

Analysis of the Relationships Between Computer Experiences, Self-Efficacy, and Knowledge of Undergraduate Students Entering a Land-Grant College of Agriculture

Donald M. Johnson
Melissa L. Lester
James A. Ferguson
University of Arkansas

Abstract

Students entering a college of agriculture and enrolled in a college-wide freshmen orientation seminar in fall 1999 ($n = 84$) and fall 2000 ($n = 69$) were surveyed to determine their computer experiences, computer self-efficacy, and computer knowledge. The purpose of the study was to describe entering students on these variables, determine if significant differences existed between the students by year, and to determine the relationships between the variables. Comparisons by year of enrollment indicated that the students were not significantly ($p > .05$) different on any of the study variables. A majority of the students reported owning a computer and having completed one or more computer courses. A majority of the students had received formal instruction in word processing and file management, while less than 50% had studied spreadsheets, presentation graphics, Internet or e-mail use, databases or computer programming. A majority of students in both years felt they had average or above average skills in word processing, electronic mail, Internet use, and file management. Conversely, a majority of respondents felt they had below average skills in spreadsheets, presentation graphics, databases, and computer programming. The mean scores on the computer knowledge exam were low both years (39.7% correct in 1999 and 41.7% correct in 2000). The variables high school grade average, number of computer courses completed, number of computer topics studied, and computer knowledge exam score all had significant ($p \leq .05$) positive correlations with computer self-efficacy for both the 1999 and 2000 student groups. A multiple regression equation containing these four variables explained 49.1% of the variance in computer self-efficacy. Computer knowledge exam score accounted for approximately 15.6% of the unique variance in computer self-efficacy, while high school grade average accounted for approximately 9.8% of the unique variance. A second regression analysis, using only these two predictors, indicated that, in combination, they were able to explain 44.2% of the variance in computer self-efficacy. The number of computer courses completed, number of computer topics studied, and computer self-efficacy all had significant positive correlations with computer knowledge exam scores for both the 1999 and 2000 student groups. Multiple regression analyses indicated that a linear combination of these three variables did not improve prediction of computer knowledge exam scores over that which could be achieved using computer self-efficacy alone (adjusted $R^2 = .35$ vs. $r^2 = .35$). Recommendations for educational practice and additional research were made based on these findings.

Introduction and Theoretical Framework

Computers are an integral and pervasive feature of modern society. According to the United States Department of Education (USDE, 1996):

Computers and information technologies are transforming nearly every aspect of American life. They are changing the way Americans work and play, increasing productivity, and creating entirely new ways of doing things. Every major U.S. industry has begun to rely on computers. (p. 9)

Computers play an important and ever increasing role in agriculture. Thus, university agriculture programs must ensure that their graduates are competent in computer use (Langlinas, 1994). A study conducted for the College of Agriculture and Life Sciences at Cornell University (Monk, Davis, Peasley, Hillman, & Yarbrough, 1996) concluded that agricultural employers “have a high expectation of computer literacy in recent college graduates” (p. 12). More than 80% of the employers rated computer skills as either an “important” or “very important” factor considered in making employment decisions. The employers rated skills in using word processing, spreadsheet, database, and presentation graphics programs as the most important computer abilities needed by prospective employees. Similar results were found in agricultural employer studies conducted for the University of Arkansas (Graham, 1997) and the University of Nebraska (Andelt, Barrett, & Bosshamer, 1997).

According to Kieffer (1995), many university faculty members and administrators accept the premise that students entering college are already competent in basic computer applications and tasks. Yet, recent research (Johnson, Ferguson, & Lester, 1998,1999) does not support this conclusion. In fact, research even suggests that students graduating from colleges of agriculture may not have adequate computer skills and knowledge (Heyboer & Suvedi, 1999; Johnson et al., 2000).

Efficacy theory suggests that task involvement and persistence are greater when individuals are confident (have a high level of self-efficacy) of their ability to successfully complete a task (Bandura, 1982). Thus, individuals having a high level of computer self-efficacy should be more likely to engage in computer tasks and to show persistence in completing computer tasks despite possible difficulties. Individuals with a low level of computer self-efficacy should be more likely to avoid computer tasks or to give up on a computer task in face of performance obstacles.

According to Kinzie, Delecourt, and Powers (1994), “Self-efficacy is predictive of future engagement with computer technologies, and . . . experiences with computers affect future use only through their effects on self-efficacy.” Clearly, the need exists to explore the relationships between computer experiences, computer self-efficacy and measures of computer skills and knowledge. Such research would add to the theory base of research in computer education.

