A Computer Literacy Course for the College of Agriculture: A Survey of Student Attitudes, Evaluations and Performance

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ABSTRACT

The emerging computer-based information technologies may dramatically alter agriculture and its related industries. To be adequately prepared for a future in agriculture, graduates of colleges of agriculture should have a basic understanding of capabilities and limitations of the computer. This is a report of recent experiences in a "computer literacy" course for students of agriculture. Questionnaires were administered at the beginning and end of the course to elicit student attitudes regarding the usage of computers in agriculture. Results indicate significant changes in attitudes over the quarter. At course end, students reported a higher respect for the usefulness of the computer in agriculture and their particular discipline. Beginning attitude and level of apprehension about the course were found to be significant determinants of student performance in and evaluation of the course.

It has been suggested that we are on the verge of a business management revolution that will be as important to the future of agriculture as were the introduction of animal power and the subsequent shift to mechanical power and chemical techniques in their own times (Sonka). The adoption of information processing technology may speed the current structural change toward fewer and larger farms. With narrowing profit margins, greater reliance on manufactured inputs, and increased use of debt financing, the vulnerability of the present day farmer to price and yield variability has heightened. Only those farmers who can control costs and productivity and who can quickly and accurately appraise marketing options will remain profitable. Information processing is likely to be key to this ability and computer literacy may be the prerequisite to effective utilization of information in the management process.

As this new information technology evolves, it is important that agriculturalists be able to evaluate its potential for business application. Teachers in college-level curriculums have close contact with the future leaders of agriculture. It is important that they familiarize themselves with the concept of computer literacy and assess the computer literacy needs of their graduates.

This is a report of recent experiences in Agricultural Economics 250 (AE 250), a "computer literacy" course offered in the College of Agriculture at The Ohio State University. The purpose of this paper is to summarize student attitudes and performance relative to this important subject matter. The particular objectives of the study are:

1. To measure student attitude toward application of

computer technology in agriculture.

2. To test for changes in these attitudes resulting from completion of AE 250.
3. To determine factors which affect student performance and attitude in AE 250

Computer Literacy and AE 250

Growth of interest in computer literacy in colleges of agriculture has paralleled the development of microcomputer technology. This highly accessible, relatively low cost technology seems to be particularly appropriate to the needs of typical agricultural businesses. Full appreciation of this technology, however, requires a basic understanding of the functions, capabilities and limitations of hardware and software and an ability to conceptualize problems for computer solution.

In the summer of 1981, the College of Agriculture modified its baccalaureate degree curriculum to require a minimum of five quarter hours of credit in computer subject matter. The requirement can be met by completion of either a programming course taught in the department of Computer and Information Science or Agricultural Economics 250.

AE 250 is organized as a five credit hour, quarter system course. The course meets for 48 minute lectures three times a week and for a two hour lab session once a week. Multiple lab sections are offered to facilitate a small class environment and to increase the use of available microcomputers. In addition to organized laboratory sections, students are assigned homework exercises. These exercises typically involve description of a simple problem (e.g., tax calculation, enterprise budgeting) for which students must devise and code a computer solution.

The course consists of five major sections, the largest being an approximately four week treatment of BASIC. Other topics include a six-lecture discussion of general purpose computer software featuring electronic spreadsheets, data base managers and word processing.

Data and Methodology

The objectives of this research are to determine student attitudes, both at the beginning and the end of the course, to measure the extent of change in attitudes during the course, and to determine those factors that influence student attitudes toward the application of computers in agriculture. To accomplish these objectives, two questionnaires were administered; one each on the first and last days of the course. Questionnaires were coded so that the individual's beginning and ending responses could be matched and changes in attitude tested with greater statistical rigor. Questionnaires were administered for four quarters with a total of 379 students submitting both beginning and ending questionnaires.

The student population of AE 250 is diverse in many respects. Approximately 66 percent of the respondents were male. Over 48 percent of the students were seniors and 34 percent juniors. Students enrolled were from 9 agricultural majors, with 14 students from outside the College. Twenty-eight percent of the respondents said they were from a commercial farm. An additional 22 percent were from rural areas other than commercial farms. The remainder were from small towns and cities.

