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An Examination of College Students' Computer Self-Efficacy as Related to Various Demographic Characteristics

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Abstract

Despite extensive computer exposure, today's students vary in their judgments of their capabilities in using technology, referred to as computer self-efficacy (CSE). A survey of university students revealed highest CSE in word processing skills followed closely by file management and presentation skills. Students reported moderate ability levels in spreadsheet skills and less than moderate skill levels in database management, webpage design, and computer programming. Females tended to report higher CSE in file management and word processing applications, whereas males indicated higher CSE in web page development. Students whose parents did not attend college were likely to have lower CSE in spreadsheet applications, presentation software, and database applications as compared to students whose parents attended college.

Keywords: computer self-efficacy, computer confidence, computer anxiety, college student computer skills

Introduction

Computer technology has permeated every aspect of society, particularly the way we work, play, and communicate. Teaching and learning, like many other life activities, have been transformed by readily available technologies that allow communication and collaboration via the Internet and personal computing devices. Educators committed to the integration of technology into the learning process believe it will expand learning and better prepare students to interface in today's workplace. Employers demand workers who can not only use technology to

complete a variety of work tasks and processes, but who also can leverage technology to advance the firm's strategic operations.

Despite extensive exposure to computers from an early age, today's students vary in their confidence levels concerning technology usage. Computer self-efficacy (CSE) refers to individuals' judgments of their capabilities to use computers in diverse situations (Marakas, Mun, & Johnson, 1998). Kinzie, Delcourt, and Powers (1994) described self-efficacy as an individual's confidence in his or her ability, which may impact the performance of tasks. 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). A study of Canadian managers and professionals revealed that CSE exerted a significant influence on individuals' expectations of the outcomes of using computers, their emotional reactions to computers, and their actual computer use (Campeau & Higgins, 1995).

Researchers have also 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 effectively (Ertmer, Evenbeck, Cennamo, & Lehman, 1994; Hasan & Ali, 2004).

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 this group typically embrace technology in various forms, including cell phones, mp3 players, digital cameras, video games, iPads, electronic readers, and personal computers. The public education sector 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. In a surprising departure from the national trend, the state of Texas recently dropped the requirement of a technology applications course as a high school graduation requirement (Tydings, 2009). While the decision could be defended from the perspective that current students generally possess informally acquired computer skills, others may argue that students' technology experiences may not include those generally required in the workplace. In spite of the extent of formal and informal computer exposure, today's students vary in their perception of their computer capabilities.

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 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 are concerned with whether 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. Computing experiences prior to college may be helpful to varying degrees in providing students with basic technology proficiency; however, 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 with significant computer backgrounds may not feel that further computer courses would be beneficial. However, research shows that those who have experienced success with computers may be more inclined to take additional computer course work. 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. Cengage 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 (Course Technology, 2011).

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 skill levels and the reality of lower competence. 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 some 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 was to examine the relationship between university students' self-efficacy in regard to computer applications skills and 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 to survey students about their perceptions of their own computer skills in seven 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, and whether the student brought a computer to college. Students were also asked whether they had taken a computer class in high school and if they intended to take a college-level computer applications course.

A total of 197 students from the selected 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% 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 report whether they intend 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

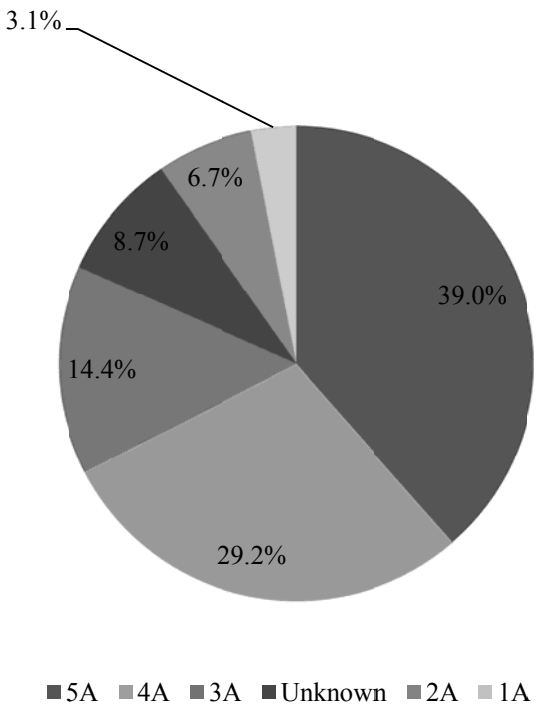
The results of the 197 student responses to the survey questionnaire are summarized as follows.