Purpose and Objectives

The purpose of this study was to determine the relationships between selected computer experiences, computer self-efficacy, and computer knowledge of students entering a land-grant college of agriculture during the fall semesters of 1999 and 2000. The specific objectives of the study were to:

1. Describe the computer experiences, computer self-efficacy, and computer knowledge of students enrolled in a college-wide orientation seminar (AGED 1011) over a two-year period and determine if significant differences existed between the students based on year of enrollment (1999 or 2000);
2. Determine the relationships between selected variables and computer self-efficacy and computer knowledge by year (1999 or 2000), and determine if significant, stable relationships existed between these variables;
3. Determine if a single or linear combination of variables could explain a significant proportion of the variance in computer self-efficacy and computer knowledge across years (1999 and 2000).

Methods

This study was conducted using a descriptive-correlational design. The subjects consisted of students enrolled in AGED 1011 (Agriculture Freshman Orientation) during the fall 1999 semester (five sections, $N = 84$) and the fall 2000 semester (four sections, $N = 73$). In 1999, all 84 students provided usable responses for a 100% response rate; in 2000, 69 students provided usable responses for a 94.5% response rate. The AGED 1011 course was selected because all students enrolled were either entering freshmen or new transfer students having completed fewer than 24 semester credit hours.

Data were collected by student responses to the “Computer Experiences and Knowledge Inventory” (CEKI). The CEKI, which was developed by the researchers and used in previous studies (Johnson, et al., 1998, 1999, 2000), consisted of three parts. Part One contained 21 items related to respondent demographics and previous computer experiences. Part Two was composed of eight Likert-type items requiring respondents to assess their self-perceived level of skill (1 = “no skill”; 5 = “high skill”) in specific areas of computer use. Part Three consisted of 35 multiple choice items (with 5 response options, including a “Do not know” option) designed to measure computer knowledge in the areas of: general computer knowledge (six items), Internet use (five items), word processing (eight items), file management (five items), spreadsheets (six items), databases (three items), and BASIC computer programming (two items). All items in Part Three 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 CEKI was evaluated by a panel of five experts with experience in teaching introductory computer applications courses to college agriculture students and was judged to possess face and content validity. The instrument was pilot-tested with six high school seniors participating in an on-campus agricultural internship program during summer 1998. The participants reported no difficulty in interpreting the instructions or items contained in the CEKI. Pilot-test reliability estimates were .90 (coefficient alpha) for Part 2 (computer self-efficacy), and .79 (KR-20) for Part Three (computer knowledge) of the instrument.

For this study, coefficient alpha reliability estimates of .89 (1999 group), .86 (2000 group), and .88 (combined) were obtained for Part 2 of the CEKI. The KR-20 reliability

estimates for Part 3 were: .78 (1999 group), .72 (2000 group), and .76 (combined). The reliability of Part One of the CEKI was not assessed, since, according to Salant and Dillman (1994, p. 87), responses to non-sensitive, demographic items are subject to “very little measurement error.”

The data were analyzed using descriptive, nonparametric, and inferential statistics. An a priori alpha level of .05 was established as the critical standard for all tests of statistical significance. The use of inferential statistics was based on the assumption that the students included in this study were a time and place sample representative of past, present and future undergraduate students entering this college of agriculture. According to Oliver and Hinkle (1982, p. 200), “Such an assumption permits the use of inferential statistics, and, if made, must be defended by the researcher as being reasonable.” Based on the consistent findings of previous research (Johnson et al., 1998, 1999, 2000) concerning the computer experiences, self-efficacy, and knowledge of students entering this college, the researchers felt such an assumption was warranted.

Results

There were no significant ($p \leq .05$) differences between years (1999 vs. 2000) for any of the student demographic characteristics included in this study. Females comprised a majority of students in both 1999 and 2000, 54.8% and 56.2%, respectively ($\chi^2 = .05$, $df = 1$, $p \leq .83$). Almost all students were classified as freshmen in both 1999 and 2000, 97.6% and 95.6%, respectively ($\chi^2 = .46$, $df = 1$, $p \leq .50$). Reported high school graduating class sizes were similar in both 1999 ($M = 195.2$) and 2000 ($M = 208.2$), $t(148) = 0.45$; $p \leq .65$. Self-reported high school grade averages for the two groups were similar, with a majority of students in both 1999 (61.9%) and 2000 (53.6%) reporting an “A-minus” or higher average ($\chi^2 = 1.20$, $df = 2$, $p \leq .55$). Finally, the average age of the students was similar in 1999 ($M = 18.4$) and 2000 ($M = 18.2$), $t(151) = -.48$; $p \leq .64$.

