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Measuring College Students' Technology Selfefficacy

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Introduction

The pervasiveness of computer technology and continuing developments in software, multimedia, and Internet resources have led to the implementation of new teaching and learning methods. Educators committed to the integration of technology into the learning process believe it will expand learning and better prepare students to participate effectively in today's workplace. Employers demand workers who can not only use technology to complete a variety of work tasks and processes but who can leverage technology to advance the firm's strategic operations.

While many students perceive themselves to be computer competent, research indicates that their preparation is not always complete or adequate. Computer self-efficacy (CSE) refers to individuals' judgment of their capabilities to use computers in diverse situations (Marakas, Mun, & Johnson, 1998). CSE has been shown to influence an individual's choice to engage in a technology task and the effort expended to accomplish it (Bouffard-Bourchard, 1990). Researchers have postulated that positive attitudes toward computers, high computer self-efficacy, and low computer anxiety levels can be important factors in helping students learn computer skills and use computers.

Review of Literature

Students currently enrolled in college have grown up as part of the Net Generation. For most, their computer experiences began in kindergarten or even earlier. Members of the group typically embrace technology in various forms, including cell phones, mp3 players, digital cameras, video games, etc. Public education has generally recognized the critical need for high school graduates to possess computer skills. Some states require students to pass a computer proficiency test as part of their kindergarten through twelfth grade preparation (Grant, Malloy, & Murphy, 2009), and most require a technology applications course as part of graduation requirements. However, in a surprising and perplexing move, a bill was signed into law in Texas in 2009 that eliminated a technology applications course requirement for high school graduation (Tydings, 2009). This move will undoubtedly mean that upcoming Texas students will enter college with less computer proficiency than current students.

Students' CSE typically is influenced by both prior coursework and personal experiences. Thatcher, Zimmer, Gundlach, and McKnight (2008) found that CSE has two dimensions, external and internal. The external dimension focuses on how individuals perceive their ability to use computers with human assistance and other forms of external support. The internal dimension focuses on how individuals perceive their capacity to use computers independently. While many current students indicate a high degree of confidence in their computer skills, earlier studies of students' CSE found a significant percentage of college students in the United States suffered from technophobia (DeLoughry, 1993). Studies even in more recent years, however, reveal that many students continue to report high computer phobia and low CSE (McIlroy, Sadler, & Boojawon, 2007).

Keengwe (2007) found that in spite of the widespread availability of computers on college campuses, students lack various computer skills necessary to support and enhance their learning experiences. Johnson, Hornik, & Salas (2008) found CSE was related to both performance and satisfaction in an information systems course. Hasan (2003) showed that certain computer experiences had varying levels of impact on an individual's CSE. For instance, experience with computer programming and graphic applications was shown to have a strong and significant effect on CSE, while experiences with spreadsheet and database applications demonstrated weak effects.

While most current students can send email messages, download music, and chat online,

employers want to know if students can use a computer as a technology tool to address recurring business needs (Young, 2004). Work-related computer skills are typically thought of as consisting of proficiency in word processing, presentation programs, and spreadsheet applications, with other skills sometimes included such as file management and web mastering. Though computing experiences prior to college may be helpful to varying degrees in providing students with basic technology proficiency, they are only a start in assuring that students are proficient in work-related computer skills when they leave college for the workplace. Some colleges and universities require incoming students to demonstrate a prescribed level of computer proficiency (Wallace & Clariana, 2005). Others require one or more computer applications courses as part of their curriculum requirements. Students required to take an introductory computer applications course at the college level often feel that additional technology study is not necessary because they already possess technology knowledge and skills. CSE has been shown to be a powerful influence on future intentions toward technology (Agarwal, Sambamurthy, & Stair, 2000).

Grant, Malloy, & Murphy (2009) compared students' CSE ratings with their actual performance on an author-developed computer skills test. The study demonstrated a discrepancy between what students perceived as their computing skills and their actual assessed skills, indicating a need for most students to receive further instruction in computing applications. Various measures of technology proficiency have been developed that could be useful in assessment of students' computer skills. For several years, Educational Testing Service (ETS) offered the *iskills* test which was developed with participation of business and industry representatives to assess the mastery of technology skills necessary for workplace success. Thomson Learning offers the Skills Assessment Manager (SAM), designed in association with Microsoft Corporation to test knowledge of Microsoft Office computer software applications. It is used by various colleges and universities to test students' technology skills (Wallace & Clariana, 2004).

While some educators hold the perception that students are becoming progressively more computer literate, some researchers have found a significant discrepancy between perception of computer skills and reality (Wallace & Clariana, 2005). If students are becoming progressively more computer capable, the content and depth of college-level computer applications courses should be adjusted appropriately (Wallace & Clariana, 2005). Effectively preparing graduates for the technology expectations of the workplace demands that the content of basic computer applications courses be continuously examined in light of student preparation for such classes and workplace needs. Content must be appropriate to the level of student needs and reflective of industry requirements.