There are several student characteristics which are hypothesized to influence attitude toward computer applications

in agriculture, student grade performance and evaluation of the course. These include (1) student sex, (2) student class rank, (3) previous exposure to computers, and (4) student major. Beginning student attitude toward AE 250 also is hypothesized to influence student performance in, and evaluation of, the course.

There is no strong reason, a priori, to believe that either sex will perform significantly better in the class than the other, or that the sexes will hold differing attitudes. For this reason, all analyses involving sex are formulated as two-tailed tests.

Student class rank was hypothesized to be positively related to course performance and evaluation of the course. As students complete coursework in business, accounting, and statistics, they are likely exposed to potential applications of the computer. This may influence their expectations of the usefulness of the computer in their future employment, making them more responsive to the subject matter of the course.

A similar argument holds for previous exposure to computers. Previous coursework in computer science or substantial exposure to computers at home or work may influence the students expectations of the usefulness of this tool. A positive relationship was hypothesized between the degree of previous exposure to computers and course performance and evaluation.

Results

Two questions on the beginning questionnaire were designed to measure prior attitudes of students toward AE 250 (Table 1). The first question addressed the primary reason students enrolled. Just over 20 percent suggested the major reason for their enrollment was the college computer literacy requirement.

Nearly 9 percent indicated their enrollment was based on the suggestion of a faculty adviser or other individual. An additional 2 percent indicated that they had previous computer coursework and wished to extend their knowledge in this subject area. The remaining individuals, 69 percent, felt the subject matter was important enough to warrant the course.

The second question summarized in Table 1 was included to measure the students' level of apprehension about the course. Students were asked to respond to the statement "I am concerned that I cannot learn fast enough to keep up in this course." Over 25 percent of the students indicated either a strongly agree or agree response. Thirty-six percent either disagreed or strongly disagreed with the statement. The former group may also explain the large enrollment of seniors in the course: Perhaps they had delayed enrollment in the course as long as possible.

A series of questions were included on both beginning and ending questionnaires to elicit student attitudes regarding the usefulness of computer technology in agriculture, their specific fields of interest, and future employment activities. The first of these questions addressed student perceptions of the usefulness of the computer in their chosen discipline. Prior to the course, approximately 31 percent suggested the computer was extremely important in their discipline (Table 1). An additional 54 percent felt that this technology was of moderate importance. Five and ten percent of the responses were "of little importance" and "I have no idea", respectively.

Ending responses to this question did not vary greatly from prior responses. An additional one percent of the

respondents felt the computer was of extreme importance in their discipline. Sixty-one percent felt the computer was moderately useful in their discipline. Just over 1 percent were left without a judgment. Application of the paired t-test indicated a change of attitude statistically different than zero at the 0.01 level of probability.

Of the 115 students who initially indicated "extreme importance", 47 ending respondents indicated the computer was only moderately important in their discipline, and one student reported the computer to be of little importance. Of the 57 students who initially felt the computer was of little value or who had no idea of its usefulness, 8 and 33 students, respectively, indicated on the ending questionnaire an evaluation of extreme and moderate importance.

A similar question addressed student expectations about future uses of computer technology in their employment or business (Table 1). On the initial survey, the statement, "I will be working extensively with computers in my future employment/business", received 12 and 42 percent of all responses in the strongly agree and agree categories, respectively. Additionally, 42 percent responded that they were uncertain if they would be working with computers. About 4 percent disagreed or strongly disagreed with the statement. In the case of the ending questionnaire, an additional 6 percent disagreed or strongly disagreed. It is unclear whether this change in response was due to an altered expectation about the usefulness of the computer in the students' particular career plans, or to a judgment that they, personally, do not wish to work with computers. The paired t-test of change of attitude

was not statistically different than zero at the 0.1 level of probability. It is interesting to note that the majority of students indicating either disagree or strongly disagree on the ending questionnaire were from the group who had previously indicated uncertainty on the beginning questionnaire.

