Computer Skills And Anxiety Of Students Entering A College of Agriculture

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Abstract

Students enrolled in AGED 1011 - Agriculture Freshman Orientation (n = 108) during the fall 1997 semester at the University of Arkansas were assessed to determine their computer skills and level of computer anxiety. While most entering students reported previous computer coursework, scores on the Computer Skills Inventory (CSI) were low, both overall and for each sub-test area of general knowledge, Internet use, word processing, file management, spreadsheets, and BASIC programming. Overall, the students in AGED 1011 had only a moderate level of computer anxiety. Based on the results, a required computer applications course with a hands-on test-out option was recommended.

Introduction

Computers are an integral component of almost all areas of modern society, with applications ranging from decision support systems to nuclear imaging and from on-line journals to computer-controlled manufacturing processes. Computers also play an important and ever-increasing role in agriculture (Odell, 1994). Thus, university agriculture programs must ensure that graduates are competent in computer use (Bekkum and Miller, 1994; Langlinias, 1994).

A recent study conducted for the College of Agriculture and Life Sciences at Cornell University found that 83% of employers rated computer skills as being either an "important" or "very important" factor in making employment decisions (Monk et al., 1996). Employers rated skills in using word processing, spreadsheet, database, and presentation graphics application programs as being the most important computer abilities needed by prospective employees.

Bekkum and Miller (1994) surveyed deans at 71 land-grant colleges of agriculture to determine strategies used to ensure that graduates were proficient in computer applications. Of the 59 responding deans, 26 (44.1%) reported a college-wide computer requirement. An additional 20 (33.9%) deans reported that some individual departments within their colleges had specific computer education requirements. All of the respondents reported that computer application courses were available to their students.

Bekkum and Miller (1994) also asked the responding deans to indicate likely changes in computer requirements for college of agriculture students. Eleven (18.6%) of the deans believed that, in the future, less time would be required for basic computer skill development, since students would have developed these skills before entering college. This would allow colleges of agriculture to either eliminate or upgrade the content of introductory computer courses. This assumption that future students will enter college with basic computer skills has been prevalent for years (for example, see Curtis et al., 1986).

Despite the optimism of agriculture deans and faculty, just how common is computer use among pre-college students? According to the most recent data from the U.S. Department of Education (1997), in 1994, 57% of 11th graders used computers at school less than once a week. This compares to 1988 when 68.7% of 11th graders reported using computers less than once a week. Thus, while student computer use is increasing, a majority of high school juniors still report limited at-school computer use.

Computer anxiety has been defined (Simonson et al., 1987) as the fear or apprehension a person associates with either actual or anticipated computer use. Houle (1996) found that college students with higher levels of computer anxiety had more negative attitudes toward computers and a lower level of self-perceived computer competency. Houle suggested that student characteristics such as computer anxiety and perceived competence are essential factors to consider in planning, delivering and evaluating computer courses.

Problem Statement

The University of Arkansas' Dale Bumpers College of Agricultural, Food and Life Sciences is one of the majority of land-grant colleges of agriculture that does not have a computer course requirement. The College does offer a three semester hour course, AGME 2903 - Computer Applications in Agriculture, which emphasizes basic and intermediate skills in operating systems and file management, Internet and electronic mail, word processing, spreadsheets, data bases and computer graphics. AGME 2903 is required by two majors (agribusiness and extension education) and may be taken for elective credit by students in the other nine College majors (Catalog of Studies, 1997).

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This study was conducted to determine the computer skills and computer anxiety of students entering the College.

Data from this study would provide information necessary to evaluate potential changes in the offering, content, and coverage of AGME 2903. In addition, the data would establish a benchmark to which future students could be compared.

Purpose and Objectives

The purpose of this study was to assess the computer skills and computer anxiety of students entering the College during the Fall 1997 semester. Specific objectives were to:

1. Determine the self-perceived computer competency of students enrolled in AGED 1011, Agriculture Freshmen Orientation.
2. Determine the actual computer competency of students enrolled in AGED 1011, Agriculture Freshmen Orientation, as measured by total scores on the Computer Skills Inventory.
3. Determine the computer anxiety of students enrolled in AGED 1011, Agriculture Freshman Orientation, as measured by total scores on the Computer Anxiety Index (Iowa State University Research Foundation, 1992).
4. Determine the inter-correlation between self-perceived computer competency, Computer Skills Inventory scores, Computer Anxiety Index scores, and selected respondent demographic characteristics.