Objective one

Slightly over three-fourths of the students in both 1999 and 2000 reported having completed one or more computer courses, with word processing and file management being the topics most frequently studied in both years. Less than one-half of the students in either year reported receiving formal instruction in Internet or electronic mail use, presentation graphics, databases or computer programming. While slightly over 50% of the 1999 group had studied spreadsheet use, slightly less than 50% of the 2000 group had studied this topic. The percentage of students owning a computer, and the percentage completing a course where computer use was required were both somewhat higher in 2000 than in 1999. Chi square analyses indicated that there were no statistically significant differences between the two groups for any of these variables, and that all observed differences were within the range of sampling error (Table 1).

There were no statistically significant differences between the 1999 and 2000 student groups in the number of computer courses completed or the number of computer topics studied. The 1999 group had completed a mean of 1.64 ($S.D. = 1.28$) computer classes, while the 2000 group had completed 1.36 ($S.D. = 1.07$) courses, $t(151) = -1.45$; $p \leq .15$. Of the eight computer

Table 1. Computer Experiences of Students Enrolled in AGED 1011 in Fall 1999 and Fall 2000.

	Year				x ²	p
	1999 (n = 84)		2000 (n = 69)			
	Yes (%)	No (%)	Yes (%)	No (%)		
Computer-related experience						
Completed computer course(s)	77.4	22.6	78.3	21.7	.02	.90
Studied the following computer topics:						
File management	59.5	40.5	63.8	36.2	.29	.59
Word processing	76.2	23.8	78.3	21.7	.09	.76
Internet/WWW	40.5	59.5	42.0	58.0	.04	.85
Electronic mail	31.0	69.0	39.1	60.9	1.11	.29
Spreadsheets	51.2	48.8	47.8	52.2	.17	.69
Presentation graphics	45.2	54.8	42.0	58.0	.16	.69
Databases	38.1	61.9	42.0	58.0	.24	.62
Computer programming	19.0	81.0	13.0	87.0	1.00	.32
Completed course(s) requiring computer use	47.6	52.4	56.5	43.5	1.20	.27
Own a computer	71.1	28.9	80.6	19.4	1.80	.18

topics listed, the 1999 group reported having studied a mean of 3.61 (S.D. = 2.67) topics, while the 2000 group had studied 3.68 (S.D. = 2.67) topics, $t(151) = 0.17$; $p \leq .86$.

The students rated their own level of skill in each of eight areas of computer use on a 5-point Likert-type scale (1 = “none,” 2 = “below average,” 3 = “average,” 4 = “above average,” and 5 = “high”). These five response categories were subsequently collapsed into three categories for analyses and reporting purposes (1 & 2 = “below average,” 3 = “average,” and 4 & 5 = “above average”). As shown in Table 2, a majority of respondents in both 1999 and 2000 felt they possessed either “average” or “above average” skills in word processing, electronic mail, Internet use, and file management. Conversely, in both years, a majority of respondents felt they possessed “below average” skills in spreadsheets, presentation graphics, databases, and computer programming. Chi square analyses indicated there were no statistically significant differences between the 1999 and 2000 student groups for their self-perceived level of skill in any of the eight areas of computer use.

Responses to the eight individual items reported in Table 2 were summed and averaged (using the original 5-point scale) to arrive at a composite measure of computer self-efficacy (CSE) for each respondent (alpha = .89 and .86, respectively, for the 1999 and 2000 student groups). The mean CSE score for the 1999 group was 2.78 (S.D. = .78); for the 2000 group the mean CSE score was 2.75 (S.D. = .72). There was no statistically significant difference between the mean scores for the two years, $t(150) = -0.26$; $p \leq .80$.

