# AN EMPIRICAL STUDY OF STUDENTS' COMPUTER SELF-EFFICACY: DIFFERENCES AMONG FOUR ACADEMIC DISCIPLINES AT A LARGE UNIVERSITY

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## ABSTRACT

This study empirically compares the differences in students' computer self-efficacy and attitudes toward computers among four academic disciplines in a university environment. The findings suggest that students at a business school have higher expectations from computers and more positive attitude toward computers than students in the other three disciplines.

## INTRODUCTION

With the tightening of the labor market and the shortage of computer science and business graduates, understanding the computing abilities of students has become an important topic for the academic and practitioner communities. This labor shortage has caused universities and technology companies to search for ways to increase the employability of graduates. Together they have created an exam to determine computing abilities of non-business and non-computer graduates called the TekXam (Healy 1999, McBride 1999). The exam is being used to prove that students who did not major in business or computer disciplines are computer-literate and capable of performing in the high-technology workplace.

This study examined students' computer software usage, computer self-efficacy, and attitudes toward computers in four colleges at a large university in the Southeast United States. These three constructs of interest were defined in terms of established measures and were compared with each other. Students' knowledge of computers, years of computer experience and usage of computer software were believed to differentiate their scores in computer self-efficacy and attitudes toward computers. Also, each student's cognitive style was believed to be a factor that affects their computer self-efficacy and attitudes (Harrison & Rainer, 1992). The results of this study provide some evidence that differences exist in students' computer self-efficacy and attitudes toward computers among the four colleges with their computer usage.

## RESEARCH QUESTIONS

First, it was hypothesized that students' computer knowledge, years of experience, and computer software usage would differentiate their scores in computer self-efficacy and attitudes toward computers. This assumption is based on a similar study which was conducted in a business environment (Compeau & Higgins, 1995). Second, students' cognitive style about computers appears to be a major factor that affects their computer self-efficacy and attitudes. It has been suggested that cognitive style represents the individual's modes of perceptional and thinking behavior (Harrison & Rainer, 1992). Third, academic settings for students' computing would have an effect on their computer self-efficacy and attitudes. Schunk (1995) argued that students often receive persuasive information from their educators indicating that they are capable of performing computing tasks. This study utilized the following research questions:

**Research Question 1:**
Does computer sophistication help explain some of the computer self-efficacy and attitude differences among academic disciplines?
**Research Question 2:**
Do students in different academic disciplines differ on the five dimensions of computer self-efficacy? If so, how and why do they differ?
**Research Question 3:**
Do students in different academic disciplines differ in their attitudes toward computers? If so, how and why do they differ?

## THEORETICAL FRAMEWORK

It has been suggested that self-efficacy is a construct derived from social cognitive theory (Gist & Mitchell, 1992). The theory posits a triadic reciprocal causation model in which behavior, cognition, and environment influence each other in a dynamic fashion (Bandura, 1977, 1986). This study is built primarily upon two established social cognitive theories, Bandura's (1986) theory of self-efficacy and Compeau and Higgins' computer self-efficacy studies (1995a, 1995b).

## RESEARCH METHODOLOGY

### Data Collection

The data were collected during the Summer and Fall 1999 terms. The final sample was comprised of 350 senior level students enrolled in four different colleges within the same university. Of this sample, 50.7% were female, 49.3% were male, 93 were from the college of education, 63 were from the

college of liberal arts, 144 were from the college of business, and 50 were from the college of forestry and wildlife. The average age of the participants was 22.6, ranging from 22 to 42 years old. The questions originated primarily from the three empirical studies: Harrison & Rainer (1992), Murphy et al (1990), and Compeau & Higgins (1995a & 1995b).

**Statistical Methods & Results**

This investigation was organized into two phases: a preliminary phase, which addressed research question1, and an investigation phase, which addressed questions 2 and 3. Based on the results from the preliminary phase, only statistically significant variables were incorporated into the investigation phase.

First, in the factor analysis, seven factors were identified and these factors included all 73 indicators. There was also significant correlation among the factors. As reported in previous research, the results indicated seven factors. The first five were for student computer self-efficacy and were called: Encouragement by Others, Other's Computer Use, Organizational Support, Outcome Expectations, Unfamiliar Software. The other two factors were students' positive and negative attitudes toward computers.