Research indicates that behavioral and psychological factors can impact CSE (Moos & Azevedo, 2009). Various studies have documented that the gender gap is closing on CSE (Sam, Othman, & Nordin, 2005), though there is evidence that male students spend more time at the computer for personal purposes than do females and males outperform females at some computer tasks (Imhof, Vollmeyer, & Beierlein, 2007). More time on task may logically translate into a higher level of perceived ability. More research is needed about the relationship between various demographic factors and CSE.

Purpose

The purpose of this research is to examine college students' self-efficacy of computer applications skills as correlated with various demographic factors.

Design of the Study

Students enrolled in selected sections of a freshman experience course at a mid-size Texas public university were surveyed about their computer self-efficacy. A one-page questionnaire consisting of 13 items was designed by the authors (See Appendix A). Freshmen college students were surveyed about perceptions of their own computer skills in seven general career-oriented computer applications: file management, word processing, spreadsheets, presentations design, database applications, web page development, and computer programming. Various demographic factors were solicited including gender, age, high school class rank, size of high school, whether high school was public or private, and college major. Additionally, responses were examined in regard to whether the respondent was a first generation college student, whether access to a computer was available at home, whether the student brought a computer to college, and whether the

student took a computer class in high school. Students were also asked about their intentions to take a college-level computer applications course.

A total of 197 students from the freshman experience course sections completed the survey. Course instructors voluntarily chose whether to ask students in their classes to participate. Most students who chose to participate answered the survey completely; in less than 2 percent of cases, some survey items were left blank. The first 11 items dealt with demographic factors. Item 12 asked students to rate their level of skill in the seven computer skill areas. Ratings were indicated on a Likert scale of 0-5, with 0 being "never used," 1 being "low skill," and 5 being "high skill." The final questionnaire item asked respondents to respond about their intention to take a college-level computer course.

Standard percentages of responses were calculated. A Kruskal-Wallis test for categorical data was employed to determine whether a difference existed in perceived level of computer skill when cross referenced with a demographic variable. A .05 significance level was used for the analysis.

Findings

The results of student responses to the survey questionnaire are summarized as follows.

General Demographics

The typical respondent to the survey was a female, age 17-19, who graduated in the top 25% of her class from a 5A public high school. Females represented 62.9% of respondents, with 37.1% of respondents being male. Nearly all (97%) of respondents were in the age bracket of 17-19 years. The majority of respondents (57.5%) indicated being in the top 25% of their class, with 97.4% having graduated from a public high school.

In the state of Texas, the class 1A-5A system is used to identify school size by student enrollment. High school size in the survey was distributed predominantly in the 5A and 4A (larger school) categories as shown in Figure 1.

When asked whether one or both parents attended college, about two-thirds (62.8%) reported parental college attendance, while the remainder (36.2%) indicated that neither parent had attended college.

The reported college majors of responding students are summarized in Figure 2. The survey group was dominated by reportedly majoring in the colleges of Science and Mathematics, Education, and Liberal Arts.

Computer-Related Characteristics

All respondents indicated having had a computer at home, most (79.6%) for more than five years. Nearly all (94.9%) reported bringing a computer with them to college. The vast majority (95.9%) of respondents had taken a computer course in high school where it was typically required. Nearly half of respondents (47.1%) were not sure whether they would take a college computer class; about a quarter (25.1%) planned to take a computer course, and the remainder (27.8%) did not intend to take a computer course.

Students were asked to assess their skill level in several technology areas, using a Likert scale with 1 being "low skill" and 5 being "high skill." A "never used" category was also provided. A brief explanation of each skill area was provided for clarity. The results of student responses are shown in Figure 3.

Overall, students indicated (in descending order of confidence), stronger than moderate skills in word processing, file management, presentation applications, and spreadsheet applications. Students indicated less than moderate skills (in descending order of confidence) in database management, web page design, and computer programming skills. This finding concerning areas of low perceived skills is not surprising, in that all three areas receiving low self-efficacy ratings were not part of the state-mandated high school curriculum in business technology courses. Some students had been exposed to all seven skill areas in their high school programs, while others had not.

Relationships Between Demographics and Computer Skills Self-Efficacy

After examining the demographic responses of the reported self-efficacy as related to the seven computer skill areas, data analysis was conducted to cross-tabulate demographic factors with perceived computer skills. Virtually uniform results that were slanted to one single answer resulted for age, high school type, bringing a computer to college, and taking a computer class in high school. For those characteristics, there was no need to cross-tabulate them with perceived computer skill.