Table 2. Self-perceived Level of Skill in Selected Areas of Computer Use, 1999 and 2000

Computer area	1999 ($\underline{n} = 84$)			2000 ($\underline{n} = 69$)			χ^2	p
	Below Average	Average	Above Average	Below Average	Average	Above Average		
	%	%	%	%	%	%		
Word Processing	9.5	41.7	48.8	4.4	31.1	32.9	1.94	.38
Electronic mail	16.7	44.0	32.4	8.7	53.6	26.6	2.58	.27
Internet use	16.7	48.8	34.5	10.1	55.1	34.8	1.46	.48
File management	20.2	42.9	36.9	26.1	46.4	27.5	1.69	.43
Spreadsheets	52.4	32.1	15.5	60.8	26.1	13.0	1.11	.57
Presentation graphics	57.1	25.0	17.9	58.0	26.1	15.9	.10	.95
Databases	60.7	29.8	9.5	68.1	18.8	13.0	2.57	.28
Programming	82.1	11.9	6.0	82.6	11.6	5.8	0.01	.99

For the 1999 student group, the overall mean score on the 35 item exam portion of the CEKI was 13.89 (39.7% correct) with a standard deviation of 5.12 and a median of 13.0 (37.1% correct). The 2000 student group achieved a mean score of 14.61 (41.7% correct) with a standard deviation of 4.68 and a median of 15.0 (42.9% correct). There was no statistically significant difference between the mean scores based on year of enrollment, $t(151) = 0.90$; $p \leq .37$.

Objective two

Objective two sought to determine if there were statistically significant ($p \leq .05$) and stable correlations between selected predictor variables and the criterion variables of computer self-efficacy and computer knowledge. To accomplish this objective, appropriate bivariate correlations (and their associated probability levels) were calculated between each variable and computer self-efficacy and CEKI exam score, by year. Z-scores were then calculated to determine if the correlations between a predictor and the criterion variable were significantly ($p \leq .05$) different by year. A variable was considered to be a potentially useful predictor if it was significantly related (in the same direction) with the criterion variable both years, and if there was no significant difference between years for the correlation coefficient.

As shown in Table 3, high school grade average, number of computer courses completed, number of computer topics studied, and CEKI exam score all had significant positive correlations with computer self-efficacy for both the 1999 and 2000 groups. The magnitude of these correlations ranged from low to substantial, using the descriptors suggested by Davis (1971). The

Table 3. Relationship Between Selected Student Characteristics and Computer Self-efficacy, 1999 and 2000.

Characteristic	Computer self-efficacy				
	1999		2000		<u>Z</u>
	<u>n</u>	<u>r</u>	<u>n</u>	<u>r</u>	
Gender ^a	84	-.12 ^b	67	-.21 ^b	.56
Age	81	-.12 ^c	67	-.04 ^c	.49
High school graduating class size	80	.05 ^c	67	.16 ^c	.69
High school grade average	81	.39 ^{c*}	67	.49 ^{c*}	.75
Completed computer use course ^d	81	.01 ^b	67	.25 ^{b*}	1.48
Number of computer courses completed	81	.28 ^{c*}	67	.49 ^{c*}	1.50
Table 3 (cont.)					
Number of computer topics studied	81	.35 ^{c*}	67	.38 ^{c*}	.21
Completed course requiring computer use ^d	81	.28 ^{b*}	67	.22 ^b	.39
Own a computer ^d	80	.42 ^{b*}	67	-.10 ^b	3.32 [*]
CEKI Exam score	81	.63 ^{c*}	67	.54 ^{c*}	.83

^aCoded as 0 = female, 1 = male. ^bPoint-biserial correlation. ^cPearson product correlation. ^d Coded as 0 = no, 1 = yes.

* $p \leq .05$.

relationship between owning a computer and computer self-efficacy was the only correlation that was significantly different between years.

As shown in Table 4, the number of computer courses completed, the number of computer topics studied, and computer self-efficacy had significant positive correlations with CEKI exam scores across both years. The magnitude of these correlations ranged from low to substantial. There were no statistically significant differences between the correlation coefficients by year.

Objective three

The final objective was to determine if a single or linear combination of variables could explain significant amounts of the variance in computer self-efficacy and CEKI exam scores across years. Only variables previously found to have significant, stable correlations with the criterion variables (objective two) were considered as potential predictors for this objective.

The variables of high school grade average, number of computer courses completed, number of computer topics studied, and CEKI exam score all had significant positive correlations with computer self-efficacy for both the 1999 and 2000 student groups (Table 3). When the two years were combined, each of the four potential predictor variables still had a significant positive

Table 4. Relationship Between Selected Student Characteristics and CEKI Exam Scores, 1999 and 2000.

