Computer Knowledge, Skills, and Experiences of Students Enrolled in Undergraduate Courses in the College of Agricultural Sciences and Natural Resources

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Abstract

The purpose of this study was to analyze computer experiences, self-perceived level of computer skills, and computer knowledge of students enrolled in undergraduate courses in the College of Agricultural Sciences and Natural Resources (CASNR) at Texas Tech University.

The target population included students enrolled in undergraduate CASNR courses during the Spring 2002 semester. The instrument was administered to a sample of 740 non-duplicated students; each provided usable questionnaires.

The students reported a variety of computer experiences; 88.1% reported completing a course in computer usage and 87.2% owned a computer. Students indicated receiving instruction in word processing (93.9%) and spreadsheet use (91.0%). The students reported above average self-perceived skills in word processing (34.6%) and Internet use (35.3%). The number of correct responses on the Computer Experiences and Knowledge Inventory was 20.06 (60.8%) out of 33 with a standard deviation of 4.94.

There were no strong predictors that could be established from correlations between demographic characteristics and computer experiences with self-perceived level of computer skills and computer knowledge.

Introduction and Theoretical Framework

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. According to the United States Department of Education (1996), every major U.S. industry has begun to rely on computers; hence, computer literacy is no longer an option in the work force, but rather a requirement.

Computers play an ever increasing role in agriculture (Odell, 1994). In modern agriculture, employers place significant importance on computer skills, with more than 80% indicating computer skills are either a "very important" or "important" factor considered when making employment decisions, according to a study conducted for the College of Agriculture and Life Sciences at Cornell University (Monk, et al., 1996). In a study conducted at Pennsylvania State University of agricultural graduates, respondents rated computer skills more important to job success than technical agricultural skills (Radhakrishna & Bruening, 1994). Since adequate computer skills are necessary for an individual to succeed in industry, a need exists to determine the current and expected trends of industry relating to computer usage. As a result, colleges of agriculture must ensure that graduates are competent in computer skills necessary for success with regard to these trends.

In a study at Cornell University, Monk et al. (1996) determined that agricultural graduates needed to be proficient in computer skills, such as word processing, presentation graphics, Internet use, and electronic mail. Also, students should be comfortable with computer and information technologies in order to expand and strengthen computer skills throughout their careers. On the other hand, in a recent study conducted by the College of Agriculture and Natural Resources at Michigan State University, Heyboer and Suvedi (1999) discovered that graduates believed they obtained less than satisfactory preparation in computer usage. They rated computers as the area in which they were least prepared for employment.

According to Kieffer (1995), many university administrators and faculty accept the premise that students enter college possessing basic computer skills. However, in a study conducted by Johnson, Ferguson, Vokins, and Lester (2000), the researchers concluded that students did not have a common core of computer experiences, lacked confidence in their computer skills, and had a low level of computer knowledge. A USDE (1996) report stated that

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"computers and information technologies are not part of the way most American students learn" (p. 9). In 1996, 65.5% of eleventh grade students reported using computers at school once a week or less (USDE, 1996).

After conducting a study of entering students in a college of business, Gordon and Chimi (1998) concluded that students lacked sufficient computer knowledge and recommended that an introductory computer literacy course be required. Brown and Kester (1993) posited that students have the tendency to forget many of the skills learned in introductory computer courses, because they did not apply the skills in subsequent courses. According to the National Center for Education Statistics (1997), only seven states require students to complete a computer literacy course in order to graduate from high school. Within these states the most common computer literacy requirement is one-semester course. In addition, a computer coursework requirement for admission is not included at many colleges and universities. In order to develop strategies to ensure that graduates of the College of Agricultural Sciences and Natural Resources (CASNR) at Texas Tech University are proficient in computer usage, computer skills of undergraduates must be determined.