The remaining variables were cross-tabulated with the seven response questions concerning perceived skill levels: gender, high school size, high school class rank, parents attending college, major by college, and intention to take a college computer course. The following significant differences were found:

File Management Self-Efficacy:

Gender is a borderline significant variable (p=.0552). Females are more likely to perceive themselves as highly skilled, while males are more apt to answer with perceived moderate skill.

Word Processing Self-Efficacy:

Gender is highly significant (p=.0057), with females more likely to perceive themselves as highly skilled and males more apt to perceive themselves with moderate skills.

Spreadsheet Applications Self-Efficacy:

The size of high school is borderline significant (p=.0730). However, this effect is true only in the case in which 3A schools and smaller are treated as one group and 4A and 5A schools are treated as the other group. Under this structure, smaller school students are prone to report higher perceived skill.

Parents attending college is statistically significant (p=.0370). If a student's parents did not attend college, then the student is more likely to have a lower level of perceived skill in spreadsheet applications. A student's plan for taking a computer skills class in college is borderline significant (p=.0616) in terms of spreadsheet

self-efficacy. Students who are unsure about whether or they will take a college level computing class are more likely to profess less skill. If they state that they will take a college level computing class, then it is more likely that they perceive themselves as highly skilled in spreadsheet applications.

Presentation Software Self-Efficacy:

Parents attending college is statistically significant (p=.0195). If a student's parents did not attend college, the student is more likely to have a lower level of perceived skill in presentation software.

Database Applications Self-Efficacy:

Parents attending college is statistically significant (p=.0147). If a student's parents did not attend college, then the student is more likely to have a lower level of perceived skill in database applications.

Web Page Development Self-Efficacy:

Gender is a borderline significant variable (p=.0997). Males are more likely to perceive themselves as moderately skilled, while females are more apt to answer with perceived low skill in web page development.

A students' high school rank is highly significant (p=.0085). Students with a higher class rank are more likely to perceive themselves as highly skilled in web page development.

Computer Programming Self-Efficacy:

No demographic variables were found to be statistically significant when cross-tabulated with perceived skill in computer programming.

Summary

In terms of demographics, the study revealed a breakdown according to gender similar to the campus wide population which is slanted in the direction of female enrollment. Those sampled were primarily traditional freshman students who had attended larger public high schools. Virtually all of those sampled had been exposed to computers in their homes and brought their own computer to campus. The vast majority had completed a required basic computer applications course in high school. Of the students who responded, the majority reported being in the top quarter of their high school class and had one or both parents who attended college.

The majority of students were enrolled in majors in either Science and Mathematics or Education. Overall, students reported highest self-efficacy in word processing skills followed closely by file management and presentation skills. Students reported moderate ability in spreadsheet skills and less than moderate skill in database management, webpage design, and computer programming.

Concerning the demographics that most explain differences in self-efficacy, a student's gender and parents' college experiences were most often judged as predictive. Females tend to perceive higher skill in file management and

word processing applications, whereas males indicate higher skill level in web page development. If a student's parents did not attend college, then the student is more likely to have a lower level of self-efficacy in spreadsheet applications, presentation software, and database applications. Other demographic variables were predictive of perceived skills in isolated instances.

Nearly half of the respondents were not sure whether they would take a college computer class, about a quarter planned to take a computer course, and the remainder did not intend to take a computer course.

Implications and Opportunities for Further Research

Freshman students in the study were reasonably confident of their computer skills. Most students in the study reported having had a high school computer applications course, which presumably impacted their level of confidence in their computer skills. A concern is that in Texas where the computer technology course has been eliminated as a requirement for graduation, students may enter college less prepared and with lower computer self-efficacy. Students may need encouragement to take college computer courses, either through requiring them or making them attractive choices for electives. Additionally, students with certain characteristics who are less confident in their computer skills may need further computer experiences more so than the general student population.

Another concern is that students with high computer self-efficacy may not necessarily be as strong in skills as they believe they are. A second phase of this research will involve freshman students in not only completing the self-efficacy survey, but also in completing a computer skills test. Self-efficacy ratings will be compared to actual performance on the skills test.

Increasingly, higher education is required to be more accountable to all stakeholders. As a major part of accountability, institutions of higher learning must consider the magnitude of their responsibility to employers to assure that graduates possess skills necessary for workplace success.