Characteristic	CEKI exam score				
	1999		2000		<u>Z</u>
	<u>n</u>	<u>r</u>	<u>n</u>	<u>r</u>	
Gender ^a	84	-.11 ^b	69	.12 ^b	1.41
Age	84	-.27 ^{c*}	69	-.14 ^c	.83
High school graduating class size	81	.07 ^c	69	.17 ^c	.61
High school grade average	81	.21 ^c	69	.32 ^{c*}	.73
Completed computer use course ^d	84	.15 ^b	69	.16 ^b	.06
Number of computer courses completed	84	.24 ^{c*}	68	.40 ^{c*}	1.09
Number of computer topics studied	84	.31 ^{c*}	69	.36 ^{c*}	.34
Completed course requiring computer use ^d	82	.08 ^b	67	.11 ^b	.21
Own a computer ^d	83	.20 ^b	67	-.09 ^b	1.46
Computer self-efficacy	81	.63 ^{c*}	67	.54 ^{c*}	.83

^aCoded as 0 = female, 1 = male. ^bPoint-biserial correlation. ^cPearson product correlation. ^d Coded as 0 = no, 1 = yes.

* $p \leq .05$.

correlation with the criterion variable (computer self-efficacy). In addition there were significant intercorrelations between the predictor variables (Table 5).

Using multiple regression, computer self-efficacy was regressed on the linear combination of the four predictor variables. The multiple regression equation containing these four variables explained 49.1% of the variance in computer self-efficacy, $F(4, 143) = 34.45$, $p \leq .0001$, adjusted $R^2 = .48$.

Table 5. Correlation Matrix for Potential Predictor Variables and Computer Self-efficacy (n = 148).

Variable	Intercorrelations				
	1	2	3	4	5
1. High school grade average	1.0	.09	.02	.25*	.44*
2. Number of computer courses completed		1.0	.67*	.29*	.37*
3. Number of computer topics studied			1.0	.33*	.36*
4. CEKI exam score				1.0	.59*
5. Computer self-efficacy					1.0

* $p \leq .05$.

Beta weights (standardized multiple regression coefficients) and uniqueness indices (squared semi-partial correlations) were then reviewed to assess the relative importance of the four variables in predicting computer self-efficacy. These beta weights and uniqueness indices are presented in Table 6.

Table 6. Beta weights and Uniqueness Indices Obtained in Multiple Regression Analysis Predicting Computer Self-efficacy.

Predictor	Beta Weights ^a		Uniqueness Indices ^b	
	Beta	t ^c	Uniqueness Index	F ^d
High school grade average	.32	4.41*	.098	9.24*
Number of computer courses completed	.12	1.53	.009	0.85
Number of computer topics studied	.13	1.60	.008	0.75
CEKI exam score	.43	6.61*	.156	14.7*

^aStandardized multiple regression coefficients. ^bSquared semi-partial correlations indicating the percentage of unique variance in computer self-efficacy explained by a given predictor. ^cFor t tests of the significance of the beta weights df = 143. ^dFor F tests of the significance of the uniqueness indices df = 1, 143.

* $p \leq .05$.

The data in Table 6 show that only high school grade average and CEKI exam scores had statistically significant beta weights. CEKI exam score had a somewhat larger beta weight than did high school grade average. The results from the uniqueness indices match those for the beta weights, in that only high school grade average and CEKI exam score were statistically significant. CEKI exam score accounted for approximately 15.6% of the unique variance in computer self-efficacy, beyond that accounted for by the other three predictors. High school grade average accounted for approximately 9.8% of the unique variance in computer self-efficacy. A second regression analysis, using only these two predictors, indicated that, in combination, they were able to explain 44.2% of the variance in computer self-efficacy, $F(2, 145) = 57.43$, $p \leq .0001$, adjusted $R^2 = .43$

The variables number of computer courses completed, number of computer topics studied, and computer self-efficacy all had significant positive correlations with computer self-efficacy for both the 1999 and 2000 student groups (Table 4). When the two years were combined, each of the four potential predictor variables still had a significant positive correlation with the criterion variable (computer self-efficacy). In addition there were significant intercorrelations between the predictor variables (Table 7).

Using multiple regression, CEKI exam score was regressed on the linear combination of the three predictor variables. The multiple regression equation containing these three variables explained 35.9% of the variance in CEKI exam scores, $F(3, 144) = 26.90$, $p \leq .0001$, adjusted $R^2 = .35$.