The last question of Table 1 was included to measure student expectations of AE 250. The question was phrased "I feel that by the end of this course I will have the necessary knowledge to do the majority of my future computer programming". Forty-one percent indicated agree or strongly agree to this statement. Such responses are, in the estimation of these instructors, overly optimistic. Computer solutions to realistic business problems often involve major programming efforts, are very time consuming and require substantial programming knowledge. Our goals in the course were to make students more aware of the potentials this technology holds for use in agriculture, to provide enough programming experience to facilitate the determination of those applications suited to computer solution and facilitate choosing from existing software or communicating with a programmer in program design.

Ending questionnaire results indicate that we were not entirely successful in this regard. Nearly 43 percent either strongly agreed or agreed with this statement. This was only a slightly larger percentage than on the first questionnaire. There was, however, a substantially larger group who indicated disagree or strongly disagree to the statement. The difference in beginning and ending attitudes was statistically different than zero at the 0.01 probability level as tested with the paired t-statistic.

Two questions were included on the ending questionnaire which asked students to evaluate changes in their attitudes over the course of the quarter. These asked students to indicate whether they had, at the beginning of the class, overestimated, underestimated, or accurately estimated (1) the usefulness of computers in agriculture and (2) the ability of an individual to develop business software. Over 50 percent indicated they had underestimated computer usefulness, while 3 percent reported that they had overestimated its usefulness. Sixty-four percent responded that they had underestimated their ability to develop software, and nearly 13 percent indicated that they had overestimated this ability.

Student Performance and Course Evaluation

The ending questionnaire incorporated three course evaluation statements prefaced with the following statement: "It's your chance to grade AE 250. For each of the following goals, rate the performance of this course. Grades should range from 0 to 100, where 0 indicates a failing effort, 100 indicates excellence, and 50 is an average level of performance". The goal statements were (1) to help students understand the future role of computer technology in agriculture, (2) to provide students with the knowledge of computers required for a successful future in agriculture, and (3) to provide students with a basic computer "literacy". Scores on all three course objectives ranged from 0 to 100. Means (standard deviations) were 73.58 (20.65), 71.91 (21.90), and 84.54 (16.98) for goals 1,2 and 3, respectively. The high student rating for objective 3 shows good support for the survey nature of the course.

Table 2 compares grade performance and course evaluation

statements by sex. A statistical test of difference of mean responses for the two groups also is reported. In all cases, neither the means nor the measure of dispersion were largely different. The difference in responses for the two groups were not statistically different than zero at the 90 percent confidence interval.

A similar comparison was made by grouping students into those who did or did not have access to a computer at home or work (Table 2). Again, the means and standard deviations for the two groups were quite similar, and the test of the hypothesis of equality of means for the two groups could not be rejected with a 90 percent confidence interval.

There were 29 individuals who reported previous coursework in computer science. Table 2 reports a comparison of course evaluation and student performance in the course for the groups of students who had no previous coursework in computers with those 29 who had. A test of the means for these two groups indicated no significant difference in course evaluations. However, students with previous computer science coursework did perform significantly better (at the 0.05 level of probability) than those who had no such coursework.

The attitudes of students toward AE 250 at the beginning of the course was hypothesized to be an important determinant of students' performance and course evaluation. The results of this comparison are reported in Table 2. The measure of beginning attitude used was the response to the question of why students had enrolled in AE 250. Those who indicated they were in the course only because of the college requirement were placed in the "negative attitude" group. Those who indicated

either the desire to expand their knowledge in the computer science area or who reported that it was valuable subject matter, were placed in the "positive attitude" group. The means for the positive attitude group was significantly larger for 2 of the 3 evaluation goals, and for class grade performance.

A similar comparison was made of students who were and were not apprehensive about AE 250 prior to the beginning of the course (Table 2). Those students who responded agree or strongly agree to the statement "I am concerned that I cannot learn fast enough to keep up in this class" were placed in the apprehensive group. Those students who responded disagree or strongly disagree were considered not apprehensive. The means for these two groups were significantly different for all evaluation statements and the course grade performance. Apprehensive students did more poorly in the course and gave lower evaluation reports.

