

Of the colleges of agriculture with a computer education requirement, the most common number of credits required was three as indicated by 20 respondents (77.0 percent) (Table 2). Three additional colleges had a variable requirement that ranged from 3-6 credits a nd three colleges had a requirement of six credits.

Table 2. Number of credits in computer education required by colleges/schools of agriculture. (N=26)

Number of Credits	Number	Percent
3	20	77.0
3-6	3	11.5
6	3	11.5

The college requirement for computer education was typically a single, three-credit course (Table 3). This was the case for about two-thirds of the 26 colleges with a computer education requirement. It is interesting to note that three colleges had a variable re quirement which ranged from one to two courses. Also, two colleges had a computer requirement, but the requirement could be met in ways other than by a course, including test-out or demonstrating computer proficiency.

Table 3. Number of courses in computer education required by colleges/schools of agriculture. (N=26)

Number of Courses	Number	Percent
1	17	65.4
1-2	3	11.5
2	4	15.4
No course	2	7.7

Computer Instruction Providers

Nearly three-fourths, 43 of the 59 respondents, indicated the college of agriculture provided computer instruction for agriculture s tudents (Table 4). The second largest providers of computer instruction were the colleges of arts and science with 45.8 percent. Computer instruction was also provided by nine colleges of engineering and nine colleges of business. A wide range of other colleges also provided computer instruction.

Table 4. Colleges/schools that provide computer instruction for agriculture students. (N=59)

College/School	Number	Percent
Agriculture	43	72.9
Arts & Science	27	45.8
Engineering	9	15.3
Business	9	15.3
Other	18	30.5

Which departments or academic units in the colleges of agriculture provide courses in computer instruction? The primary departments identified in Table 5 in the colleges of agriculture that provide courses were: agricultural engineering at –25.4 percent and ag economics/business at –20.3 percent. Several departments of animal science, agricultural education, agronomy, forestry and general agricu lture were also listed as providers of computer courses.

Table 5. Agriculture departments/academic units that provide courses in computer instruction. (N=59)

Departments	Number	Percent
Agricultural Engineering	15	25.4
Agricultural Economics/Business	12	20.3
Animal Science	8	13.6
Agricultural Education	7	11.9
Agronomy	6	10.2
Forestry	5	8.5
General Agriculture	4	6.8
Other	18	30.5

As expected, a large number of computer science departments (30) provided courses in computer instruction as described in Table 6. It was noted that 31 other non-agriculture departments were listed as providers of computer courses. These departments were quite varied in nature.

Table 6. Non-agriculture departments that provide courses in computer instruction. (N=59)

Departments	Number	Percent
Computer Science	30	50.8
Other	31	52.5

Computer courses were being taught primarily at the freshman and sophomore level with 45.8 and 27.1 percent, respectively (Table 7). Twelve respondents did not respond to this question.

Table 7. Level that computer courses are taught. (N=59)

Level	Number	Percent
Freshman	27	45.8
Sophomore	16	27.1
Junior	4	6.8

Units of Computer Instruction

What units of instruction are taught in computer courses provided to students in colleges of agriculture? According to the data pre sented in Table 8, fifty-eight of the 59 respondents or 98.3 percent indicated word processing was taught. This was closely followe d by spreadsheets with 96.6 percent and databases with 88.1 percent. Agricultural applications, graphics and the use of networks we re noted by slightly more than 50 percent. Telecommunications and integration were included as units of instruction by approximatel y 40 percent of the group. Instruction in artificial intelligence was provided by only 22 percent of the departments or colleges.

Table 8. Units of instruction taught in computer courses. (N=59)

Unit	Number	Percent
Word Processing	58	98.3
Spreadsheets	57	96.6
Databases	52	88.1
Ag Applications	37	62.7
Graphics	35	59.3
Networks	31	40.7
Telecommunications	24	40.7
Desktop Publishing	20	33.9
Integration	23	40.0
Artificial Intelligence	13	22.0

Computer Teaching Format

Slightly less than two-thirds of the surveys provided information regarding the teaching format used in the computer courses. Two hours of lecture and two hours of lab appeared to be the most popular format (Table 9). This is consistent with the typical 3-credit course. Lecture ranged from one to four hours per week and labs (scheduled) ranged from one to six hours per week. Open lab was frequently cited as part of the teaching format but no clear patterns emerged.