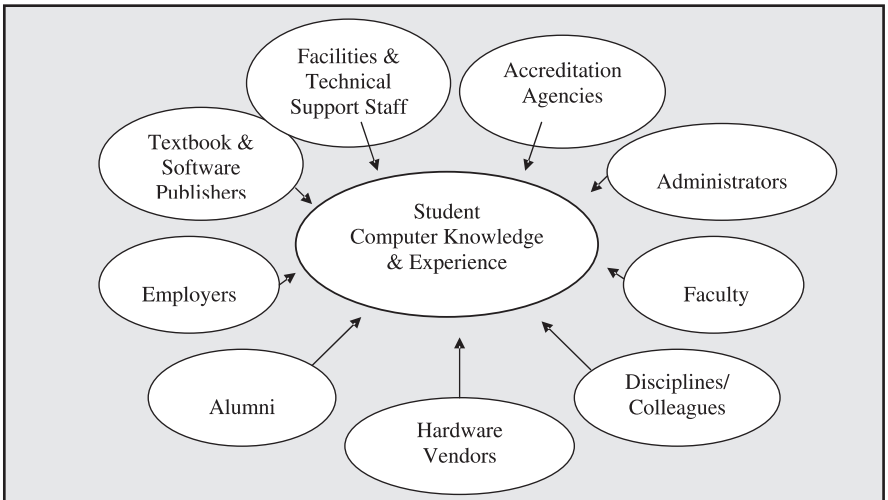

Figure 1. Multiple Interest Groups Related to Computers in the Classroom. Source: Modified from Brent (1999, p.165).

According to Brent (1999), application of computers in classrooms as well as in learning labs and homes must succeed concurrently on different levels. There are multiple interest groups that must be considered when using computers in the classroom. Each group plays an essential role in the process. If any group is not willing to do its part, room for failure is present. Figure 1 illustrates the various interest groups that are related to computers in the classroom.

"The use of computers in the classroom will never be successful if it does not meet student needs" (Brent, 1999, p. 165). If students do not perform well when using computers, then room for failure exists. According to Brent (1999), if students are finding that computer programs are inconvenient or too demanding, they will not hesitate to make their feelings known.

For faculty, computers can offer advantages in the classroom. Computers offer lecture support in order to create interesting presentations for teaching purposes. Instructors may also use computers in labs for students. Online resources are also used in the classroom for students conducting research.

Technology in the classroom creates logistical issues for the instructor. The instructor must make sure that the right type of support is available for students at the right time. For instance, do computer labs have enough computers available for those students that wait until the last minute to complete an assignment? Having adequate facilities and a helpful support staff is necessary for successful application of computers in education (Brent, 1999).

Administrators have become enthusiastic and supportive of computer usage and adoption in the classroom by instructors and students. Brent (1999) indicated that administrators are supportive of high-tech classrooms, because they can document technology in annual reports and make the school look good to prospective students.

According to Long, et al. (1992), graduates value knowledge and skills in the computer sciences. Many studies have found that college graduates rate computer skills important to career success (Andelt,et al., 1997; Graham, 1997; Radhakrishna & Bruening, 1994). Still, there are graduates who believe they have not received satisfactory preparation in computer usage (Heyboer & Suvedi, 1999). One way to adequately prepare students in computer usage is through partnerships that involve industry. Partnerships between higher education and industry have great implications for agriculture. Employers have expressed concern for the lack of sufficiently trained graduates to meet the challenges of a high-performance workplace and have further proposed that the curriculum for agriculture was out of date and should be changed (Graham, 2001; Kunkel, et al., 1996). As a result, core competency skills have become a requirement for both higher education and industry. To meet the demand for computer-literate students, accreditation agencies have recommended that universities implement computer competency entrance exams, exit exams, and require computer courses (Young, 1997). Incorporating the desired skills into the curriculum will help graduates to be

more qualified to adapt to the high-tech, fast paced jobs of the future (Graham, 2001).

In order for computers to be successful in the classroom, good software is essential. Departments and disciplines must address the use of computers in the courses, along with computer-related work. Faculty members need to consider how technology is valued by other colleagues in their discipline (Brent, 1999).

The final interest group is publishers of software and textbooks. Software publishers have an important position influencing the development of computer applications. Software must be appropriate for the course, interesting to the students, and capable of running on computers available to students and faculty. Today, textbook publishers are offering software with their textbooks, usually a CD-ROM. Additional resources for the classroom include Web pages supported by publishers in support of their texts.

According to Brent (1999), computers in the classroom will continue to be affected by the interaction among these various interest groups. "Successful technology in the classroom will need to meet the needs of each group" (Brent, 1999, p. 173).

Purpose and Objectives

The purpose of this study was to analyze computer experiences, self-perceived level of computer skills, and computer knowledge of students enrolled in undergraduate courses in the CASNR at Texas Tech University. The following objectives were formulated to accomplish the purpose of this study:

1. Determine demographic characteristics along with computer experiences of students;
2. Determine self-perceived level of computer skills of students;
3. Determine computer knowledge of students as measured by scores on the exam portion of the Computer Experiences and Knowledge Inventory (CEKI); and
4. Determine relationship between demographic characteristics, computer experiences, self-perceived level of skills, and scores on the exam portion of the CEKI.

