

Gender Differences in Computer Anxiety and Self-Efficacy:

A Study of College Students

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Abstract

Over the last ten years, computers have become increasingly more important in everyday life. They have become capable of assisting with everything from academia to entertainment, and they play a predominant role in the lives of most college students. However, this rise in technology has not come without consequences. Studies have found significant gender differences in both performance and attitudes towards computers (Cooper, 2006). These differences could lead to severe long-term repercussions for women in both academic and workplace situations. Past studies have found that males have significantly higher levels of computer self-efficacy, as well as lower anxiety and more positive attitudes towards computers (Weil, 1987; Busch, 1995; Cooper & Weaver, 2003; Cooper, 2006), however, many of these studies have used measures discussing technology that is now obsolete. The primary aim of this study is to investigate gender differences in computer anxiety and self-efficacy in a population of college students, and to apply a revised computer self-efficacy scale.

Specific Aims

The main focus of this study is to investigate gender differences in attitudes towards technology use. Two primary research questions will be tested.

The first question will investigate gender differences in computer anxiety.

The second question will evaluate gender differences in computer (specifically web user) self-efficacy using a recently developed valid and reliable scale that has not been previously used to assess gender differences in computer self-efficacy.

Additionally, age differences in computer anxiety and self-efficacy will be evaluated, if an adequate sample size across ages is obtained. Correlations between computer self-efficacy and anxiety will be conducted.

Gender Differences in Computer Anxiety and Self-Efficacy: A Study of College Students

Technology has become a vital addition to modern society. It has become integrated everywhere, from personal electronics to academics and the workplace. The increasing importance of technology has created a need to study user interactions with new devices, as well as problems that may arise from these changes.

Studies have found dramatic gender differences in computer self-efficacy, anxiety, and general attitudes, as well as computer ownership and preferred activities (Cooper, 2006). Women take fewer computer classes (Pinkard, 2005) and are less likely to graduate with IT degrees. These differences in technological skill could potentially cause severe social and economic repercussions for women. Additionally, higher levels of anxiety and low computer self-efficacy could dissuade women from entering high-paying career fields related to technology, such as engineering, computer science, and mathematics.

The Digital Divide

The rise in technology has seen the emergence of a social issue called the "digital divide." The digital divide refers to individual or group inequalities in technological knowledge, accessibility, skill and self-efficacy. These differences are often due to factors such as gender, age, race, and socioeconomic status (Jones, Johnson-Yale, Millermaier, & Perez, 2009). As technology increases in importance, digital divides are becoming a more serious social problem (Sassi, 2005, p. 695).

Cooper (2006) conducted a meta-analysis on the past 20 years of research studying gender differences and the digital divide. He found many studies from the past two decades

reporting that girls and women expressed greater anxiety and more negative attitudes toward computers than boys and men. Cooper argued that the gender disparity likely stems from computer anxiety and socialization patterns that present more boys than girls with computers from an early age, in addition to gender stereotypes and other social and developmental factors. He speculated that this computer anxiety might lead to differences in both attitudes and performance.

Cooper discussed several studies addressing developmental differences between boys and girls that potentially contribute to the digital divide. For instance, Lepper and Malone (1987) asked boys and girls what they liked best about computers. Boys reported that they preferred activities involving war, games, and hand-eye coordination, whereas girls preferred education-oriented activities and colors. Cooper argues that boys begin playing games on computers early on, while girls are taught to avoid them. When both genders end up using computers in an academic environment, boys are likely to be more comfortable due to their greater levels of previous experience.

According to Cooper, learning software is also targeted at men. He points out that most computer programmers who design the software are male, and that they might be developing the programs for a target audience that is mostly comprised of boys and men. Huff and Cooper (1987) conducted a study in which teachers were asked to design learning software questions for either elementary school boys, girls, or an unspecified gender. The "female" questions involved distinctly female activities, such as "shopping", whereas the "male" and "unspecified" questions were rated (by independent raters) as "statistically indistinguishable" from programs that had been written for boys (Cooper, 2006). Overall, Cooper points out many similarities between recreational video games designed for boys and

learning software, which puts girls at a distinct disadvantage. Girls learn from an early age that "computers are an educational medium designed with boys in mind" (Cooper, 2006, p. 326). Cooper states this perception creates greater stress and anxiety whenever girls and women interact with computers.