Table 9. Teaching format used in the computer courses. (N=59)

Teaching Format	Number of Hours/Week	Number of Courses	Percent
Lecture	1	6	10.2
	2	20	33.9
	3	11	18.6
	4	1	1.7
Lab (scheduled)	1	3	5.1
	2	18	30.5
	3	4	6.8
	4	2	3.4
	6	1	1.7

Computer Equipment

Ninety-eight percent listed IBM/IBM-compatible computers while 52.5 percent indicated they were using Macintosh computers (Table 10). In other words, over one-half of the colleges had access to and were using both types of computers for instruction. A substantial number were using computer projection and computer networks in teaching with 45.8 and 50.8 percent, respectively.

Table 10. Types of computers and related teaching equipment used in teaching the computer courses. (N=59)

Computers/Equipment	Number	Percent
IBM/IBM-compatible	58	98.3
Macintosh	31	52.5
Computer projection	27	45.8
Networks	30	50.8

Future Changes in Computer Requirements

The respondents were asked to briefly describe possible future changes they foresaw in computer education requirements for B.S. stud ents in agriculture. Several respondents (11) stated that they felt that less time would need to be spent on basic skill development. They felt that students would be coming to college "computer literate". This will allow them to either eliminate beginning comp uter classes or to upgrade the content of computer classes. Several respondents also indicated that more computer applications will be integrated into courses throughout the curriculum. One respondent summed up with this statement, "There will be a shift from em phasis on literacy, to contextual applications and integrating more broadly across the curriculum".

No one indicated that the use of the computer would decline in the future. In fact, they indicated that the use of computers would increase. One respondent stated that professors and employers will expect all agriculture graduates to be computer literate. Two respondents felt that students would be required to demonstrate computer literacy as a part of graduation requirements. Several respondents indicated that computer utilization will be integrated into more classes, even

when it is not the primary focus of the class . They stated that the instructor would be using the computer as a teaching/ learning tool and the students would be using applications to analyze and solve problems.

Several respondents listed ways the computer will be used in future college classes. They listed multimedia presentations. database applications, networking. GIS. CD-ROM, and CAD as examples of applications that will be used more in the future. They also stated that specific applications will be developed and utilized in agriculture classes. One respondent indicated that distance education will become more available through the use of computers.

Summary and Conclusions

Educators in colleges and schools of agriculture expect their students to be "computer literate." While they would like them to be computer literate before they come to college, it is evident that many of the educators do not feel that students possess the necess ary computer skills since the majority of colleges/schools or departments either require computer courses or have a computer skills requirement. Based on the units of instruction taught in computer courses, they want their students to be able to use word processing programs, spreadsheets, and databases. Many also want them to be able to use graphics programs and have a knowledge of computer networking. Nearly all of them indicated that students will need to be able to use specific agriculture applications in a number of courses.

Typically, computer education was addressed by providing a single. 3-credit course. This course was taught to a great extent by a d epartment in the college of agriculture and/or the department of computer science. Within the colleges of agriculture, the departme nts of agricultural engineering and agricultural economics/business were the primary providers of computing courses. Numerous other agriculture departments also provided computer instruction. Most courses were taught at the freshman level followed by the sophomore level.

Two hours per week of lecture and two hours per week of scheduled lab were the most frequently used teaching format. It was evident that open lab time was also utilized, but no clear pattern emerged. Nearly all teaching units had IBM/ IBM-compatible computers ava ilable while slightly more than one-half also had Macintosh computers. Approximately one-half of the respondents indicated they wer e using computer projection and computer networks in teaching computer courses.

When asked to describe future changes in computer requirements for B.S. students in agriculture, many felt that less time will be spent on basic skill development. It was clear that many respondents felt computing will become more integrated into courses througho ut the curriculum. It was stated the computer will become more of a teaching/learning tool for instructors and students to use in analyzing and solving problems.

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