Second, the measurement characteristics of the seven factors were assessed to determine the reliability based on internal consistency for each scale. This was accomplished by calculating Cronbach's alpha for each factor. The alpha values for the individual factors ranged between.87 and .94 (actual alpha values are reported in Table 4). These alphas are well above the cutoff value suggested by Nunnally (1978) of .70 for hypothesized measures of a construct.

Third, a MANOVA was performed to examine the level of student computer sophistication. The purpose of this analysis was to determine if any of the measures aided in the understanding of differences in students' computer experience, knowledge and software usage among the four disciplines. Table 1 reflects the test results, showing that only computer software usage was significant and was thus utilized for further examination.

Performing an ANOVA with Tukey test revealed differences in computer software usage among the four disciplines. All of the results generated by Tukey, Scheffe, LSD and Bonferroni procedures were similar. Only the computer software usage of the college of business was significantly different from other disciplines. Since the computer software usage was assumed linearly related to the seven factors, the usage was used as covariance to MANCOVA and ANCOVA in the investigation phase.It has been suggested that both MANCOVA and ANCOVA are techniques that feature the characteristics of both analysis of variance and regression (Fisher, 1938, Huitema, 1980). Table 2 depicts the test results among the colleges with the Tukey procedure.

In the investigation phase, an application of both MANCOVA and ANCOVA techniques were used to determine whether or not differences existed in students' attitudes and computer self-efficacy among the four disciplines. The results would shed light on the research questions related to the computer self-efficacy and attitudes toward computers among the four disciplines. Table 3 depicts the descriptive test statistics for the seven factors.

## DISCUSSION OF RESULTS

The preliminary tests on students' self efficacy and attitudes showed that a measure of computer sophistication could be used as a control variable. Following the preliminary tests, additional tests were performed to show that there were differences on the positive attitude and outcome expectation dimensions. These two factors were significant. The two differences among the four disciplines were further investigated. This time MANCOVA and ANCOVA were used for multiple comparisons using computer software usage as a covariate. The results indicated a significant difference between the college of business and the other three disciplines. They also provided some hints into how students' computer self-efficacy, computer software usage and attitude toward computers are impacted by each other.

Students' computer software usage was a significant variable for further investigation on differences in all five factors for their computer self-efficacy and two attitudes toward computers among the four disciplines. This indicated that students' years of computer experience and knowledge were less important than their actual computer usage on a daily basis for academic and personal purposes. Therefore, the following is suggested:

Students' computer software usage has a significant effect on the differences in students' computer self-efficacy and attitudes toward computers in a university environment. No evidence is presented for differences between the disciplines on the first three dimensions of computer self efficacy, because they were not significant statistically. They were: the differences in computer self-efficacy by others' encouragement using computers, the differences in computer self-efficacy by others' use of computers, and the differences in computer self-efficacy by support among academic disciplines.

The differences in computer self-efficacy by students' outcome expectations among the four disciplines was significant with their computer software usage. After examining the differences among the four disciplines with a Tukey test in ANOVA, students at the college of business

appear to have higher expectation from computers than students at the other three disciplines. While the last dimension of computer self-efficacy, dealing with unfamiliar software, was not significant. Therefore, the research question number 2 is concluded as follows: Students at the college of business have higher outcome expectations from computers than students at the other three participating disciplines within a university.

The differences in students' positive attitude toward computers were significant, while the differences in their negative attitude toward computers were not significant. After examining the differences among the four disciplines with a Tukey test in ANOVA, students at the college of business appear to have more positive attitude toward computers than students at the other three disciplines. Therefore, the research question number 3 is concluded as follows: Students at the college of business have a higher positive attitude toward computers than students at the other three participating disciplines within a university.