Table 7. Correlation Matrix for Potential Predictor Variables and CEKI Exam Scores (n = 148).

Variable	Intercorrelations			
	1	2	3	4
1. Number of computer courses completed	1.0	.67*	.37*	.29*
2. Number of computer topics studied		1.0	.36*	.33*
3. Computer self-efficacy			1.0	.59*
4. CEKI exam score				1.0

* $p \leq .05$.

Again, beta weights and uniqueness indices were reviewed to assess the relative importance of the three variables in predicting CEKI exam scores. As shown in Table 8, only computer self-efficacy had a statistically significant beta weight or uniqueness index. Computer self-efficacy accounted for approximately 24.7% of the unique variance in CEKI exam scores. Reviewing the bivariate correlation ($r = .59$) between computer self-efficacy and CEKI exam score (Table 7), indicates that computer self-efficacy, when used alone to predict CEKI exam scores, was capable of explaining 34.8% of the variance ($r^2 = .348$).

Table 8. Beta weights and Uniqueness Indices Obtained in Multiple Regression Analysis Predicting CEKI Exam Scores.

Predictor	Beta Weights ^a		Uniqueness Indices ^b	
	Beta	t^c	Uniqueness Index	F^d
Number of computer courses completed	.000	0.00	.000	0.00
Number of computer topics studied	.126	1.39	.008	1.77
Computer self-efficacy	.524	7.46*	.247	51.60*

^aStandardized multiple regression coefficients. ^bSquared semi-partial correlations indicating the percentage of unique variance in CEKI exam scores explained by a given predictor. ^cFor t tests of the significance of the beta weights $df = 144$. ^dFor F tests of the significance of the uniqueness indices $df = 1, 144$.

* $p \leq .05$.

Conclusions and Recommendations

This study sought to describe, compare, and explain the relationships between computer experiences, self-efficacy and knowledge for students entering a land-grant college of agriculture, and enrolled in a freshmen orientation seminar, in the fall of 1999 and 2000. Understandings developed from this study will provide guidance in the enhancement of the computer education provided to these and future agriculture students. In addition, the findings of this study will add to the theoretical base for future research.

The first major conclusion to be drawn from this study is that there were virtually no differences by year on any computer-related variable for students enrolled in AGED 1011, Agriculture Freshman Orientation. Despite well-publicized, rapid changes in computer technologies, these results indicate that students entering this College vary little in computer experiences, self-efficacy, or knowledge from one year to the next. Any changes that will doubtless occur will most likely be evolutionary, rather than revolutionary. Thus, the exponential growth in students' computer experiences and knowledge predicted by some futurists may be somewhat overstated. Colleges of agriculture should continue to base computer education requirements and expectations on reality rather than perceptions.

Across years the students in this study reported a variety of computer experiences. Approximately three-fourths had completed one or more computer courses and owned a computer. A majority of the students had received formal instruction in word processing and file management. However, a majority of students had not received formal instruction in Internet or electronic mail use, spreadsheets, presentation graphics, databases or computer programming. Only about one-half of the students reported ever completing a course (other than a computer applications course) where computer use was required. Thus, it was concluded that these students had not completed a common core of educational experiences related to the most commonly used computer applications and tasks. Professors teaching introductory courses should take this into account as they plan computer-related assignments.

Overall, the students perceived their level of competence in word processing, electronic mail, Internet use, and file management as average or above average. They perceived their skills in spreadsheets, presentation graphics, databases and computer programming as being below average. The overall mean for computer self-efficacy was slightly below the mid-point on the 1 to 5 scale. Based on these findings, it was concluded that many entering students lack confidence in their computer skills. This finding is especially troubling given the relationship between low computer self-efficacy and avoidance of computer tasks (Bandura, 1982; Fletcher & Deeds, 1994; Kinzie et al., 1994).

Students scored approximately 40% correct on the exam portion of the CEKI. Thus it was concluded that, overall, entering students have a fairly low level of computer knowledge. Taken together with the finding concerning computer self-efficacy, the researchers recommend that a college-wide computer applications course requirement should be established for all students entering the College. Students should be required to complete this course during their first year of enrollment. However, because some students do appear to have an acceptable level of computer knowledge, a performance testing option should be available to allow students to test out of this required course.