Methods

This study was conducted using a descriptive-correlational design (Ary et al., 1990). The population included all University of Arkansas students officially enrolled in AGED 1011, Agriculture Freshman Orientation, as of the second class meeting of the Fall 1997 semester (N = 114). AGED 1011 was selected because it is a required course for all students (including transfers with 24 semester hours or less) entering the College. Of the 114 students enrolled on the second day of classes, 108 (94.7%) provided usable data.

Data were collected by student responses to two instruments: the Computer Skills Inventory (CSI) and the Computer Anxiety Index (CAIN) (Iowa State University Research Foundation, 1992). The CSI was developed by the researchers, and consisted of two parts. Part One contained nine demographic items and four items designed to measure self-perceived computer competence. Part Two consisted of 28 multiple choice items (with five response options) designed to measure student computer competency in the areas of: (a) general knowledge, (b) Internet use, (c) word processing, (d) file management, (e) spreadsheets, and (f) computer programming (BASIC). All items in Part Two were written so as to be answerable by persons familiar with common operating systems and application programs. In other words, the items were not software-specific.

The CSI was examined by a panel of five individuals with experience in teaching introductory computer courses to college agriculture students, and judged to possess content validity. The CSI was pilot-tested with three sections of AGME 2903, Microcomputer Applications in Agriculture, prior to use in the main study. Students participating in the pilot-test reported no difficulty understanding the instructions or items contained in the CSI.

The internal consistency reliability estimates for the CSI were .70 (coefficient alpha) for the items in Part One dealing with self-perceived computer competency, and .59 (K-R 21) for the 28 items comprising Part Two of the instrument. Although the reliability estimates were lower than desired, Ary et al. (1990) indicate that reliabilities in this range are acceptable when the purpose of the research is to make decisions or comparisons on a group (rather than individual) basis.

The CAIN (Iowa State University Research Foundation, 1992) is a commercially available instrument designed to measure computer anxiety. The CAIN consists of 26 computer-related statements which respondents rate on a one to six Likert-type scale (1 = "strongly agree" and 6 = "strongly disagree"). Responses to each of the 26 statements are summed to arrive at a total CAIN score, which can range from 26 (low anxiety) to 156 (high anxiety). Simonson et al. (1987) reported reliabilities of .90 (test-retest) and .94 (coefficient alpha) for the CAIN. For the present study, the coefficient alpha reliability estimate was .92.

Results

Of the 108 students providing usable data, 58.9% were male and 41.1% were female. Freshman students comprised 85.0% of the respondents, followed by sophomores (12.1%), juniors (1.9%) and seniors (0.9%). The respondents had an age range of 17 to 34 years, with a median of 18 and a mean of 18.4. The respondents reported high school graduating class sizes of from 14 to 620, with a median of 111 and a mean of 164.5.

A majority of the respondents (67.3%) reported having taken a course in computer use, while nearly half (49.1%) of the students reported taking a course in which computer use was expected, but not the primary focus. The self-reported typing speed of the respondents ranged from 0 to 75 words per minute, with a mean of 35.0 (SD = 14.35) and a median of 32.0. Nearly two-thirds of the respondents (62.6%) reported owning a computer.

Objective One:

The first objective was to assess the self-perceived computer competency of students enrolled in AGED 1011, Agriculture Freshmen Orientation, as indicated by responses to four Likert-

Table 1. Self-Perceived Computer Competence of Students Enrolled in AGED 1011, Agriculture Freshman Orientation (n = 108).

Application	$\bar{x}$[a]	SD	Median
Word processing	3.11	1.22	3.0
Internet (World Wide Web) use	2.33	1.54	3.0
Spreadsheets	1.81	1.45	2.0
Computer programming (BASIC)	0.90	1.12	0.0

[a]Based on a 0 (no competence) to 5 (high competence) scale.

type items dealing with specific computer applications. As shown in Table 1, students felt they had the highest level of competence in word processing and the lowest level of competence in computer programming.