**Table 1 - Results of Computer Sophistication Test**

| Variable | F | P | Remarks |
|---|---|---|---|
| Years of Computer Experience | 1.60 | .19 | Not Significant |
| Knowledge of Computers | 1.92 | .13 | Not Significant |
| Computer Software Usage | 6.42 | >.01 | Significant |

**Table 2- Comparison of Differences in Computer Software Usage**

| College | College | P | Remarks |
|---|---|---|---|
| Business | Education | .00 | Significant |
| | Forest/Wild Life | .05 | Significant |
| | Liberal Arts | .03 | Significant |
| Education | Business | .00 | Significant |
| | Forest/Wild Life | .94 | Not Significant |
| | Liberal Arts | .91 | Not Significant |
| Forest/ Wild Life | Business | .05 | Significant |
| | Education | .94 | Not Significant |
| | Liberal Arts | 1.00 | Not Significant |
| Liberal Arts | Business | .04 | Significant |
| | Education | .91 | Not Significant |
| | Forest/Wild Life | 1.00 | Not Significant |

Note: P-value < .05 Significant

**Table 3 - Descriptive Statistics for the Seven Factors in the Study**

| Factors | M | Std Dv | α | Correlation Coefficient | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| Encouragement Others | 4.2 | .67 | .94 | 1.0 | | | | | |
| Others Computer | 5.3 | .87 | .95 | .62 | 1.0 | | | | |
| Organizational Support | 4.5 | 1.3 | .94 | .47 | .38 | 1.0 | | | |
| Outcome Expectations | 3.7 | .75 | .91 | .42 | .39 | .24 | 1.0 | | |
| Unfamiliar Software | 6.6 | 1.9 | .90 | .60 | .48 | .45 | .34 | 1.0 | |
| Positive Attitude | 5.0 | .67 | .87 | .37 | .48 | .27 | .63 | .29 | 1.0 |
| Negative Attitude | 2.8 | .87 | .86 | -.33 | -.25 | -.16 | -.20 | -.26 | -.24 |

**Table 4 -Differences in Computer Self-Efficacy, Attitudes toward Computers, and Computer Software Usage Among Four Disciplines**

| Source | Dependent Variable | F | P | Remarks |
|---|---|---|---|---|
| Computer Software Usage | Positive Attitude | 23.59 | .00 | Significant |
| | Negative Attitude | 4.14 | .04 | Significant |
| | Encouragement of Others | 153.28 | .00 | Significant |
| | Others Computer Use | 63.16 | .00 | Significant |
| | Organizational Support | 19.35 | .00 | Significant |
| | Outcome Expectations | 35.30 | .00 | Significant |
| | Unfamiliar Software | 58.33 | .00 | Significant |
| College | Positive Attitude | 8.29 | .00 | Significant |
| | Negative Attitude | 1.47 | .22 | |
| | Encouragement of Others | .61 | .66 | |
| | Others Computer Use | .17 | .92 | |
| | Organizational Support | 1.04 | .37 | |
| | Outcome Expectations | 4.03 | .01 | Significant |
| | Unfamiliar Software | .49 | .71 | |

Note: Wilke's Lamda's p-value was .000 for Computer Software Usage and .002 for College in this test.

**Table 5 - Multiple Comparisons Among the Four Colleges**

| | | Positive Attitude | | Outcome Expectation | |
|---|---|---|---|---|---|
| College (I) | College (J) | P | Remarks | P | Remarks |
| Business | Education | .00 | Significant | .00 | Significant |
| | Forest/ Wild Life | .00 | Significant | .05 | Inconclusive |
| | Liberal Arts | .00 | Significant | .02 | Significant |
| Education | Business | .00 | Significant | .00 | Significant |
| | Forest/ Wild Life | .80 | Not Significant | .87 | Not Significant |
| | Liberal Arts | 1.0 | Not Significant | .89 | Not Significant |
| Forest/ Wild Life | Business | .11 | Not Significant | .05 | Inconclusive |
| | Education | .12 | Not Significant | .87 | Not Significant |
| | Liberal Arts | .12 | Not Significant | 1.00 | Not Significant |
| Liberal Arts | Business | .00 | Significant | .02 | Significant |
| | Education | 1.0 | Not Significant | .89 | Not Significant |
| | Forrest/ Wild Life | .82 | Not Significant | 1.00 | Not Significant |

Note: Dependent Variables: Positive Attitude and Outcome Expectation

**References & Unabridged Paper Available from Either Author**