Method and Procedures

A descriptive-correlational design was used in this study. The instrument used to collect data for this study was a modified version of the Computer Experiences and Knowledge Inventory (CEKI) developed by the University of Arkansas. The CEKI consisted of three sections. The first section provided descriptive demographic and prior computer experience data. The second section included 8 Likert-type items requiring students to assess their self-perceived level of skill in specific areas of computer experiences. The third section consisted of 33 multiple choice items designed to measure computer knowledge.

The CEKI was pilot-tested by a group of students that were not included in the sample for this study, to verify instrument reliability and make changes and clarifications prior to conducting the study. The instrument was found to be reliable with a Cronbach's coefficient alpha of .89 for Part Two, and a Kuder-Richardson-20 of .72 for Part Three. The reliability of Part One of the CEKI was not assessed, since, according to Salant and Dillman (1994), responses to non-sensitive, demographic items are subject to "very little measurement error" (p. 87).

The target population for this study included students enrolled in undergraduate CASNR courses during the Spring 2002 semester. The total student enrollment, which includes each CASNR course taught during the Spring 2002 semester, was 3,605. This number does not exclude students that were enrolled in more than one CASNR course. Therefore, consideration should be taken of the fact that the total enrollment includes duplication. The researcher used cluster sampling in this study and also eliminated participant duplication.

The sample consisted of non-duplicated students (n = 740) enrolled in undergraduate CASNR courses at Texas Tech University during the Spring 2002 semester. These courses were identified using an official list supplied by the dean's office. Faculty teaching one course during the semester were automatically chosen to participate in the study. Those teaching two or more courses had only one course randomly selected to participate in the study. Faculty members teaching multiple sections of one course had each section participate in the study. Internship and special problems courses were not included in the study since these courses did not have a scheduled time to meet.

The researcher met with the executive associate dean and individually with the department chairpersons representing each of the six departments in the CASNR in order to request support and permission to conduct the study. A memorandum, which was signed by the researcher and executive associate dean, was then sent to faculty members in the CASNR on February 12, 2002, requesting their cooperation and participation in this study. The researcher then corresponded with each faculty member to schedule a date and time when the CEKI would be administered in the respective course. From March 4, 2002, through April 19, 2002, data was collected in the selected CASNR courses.

Statistical analysis was completed using a statistical software program, SPSS, version 10.0. Descriptive statistics were used to summarize the data pertaining to: (a) the demographic variables of

students, (b) their computer experiences, (c) their self-perceived level of computer skills, and (d) their computer knowledge. Pearson product moment correlations were used to examine data pertaining to the relationship between demographic characteristics, computer experiences, self-perceived level of skills, and scores on the exam portion of the CEKI

Results and Findings

Of the 740 respondents providing usable data, ages ranged from 17 to 38 years, with a mean of 20.9. There were 159 (21.8%) participants that were 20 years old and 153 (20.7%) participants that were 21. Twenty-three participants had no response to this item. Of the survey participants, 39.2% (290) were female and 60.8% (450) were male. There were 256 (34.6 %) seniors that participated in the study. A little over one-fourth (186) of the participants reported their classification as junior. The percentage of those taking the CEKI that were sophomores was 21.2% (157). Freshmen represented 17.7% (131) of the sample taking the questionnaire.

Over three-fourths (88.1%) had taken a computer course, while 88 (11.9%) had not taken a computer course. A mean of 2.63 was reported for the number of courses completed. Of the survey participants, 24.9% (163) had completed computer courses in high school, 10.1% (66) had indicated completing computer courses in college, and 65.0% (425) reported computer courses were completed in both high school and college. There were 86 participants with no response to this item. Participants that had completed a course in computer use were asked to indicate if they had received instruction in selected computer topics. Table 1 indicates respondents reporting the highest percentage (93.9%) for instruction received was in word processing, while the lowest percentage (40.6%) for instruction received had been in computer programming.

Of the 740 students participating in the study, 95 (12.8%) reported that they did not own a computer, while 645 (87.2%) indicated that they did own a computer. Students owning a computer were asked to indicate the type of computer they owned and what operating system they used. There were 623 (95.3%) participants that reported owning an IBM compatible computer, while 4.7% (31) indicated owning a Macintosh system computer. There were 86 students with no response to this item on the CEKI.