Summary

Changes in attitude of students in the College of Agriculture as result of enrollment in AE 250, a "computer literacy" course, were measured using paired beginning and ending questionnaires. Results indicated significant changes in attitude. At course end, students reported higher respect for the usefulness of the computer in agriculture and their particular discipline. The majority indicated that, at the beginning of the course, they had underestimated both the usefulness of the computer in agriculture and their ability to write software. Beginning attitude and level of apprehension about the course were found to be significant determinants of student performance and evaluation of the course.

References

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Table 1. Before- and After-Class Attitudes of AE 250 Students.

Remark	Relative Frequency	
	Prior	Ending
I am in this class:		
Only because of requirement	20.05	
My advisor recommended it	8.76	
I feel that it is important for future	68.93	
I want to extend knowledge beyond that developed in previous computer courses	2.26	
I am concerned that I cannot learn fast enough to keep up in this course.		
Strongly agree	5.11	
Agree	17.33	
Uncertain or neutral	40.91	
Disagree	30.97	
Strongly disagree	5.68	
My evaluation of the usefulness of the computer in my chosen area is:		
Extreme importance	30.93	31.75
Moderate importance	53.87	61.11
Little importance	5.07	5.82
No idea	10.13	1.32
I will be working extensively with computers in my future employment/business.		
Strongly agree	12.43	13.79
Agree	41.53	42.44
Uncertain or neutral	42.06	33.95
Disagree	3.70	7.43
Strongly disagree	0.26	2.38
By the end of this course, I will have the necessary knowledge to do the majority of my future computer programming.		
Strongly agree	3.7	1.06
Agree	37.57	41.76
Uncertain or neutral	51.85	34.04
Disagree	6.08	19.68
Strongly disagree	0.53	3.46

Table 2. Comparison of Student Evaluations and Performance by Selected Characteristics.

Measure [a/]	Mean	Std. Dev.	Mean	Std. Dev.	Difference of Means (Z-Score)	
Sex	**Male**		**Female**			
Goal 1.	73.67	20.11	73.44	21.79	0.088	
Goal 2.	72.05	21.78	71.68	22.26	0.136	
Goal 3.	85.08	16.89	83.44	17.19	0.777	
Course Grade	82.96	8.72	82.66	8.98	0.271	
Computer Access	**No Access**		**With Access**			
Goal 1.	73.51	20.95	73.43	19.73	0.026	
Goal 2.	71.45	21.59	73.39	23.39	-0.595	
Goal 3.	84.34	17.37	84.93	15.48	-0.233	
Course Grade	82.94	8.72	82.62	9.31	0.242	
Coursework	**Computer Courses**		**No Computer Courses**			
Goal 1.	70.58	20.84	73.87	20.64	-0.769	
Goal 2.	72.88	21.96	71.82	21.93	0.235	
Goal 3.	84.23	18.25	84.57	16.89	-0.091	
Course Grade	86.24	7.38	82.55	8.86	2.347	**
Attitude	**Negative Attitude**		**Positive Attitude**			
Goal 1.	70.89	23.88	74.40	19.70	-0.987	
Goal 2.	63.52	25.93	73.42	20.84	-2.573	**
Goal 3.	77.68	18.87	86.86	15.07	-3.281	***
Course Grade	79.08	8.34	83.63	8.58	-3.488	***
Apprehension	**Apprehensive**		**Not Apprehensive**			
Goal 1.	67.62	24.33	74.48	20.17	-1.848	*
Goal 2.	65.44	24.85	73.26	22.17	-2.016	**
Goal 3.	80.46	21.40	88.52	14.31	-2.607	***
Course Grade	78.80	8.73	85.63	8.35	-4.861	***

a. The goal statements are (1) to help students understand the future role of computer technology in agriculture, (2) to provide students with the knowledge of computers required for a successful future in agriculture, and (3) to provide students with basic computer "literacy".

* Different from zero at the 0.10 level of probability

** Different from zero at the 0.05 level of probability

*** Different from zero at the 0.01 level of probability