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Figure 1
Distribution by High School Size

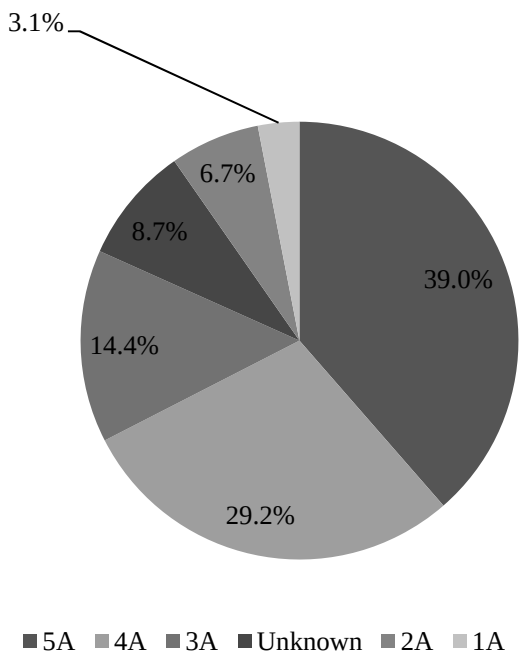

Figure 2
Reported College Majors

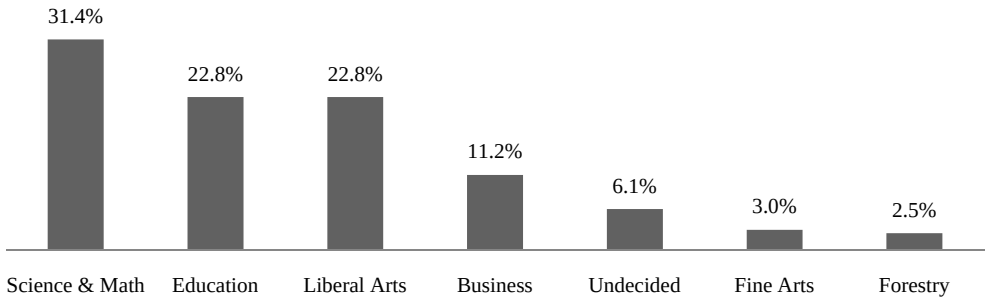

Figure 3
Student Self-Efficacy in Seven Technology Skill Areas

Skill Area	*0	1	2	3	4	5	Avg. Score	SD
File Management	2	3	10	29	49	102	4.19	1.08
Word Processing	0	0	4	33	55	104	4.32	0.83
Spreadsheet	10	17	33	55	49	33	3.09	1.37
Presentation	0	10	8	25	60	93	4.11	1.10
Database Management	23	30	33	64	30	17	2.48	1.48
Web Page Design	47	35	36	47	21	10	1.95	1.51
Computer Programming	54	47	33	37	13	13	1.73	1.52

*0 – Never Used
1 – Low Skill
5 – High Skill

STEPHEN F. AUSTIN STATE UNIVERSITY
FRESHMAN PERCEPTIONS OF THEIR COMPUTER SKILLS
FALL 2009

Please indicate your responses to the following in the spaces provided for each question.

I. Background:

1. Sex: ( ) Male ( ) Female

2. Age: ( ) 17-19 ( ) 20-22 ( ) 23-25 ( )Over 25

3. HS Class Rank: ( ) top 25% ( ) top 50% ( ) lower 50% ( ) lower 25% ( ) don't know

4. High School size designation: ( ) 5A ( ) 4A ( ) 3A ( ) 2A ( ) 1A ( ) don't know

5. Type of High School: ( ) Public school ( ) Private School ( ) Home school

6. Did either or both of your parents attend college? ( ) Yes ( ) No ( ) Don't know

7. What is your major: _____

II. Computer Experience

8. Did you bring your own computer to college? ( ) Yes ( ) No

9. How long did you have access to a computer at home? ( ) never ( ) less than 1 year ( ) 1-2 years ( ) 3-5 years ( ) more than 5 years

10. Did you take a basic computer skills class in high school?
( ) Yes ( ) No

11. If you answered Yes, was it ( ) Required? ( ) Elective?

12. From the following list of computer skills, please circle from 0 (never used) to 5 (high skill) for the degree of proficiency you believe yourself to have:

	Never Used	Low Skill				High Skill
File Management (i. e., saving, Copying, moving files, etc.)	0	1	2	3	4	5
Word processing applications (i.e., MS Word, WordPerfect, etc.)	0	1	2	3	4	5
Spreadsheet applications (i.e., MS Excel, Lotus 1-2-3, etc.)	0	1	2	3	4	5
Presentations (i. e., PowerPoint)	0	1	2	3	4	5
Database applications (i.e., MS Access)	0	1	2	3	4	5
Web page development	0	1	2	3	4	5
Computer programming (i.e., Basic, C++, Cobol, Java, etc.)	0	1	2	3	4	5

13. Do you plan to take a college-level computer applications course? ( ) Yes ( ) No

Thank you for completing the survey