Participants were asked to rate their self-perceived level of skill in eight areas of computer use, using a five-point Likert-type scale (0 = 'none' and 4 = 'high'). A little over one-third (34.6%) of respondents indicated word processing skills above average and an additional 35.3% of respondents indicated Internet use above average (Table 2). Participants reported average skills in spreadsheet use (43.6%), presentation graphics (41.4%), and file management (40.1%). In addition, average skills were also reported for database use (37.3%) and electronic mail (32.4%). There were 42.7% of participants reporting a skill of none in computer programming. An overall mean of

Table 1

Computer Topics Taught in Computer Course(s) Completed by Participants (n=740)

Computer Topic	Taught (%)	Not Taught (%)
File management	89.0	11.0
Word processing	93.9	6.1
Internet (World Wide Web) use	79.1	20.9
Electronic mail (e-mail)	74.0	26.0
Spreadsheet use	91.0	9.0
Presentation graphics	87.2	12.8
Database use	77.7	22.3
Computer programming	40.6	59.4

Table 2

Self-Perceived Level of Skill in Selected Areas of Computer Use as Reported by Participants (n = 740)

	Self-Perceived Skill Level						
		Below		Above			
Area of Computer Use	None (%)	Average (%)	Average %	Average (%)	High %	Mean	SD
File management	1.2	7.2	40.1	23.5	28.0	2.70	0.99
Word processing	0.4	3.5	32.3	34.6	29.2	2.89	0.88
Internet use	0.5	4.9	32.7	35.3	26.6	2.83	0.90
Electronic mail (e-mail)	0.8	5.1	32.4	31.5	30.1	2.85	0.94
Spreadsheet use	3.5	18.4	43.6	23.8	10.7	2.20	0.98
Presentation graphics	5.3	18.2	41.4	22.8	12.3	2.19	1.04
Database use	8.8	32.7	37.3	14.7	6.5	1.77	1.02
Computer programming	42.7	27.0	20.5	7.4	2.3	1.00	1.07

2.3 was reported for self-perceived level of skills.

Participants took the CEKI exam to determine their level of knowledge in six areas. The mean number of correct responses on the CEKI was 20.06 (60.8%) with a standard deviation (SD) of 4.94. Participants scored a higher percentage of correct responses on the Internet (82.4%) and general computer knowledge (71.2%) sections. The percentage of correct responses for word processing was 56.6%, followed by file management (53.6%) and spreadsheet use (49.3%) The lowest overall score was on the use of database (42.3%). Table 3 summarizes student scores on the exam portion of the CEKI.

Table 4 indicates the significant relationships between demographic characteristics and computer experiences with self-perceived level of skills at the p = .05 level. The relationship between self-perceived level of skills and age was r = -.094, while the relationship between self-perceived level of skills and number of courses completed was r = .306, which indicates a low positive correlation.

Table 4

Correlations Between Selected Demographic Characteristics, Computer Experiences, and Self-Perceived Level of Skills

Variable	Self-Perceived Level of Skills	P – Value
Age (*r*)	-.094*	.012
Gender (*r*)	-.071	.055
High school graduating average (*r*)	-.193*	.000
High school graduating class size (*r*)	.058	.125
College classification (*r*)	.010	.786
Computer course(s) completed (*r*)	.122*	.001
Number of courses completed (*r*)	.306*	.000
Computer experiences (topics studied) (*r*)	.268*	.000
Own a computer (*r*)	.190*	.000
Type of computer owned (*r*)	.003	.947
Type of operating system used (*r*)	-.009	.821

Note. r = Pearson product moment correlation coefficient, * = significantly correlated at the p = .05 level (2-tailed).

Table 3

Participant Scores on the Exam Section of the CEKI by Area and Total (N = 740)

Exam Section (number of items)	M	SD	% Correct
General computer knowledge (6)	4.27	1.33	71.2
Internet (WWW) use (5)	4.12	.94	82.4
Word processing (8)	4.53	1.52	56.6
File management (5)	2.68	1.36	53.6
Spreadsheet use (6)	2.99	1.57	49.3
Database use (3)	1.27	.86	42.3
TOTAL (33)	20.06	4.94	60.8

The relationships between demographic characteristics, computer experiences, self-perceived level of skills, and scores from the exam portion of the CEKI were also examined. The significant relationships at the p = .05 level between demographic characteristics and CEKI scores are shown in Table 5. All relationships showed "little if any correlation" for demographic characteristics and computer experiences (Hinkle, Wiersma, and Jurs, 1998, 120). The relationship between CEKI exam score and gender was r = .024, while the relationship between exam score and completed computer courses was reported at r = .216. A "low positive correlation" (r = .402) was found between self-perceived skills and the CEKI score (Hinkle, Wiersman, and Jurs, 1998, 120).