Responses to the four individual items were summed and averaged to arrive at a composite measure of computer competency, with a possible range of from 0 (no competence) to 5 (high competence). The distribution of scores for the composite variable, self-perceived computer competence, was near normal (skewness = - 0.06), with a mean of 2.04 (SD = 0.97).

Objective Two: The distribution of student scores on the 28 item Computer Skills Inventory had a slight positive skew (skewness = 0.53) with a range of 5 (17.8% correct) to 27 (96.4% correct). The mean number of correct responses was 12.46 [(44.5%) (SD = 3.73)]. Overall, students scored a higher percentage of correct responses on the Internet, general knowledge, and word processing sections of the CSI. The lowest overall scores were on the computer programming section. Table 2 summarizes student achievement on the CSI.

Table 2. Student Scores on the Computer Skills Inventory (CSI) by Area and Total (n = 108).

Test Area (number of items)	$\bar{x}$[a]	SD	% Correct
General Knowledge (4)	2.24	1.00	56.0
Internet Use (4)	2.24	0.56	56.0
Word Processing (6)	3.11	1.46	51.8
Spreadsheets (7)	2.96	1.74	42.3
File Management (5)	1.86	1.22	37.2
Computer Programming (2)	0.22	0.48	11.0
Total (28)	12.46	3.73	44.5

[a]Number of items answered correctly.

Objective Three: The third objective was to determine the computer anxiety of students enrolled in AGED 1011 as indicated by scores on the Computer Anxiety Index (CAIN) (Iowa State University Research Foundation, 1992). The possible range of scores on the CAIN is 26 to 156, with higher total scores indicating higher levels of computer anxiety.

For the respondents in this study, the distribution of scores on the CAIN was positively skewed (skewness = 1.48), with scores ranging from 31 to 143. The mean CAIN score was 64.9 (SD = 20.1); the median score was 63.5. Table 3 compares the CAIN scores for students enrolled in AGED 1011 with those of the norm groups used in validating the CAIN (Simonson et al., 1992).

The percentile equivalent of the mean CAIN score for AGED 1011 students was slightly higher, but comparable to, those reported for junior high and Iowa State University students. The percentile equivalent for AGED 1011 students was significantly higher than for either category of business sector computer users, especially those with formal computer training.

Table 3. Comparison of CAIN Scores of AGED 1011 Students with Norm Groups Reported by Simonson et al., 1992 (n = 106).

Group	N	x	SD	Percentile Score[z]
AGED 1011 Students	**106**	**64.89**	**20.04**	**68th**
Business Sector Users with Formal Computer Training	67	46.28	15.08	28th
Business Sector Computer Users[y]	122	51.74	14.04	40th
Junior High School Students[x]	1088	61.23	19.05	60th
College Students[w]	545	62.33	17.66	63rd

[z]Based on percentile norms reported by Simonson et al., 1992.
[y]Business and industry workers routinely using computers on the job.
[x]Primarily 8th grade students.
[w]Freshmen, sophomores and juniors enrolled at Iowa State University.

Objective Four: The fourth objective of this study was to determine the relationships between and among selected student demographic variables and self-perceived computer competency and scores on the CSI and CAIN. Using the descriptors suggested by Davis (1971), the correlation between student demographic variables and scores on the three assessment measures (SPC, CSI, and CAIN) ranged from negligible to moderate. As shown in Table 4, estimated typing speed and computer ownership were the demographic variables having the highest correlation with both self-perceived computer competence (SPC) and total scores on the Computer Skills Inventory (CSI); however, there was no relationship between these variables and scores on the Computer Anxiety Index (CAIN).

The inter-correlations between self-perceived competency (SPC), Computer Skills Inventory (CSI), and Computer Anxiety Index (CAIN) scores are also reported in Table 4. The correlation between observed SPC and CSI scores (.38) was moderate (Davis, 1971). However, by applying the attenuation for measurement error formula (Glass and Hopkins, 1996), a substantial correlation of .59 was estimated between the true scores for SPC and CSI. The correlations between CAIN scores and the SPC and CSI scores were low to negligible (both before and after attenuation for measurement error). This is consistent with the findings of Simonson et al. (1992).

Table 4. Inter-Correlations Between Student Demographic Variables and Self-Perceived Computer Competency, Computer Skills Inventory and Computer Anxiety Index Scores.