High school grade average, number of computer courses completed, number of computer topics studied, and CEKI exam score all had significant, positive and stable correlations with computer self-efficacy. CEKI exam score and high school grade average were the best predictors of computer self-efficacy, with a linear combination of these two variables explaining 44.2% of the variance in self-efficacy. This finding makes sense theoretically given that previous academic success (as evidenced by higher grades) may condition one to expect general academic success, while greater knowledge about a specific domain (as evidenced by higher CEKI exam scores) may lead to higher

confidence in one's ability within this domain (Good & Brophy, 2000). Further research should be conducted to test this hypothesis.

The number of computer courses completed, number of computer topics studied, and computer self-efficacy all had significant, positive and stable correlations with CEKI exam scores. However, a linear combination of these three variables did not improve prediction of CEKI scores over the use of computer self-efficacy alone. This supports the contention by Kinzie et al. (1994) that the effects of various computer experiences primarily act to enhance computer self-efficacy, which, in turn, is the best predictor of computer skills (or knowledge). Again, further research should be conducted to gain a better understanding of this efficacy effect on student computer learning.

References

Andelt, L.L., Barrett, L.A., and Bosshamer, B.K. (1997). Employer assessment of the skill preparation of students from the College of Agricultural Sciences and Natural Resources, University of Nebraska-Lincoln: Implications for teaching and curriculum. NACTA Journal, 41 (4), 47-53.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37(2), 122-147.

Davis, J.A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall.

Fletcher, W.E., & Deeds, J.P. (1994). Computer anxiety and other factors preventing computer use among United States secondary agricultural instructors. Journal of Agricultural Education, 35 (2), 16-21.

Good, T.L. & Brophy, J.E. (2000). Looking in classrooms. New York: Harper Collins

Graham, D.L. (1997). Employer follow-up study. Unpublished manuscript. Fayetteville, AR: Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas.

Heyboer, G. & Suvedi, M. (1999). Perceptions of recent graduates and employers about undergraduate programs in the College of Agriculture and Natural Resources at Michigan State University: A follow-up study. Proceedings of the 26th National Agricultural Education Research Conference, 14-26.

Houle, P.A. (1996). Toward understanding student differences in a computer skills course. Journal of Educational Computing Research, 14(1), 25-48.

Johnson, D.M., Ferguson, J.A., & Lester, M.L. (1998). Computer competency and anxiety of students entering a college of agriculture. Paper presented at the 7th International Conference on Computers in Agriculture. Orlando, FL.

Johnson, D.M., Ferguson, J.A., & Lester, M.L. (1999). Computer experiences, self-efficacy and knowledge of students enrolled in introductory university agriculture courses. Journal of Agricultural Education, 40(2), 28-37.

Johnson, D.M., Ferguson, J.A., & Lester, M.L. (2000). Students enrolled in selected upper-division agriculture courses: An examination of their computer experiences, self-efficacy and knowledge. Journal of Agricultural Education, 41(4), 62-72.

Kieffer, L.M. (1995). Establishing a computer literacy requirement for all students. (ERIC Document Reproduction No. ED 392436).

Kinzie, M., Delecourt, M., & Powers, S. (1994). Computer technologies: Attitudes and self-efficacy across undergraduate disciplines. Research in Higher Education, 35(6), 745-768.

Langlinias, S.J. (1994). Integrating computer applications techniques into agriculture curriculum. In Watson, D.G., F.S. Zazeuta, and T.V. Harrison (eds.). Computers in Agriculture, 1994. (pp.294-299). St. Joseph, MI: American Society of Agricultural Engineers.

Monk, D., Davis, P., Peasley, D., Hillman, P., and Yarbrough, P. (1996). Meeting the needs of CALS students for computing capabilities: Final report of the Ad Hoc committee on College of Agriculture and Life Sciences student computing competencies. Ithaca, NY: College of Agriculture and Life Sciences, Cornell University.

Oliver, J.D., & Hinlek, D.E. (1982). Occupational education research: Selecting statistical procedures. Journal of Studies in Technical Careers, 9, 199-207.

Radhakrishna, R.B., and Bruening, T.H. (1994). Pennsylvania study: Employee and student perceptions of skills and experiences needed for careers in agribusiness. NACTA Journal, 38(1), 15-18.

Salant, P., and Dillman, D.A. (1994). How to conduct your own survey. New York: John Wiley & Sons, Inc.

United States Department of Education. (1996). Getting America's students ready for the 21st Century: Meeting the technology literacy challenge. Washington, DC: Author.