General Demographics

Females represented 62.9% of respondents, with 37.1% of respondents being male. 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. 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, with 5A schools having the highest number of students. High school size in the survey was distributed predominantly in the 5A and 4A (larger school) categories as shown in Figure 1.

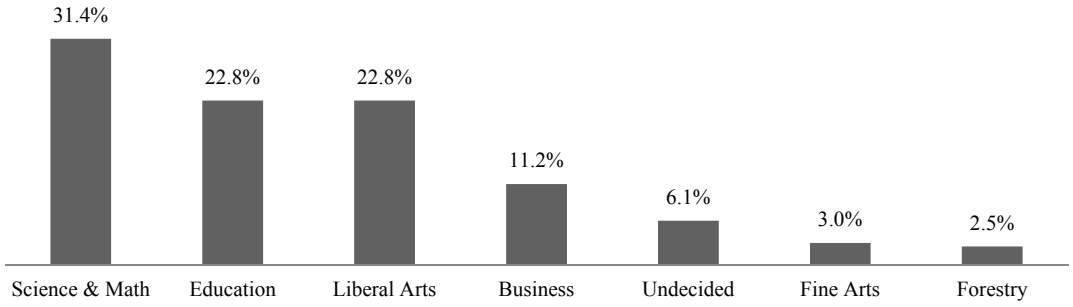
Figure 1. Distribution by High School Size



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.

Figure 2. Reported College Majors



The survey group was dominated by majors reported from 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.

Figure 3. Student Self-Efficacy in Seven Technology Skill Areas

Skill Area	*0	1	2	3	4	5	Avg. Score	SD
Word Processing	0	0	4	33	55	104	4.32	0.83
File Management	2	3	10	29	49	102	4.19	1.08
Presentation	0	10	8	25	60	93	4.11	1.10
Spreadsheet	10	17	33	55	49	33	3.09	1.37
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

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 skill levels. 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. Thus, no relationship was shown to be present between these demographic factors and the perceived level of 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) in relation to students' spreadsheet self-efficacy. 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) in relation to presentation software self-efficacy. 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) in relation to database applications self-efficacy. 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) as related to web page development self-efficacy. 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.

Discussion

The study examined responses to a survey from students enrolled in selected sections of a freshman experience course. The survey gathered information about demographics and

computer-related characteristics, as well as students' self-efficacy as related to selected computer skills. The percentage of females in the study closely approximated that of the entire campus population. 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. The majority of respondents 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, students' 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

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. Preliminary tacit information gathered from the Texas business community indicates that employers are concerned with the level of computer skills newly hired employees will bring to the workplace if the technology credit is not restored to the curriculum.

In instances where high school students who are not required to learn appropriate business technology skills, students may need encouragement to take college computer courses, either through requiring them or making them attractive choices for electives. Additionally, students who are less confident in their computer skills may need further computer experiences more so than the general student population. Colleges and universities with a significant number of first generation students may want to pay particular attention to the computer skill preparation of its students.

Opportunities for Further Research

Another concern is that students with high computer self-efficacy may not necessarily be as strong in skills as they believe they are. In order to validate that students' beliefs match their actual skills, a second phase of this research could involve having freshman students not only complete the self-efficacy survey, but also take a computer skills test. Self-efficacy ratings could then be compared to actual performance on the skills test.

Increasingly, higher education institutions are required to be more accountable to all stakeholders. As a major part of accountability, institutions of higher learning must not only

satisfy accreditation agencies, but they must also consider the magnitude of their responsibility to employers to assure that graduates possess skills necessary for workplace success. Ongoing research is necessary to stay informed about the computer skills that college graduates need to be successful in their careers.

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