Variable	SPC	CSI	CAIN
Age	-0.02	.04	-.10*
Gender[a]	-0.06	-.04	-.09
Number in HS graduating class	0.03	-.13*	.14*
Completed a computer course[b]	-0.03	.03	-.07
Completed course requiring computer use[b]	.10*	.05	-.05
Estimated typing speed (words per minute)	.40**	.22*	.00
Own a computer[b]	.24*	.23*	.06
Self-Perceived Competency (SPC)	1.0	.38**	-.16*
Computer Skill Index (CSI)		1.0	-.07
Computer Anxiety Index (CAIN)			1.0

[a]Coded as Female = 1; Male = 2.
[b]Coded as No = 0; Yes = 1.
* = Low association; ** = Moderate association (Davis, 1971).

Discussion

Students enrolled in AGED 1011, Agriculture Freshmen Orientation, during the Fall 1997 semester reported a variety of computer experiences. Slightly over two-thirds of the students reported having completed a computer use course, while nearly one-half had completed a course where computer use was expected. Also, 62.6% of the students reported owning a computer.

Despite these computer experiences, the students did not perceive themselves as having a high degree of computer competence. In only one (word processing) of the four areas studied did the self-perceived mean competency rating exceed the mid-point (2.5) of the 0 (no competence) to 5 (high competence) rating scale. The mean (2.04) for the composite variable, self-perceived computer competency also fell below the mid-point of the scale. Thus, it was concluded that the respondents lack confidence in their computer abilities.

The mean score on the 28 item Computer Skills Inventory (CSI) was 12.45 (44.5% correct). Students scored highest on the general knowledge (56.0%), Internet use (56.0%), and word processing (51.8%) portions of the CSI. The lowest scores were on the spreadsheet (42.3%), file management (37.2%), and BASIC computer programming (11%) portions of the CSI. It was concluded that students enrolled in AGED 1011 were deficient in basic computer skills in all areas covered by the CSI.

As a group, students in AGED 1011 did not exhibit a particularly high level of computer anxiety, as measured by scores on the Computer Anxiety Index (CAIN). However, a sizable minority of students in AGED 1011 did indicate a high degree of computer anxiety, with 10% of the students being at or above the 94th percentile for computer anxiety.

Of the demographic variables studied, only estimated typing speed and computer ownership were of any practical significance in predicting either self-perceived computer competence or total score on the CSI. None of the demographic variables were of any practical significance in predicting computer anxiety, with the largest correlate (number in HS graduating class) explaining less than 2% of the variance in CAIN scores.

Having completed a computer course had no practical relationship with self-perceived computer competence, computer skills, or computer anxiety. According to Hastings (1994, p. 285), this lack of relationship between high school computer courses and computer competence may occur because, "The rapid rate of technology change in computer hardware and software is frequently going to leave many high

school curricula behind."

After attenuation for measurement error, a substantial relationship ($r = .59$) was estimated between the true scores for self-perceived computer competence and total score on the CSI. This indicates that student self-assessment of computer competence may have potential as a method of identifying students needing computer instruction.

Implications

Despite their previous exposure to computers and computer courses, many students enrolled in AGED 1011, Agriculture Freshman Orientation could significantly benefit from completing an introductory college-level computer course. Based on this finding, it appears that AGME 2903, Computer Applications in Agriculture is a viable course which meets a definite need in the curriculum.

The findings of this study also indicate a need to seriously consider implementing a college-wide computer course requirement. This could be accomplished by requiring students to complete AGME 2903 — Computer Applications in Agriculture. But, because some students already have well-developed computer skills, a performance testing option should be allowed whereby students could test-out of the computer course requirement. Given the current and increasing importance of computers in agriculture, requiring a computer course but providing a test-out option seems the most responsible course of action for the College.

Completing a computer course or a course requiring computer use was not significantly related to either self-perceived computer competency or total CSI scores. Thus, previous computer coursework should not be used as a criterion in exempting students from a college-wide computer requirement.

Research should be conducted on a periodic basis to assess both graduates' and employers' perceptions of the computer skills required and possessed by agricultural professionals. The present study should be replicated periodically, so that longitudinal data concerning student computer competence and anxiety are available. Such data, when combined with data from graduates and employers, would provide a rich source of information for enhancing the computer experiences and education provided to students in the College.

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