Conclusions

The findings from this study indicate that students enrolled in CASNR courses have been exposed to previous computer usage through courses at the high school and college level. Over three-fourths of the participants owned a computer and had completed a course in computer usage. However, over one-half of the participants indicated that they had not received instruction in computer programming, while over one-fourth indicated they had not received instruction in electronic mail (e-mail). Nearly one-fourth indicated they had not received instruction in database and Internet use. A majority of participants indicated that they had received instruction in word processing, spreadsheet use, file management, and presentation graphics. Thus, it was concluded that these students have participated in a common core of educational experiences related to the most commonly used computer applications.

Overall, the participants perceived their level of skills in word processing and Internet use above average. They perceived their skills in file management, electronic mail (e-mail), spreadsheet use, presentation graphics, and database use as average. Based on these findings, it was concluded that a majority of respondents believed they possessed above average to average skills in the eight areas of

Table 5

Correlations Between Selected Demographic Characteristics, Computer Experiences, Self-Perceived Level of Skills, and Exam Score on the CEKI

Variable	CEKI Exam Score	P - Value
Age (*r*)	.074	.052
Gender (*r*)	.024	.529
High school graduating average (*r*)	-.276*	.000
High school graduating class size (*r*)	-.042	.270
College classification (*r*)	.212*	.000
Computer course(s) completed (*r*)	.216*	.000
Number of courses completed (*r*)	.209*	.000
Computer experiences (topic studied) (*r*)	.139*	.001
Own a computer (*r*)	.157*	.000
Type of computer owned (*r*)	-.103*	.010
Type of operating system used (*r*)	-.081*	.044
Self-perceived level of skills (*r*)	.402*	.000

Note. r = Pearson product moment correlation coefficient, * = significantly correlated at the p = .05 level (2-tailed).

computer usage. The lowest level of computer skill was computer programming. The mean reported for self-perceived level of skills in this study was 2.30.

Based on the results on the CEKI, it was concluded that students were deficient in all areas covered by the questionnaire, especially in database use, spreadsheet use, file management, and word processing. Participants scored the highest on the Internet use and general computer knowledge sections on the CEKI. The mean number of correct responses was 20.06 (60.8%).

The relationships between demographic characteristics and computer experiences with self-perceived level of skills were statistically significant with either negative or positive correlations. However, correlations between age, high school graduating average, computer courses completed, computer experiences (topics studied), and computer owned by student had little influence on self-perceived level of skills. A low positive correlation was found between number of computer courses taken and self-perceived level of skills. Therefore, it was concluded no strong prediction could be established from these correlational results.

A statistically significant, low positive correlation was found between self-perceived level of skills and CEKI exam score. The relationships between high school graduating average, type of computer owned, and type of operating system used with CEKI exam score had statistically significant, negative correlations, indicating these variables had little influence on the CEKI exam score. However, the relationships between college classification (freshman, sophomore, junior, or senior), computer course(s) completed, number of courses completed, computer experiences (topics studied), and computer owned with CEKI exam score yielded statistically significant, positive correlations. It was also concluded that no strong prediction could be established from these correlational results. Overall, regardless of demographic characteristics, computer experiences, and computer knowledge, there were no significant differences in computer knowledge and skills that existed among participants.

Recommendations

The study of computer experiences, self-perceived level of skills, and computer knowledge of students enrolled in CASNR courses adds to current research in regard to the importance of computer knowledge and skills required of graduates once they enter into the job market.

Further research concerning computer experiences, self-perceived level of skills, and computer knowledge of students in the CASNR should be continued and expanded. This study should be replicated with samples of entering freshmen and graduating senior-level students. If such studies should yield similar results, efforts must be made within the CASNR to enhance the computer knowledge and usage of students. To accomplish this, the following actions are recommended.

First, entering freshmen across each department should be required to complete a computer applications course during their first semester of enrollment. Second, to ensure that students maintain adequate usage of various computer applications throughout their undergraduate years, instructors should integrate required computer usage into their courses. This should be done with usage of various applications through assignments and learning labs that can be used to enhance the academic subject matter. This would be useful in ensuring students do not forget how to use specific computer applications. Third, efforts should be made to ensure graduates are adequately prepared for careers upon graduation through the requirement of computer-intensive courses.

Research is also recommended in order to gain perspectives from faculty, alumni, and potential employers. Perspectives from faculty members are needed in order to determine what computer applications are most used in courses within the six departments in CASNR. Perspectives from alumni must be used to determine how CASNR courses prepared former students for careers as well as determine

views of what computer skills are required by current employers. An employer perspective should be used to determine how important computer skills are in selecting employees, what type of computer applications are used by employees, and how often computers are used on the job.

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