Jones, Johnson-Yale, Millermaier and Pérez conducted the most recent comprehensive study on digital divides in 2009. They surveyed students from 40 U.S. higher education institutions and looked at gender and race differences in Internet anxiety and use, as well as digital divides. Their findings from a randomly selected sample of 7,421 (43.5% men and 56.5% of women) supported findings from previous studies (Fortson et al., 2007; Odell et al., 2000; Sherman et al., 2000). For example, 53% of the men who responded "reported visiting an adult website at least once a week" (p. 255), compared to 9% of women. Sixty-two percent of men "looked for information on leisure activities," whereas only 45% of women reported doing so (p. 255). This data, as well as many other statistics from the study (62% of male students reported looking for information on leisure activities, such as books and movies, compared to 45% of females; 37% of men reported downloading music, compared to 20% of females), support the hypothesis that men are more likely to engage in entertainment-oriented activities, and women are more likely to focus on social networking and communication.

These numbers imply that gender differences in Internet use definitely do exist, even in leisure activities that Internet users choose for themselves. Prior studies found similar patterns: Odell et al. (2000) found gender differences in preferred uses of the Internet, for example, college men were more likely than women to use the Internet for "research purchases" (36.4% vs. 26.6%) and to access adult websites (25% vs. 1.3%). Overall, the study

reported that men are more likely to use the Internet for a wider variety of activities, although "college students spend approximately the same amount of time online" (Fortson et al., 2007; Jackson et al., 2001a; Odell et al., 2000; Jones, Johnson-Yale, Millermaier, & Perez, 2009, p. 247).

Anxiety and Attitudes

Computer anxiety can be defined as "adverse anxiety reactions to the use of computers" (Cooper, 2006). Several studies have supported the computer anxiety argument: Weil et al. reported "about one in three adults in the United States experienced computerphobia – anxiety related to the use of computers" (Weil et al., 1987; as cited in Cooper, 2006, p. 321). Cooper and Weaver surveyed college students about reactions to computers, and found that "young women were far more unsure of their ability with computers than the young men" (Cooper & Weaver, 2003; as cited in Cooper, 2006, p. 321). Sherman, End, Kraan, Cole, Campbell, Birchmeier, and Klausner (2000) found that men use the technology more frequently, and have more positive attitudes towards it than women, who are more likely to report technology-related anxiety. Zhang's 2002 study of college students and industrial employees supported these findings and showed a significant gender difference in anxiety levels towards technology (p.90). Zhang surveyed 296 college students and 680 industrial employees. He found that women in college showed more positive attitudes towards the Internet, although male employees felt more positively than female employees.

Gender and Self-Efficacy

Several studies have found a correlation between computer anxiety and computer self-efficacy. Bandura's (1977) concept of self-efficacy provided a framework for studying how individuals felt about their abilities to perform certain tasks. Bandura defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (Bandura, 1986, p. 391; as cited in Khorrami-Arani, 2001, p. 18). Self-efficacy "will influence the choice of whether to engage in a task, the effort expended in performing it, and the persistence shown in accomplishing it" (Bandura, 1977; Bandura & Schunk, 1981; Barling & Beattie, 1983; Bouffard-Bouchard, 1990; Brown, Lent & Larkin, 1989; Hackett & Betz, 1989; as cited in Busch, 1995, p. 2).

By comparison, Computer Self-Efficacy (CSE) is defined as "a judgment of one's capability to apply computer technology to specific tasks" (Stephens & Shotick, 2002, p.590). CSE can be a predictor for career choices, especially if women become intimidated by the more male-dominated fields, such as engineering, math, and science. Several studies have found significant gender differences in self-efficacy related to these disciplines (Betz & Hackett, 1981; Betz & Hackett, 1983; Hackett, 1985; Hackett & Betz, 1981; Lent, Brown & Larkin 1984 and 1985; Post-Kammer & Smith, 1985).

Some research has investigated gender differences in self-efficacy specifically relating to computers. Busch (1995) investigated gender differences in computer attitudes and perceived computer self-efficacy in a group of 147 college students (who had just taken a computer class). Busch's study utilized the Computer Attitude Scale (CAS), developed by

Gressard and Loyd (1984, 1986). Self-efficacy was measured by asking subjects how comfortable they felt completing certain computer tasks (for example, accessing the Internet or saving a file). The study did not find gender differences relating to basic task performance, however, men demonstrated significantly higher perceived self-efficacy relating to complex tasks than women.

Measures: Past and Present

The main body of research investigating gender differences in technology attitudes and performance has used the Computer Self-Efficacy Scale (CSE), developed in 1989 (Murphy et al.) and the Computer Attitudes Scale (CAS) developed in the late 1980s (Gressard & Loyd, 1984; 1986). Although these measures may have been accurate at the time, they involve questions relating to technology and terminology that is now obsolete (for example, use of floppy disks).

One of the most recent inventories is the modified Web User Self-Efficacy scale (WUSE). The original scale was created by Eachus and Cassidy (2004), and contained 40 items. The scale was revised in 2006 by Eachus, Cassidy, and Hogg, who analyzed the original scale and reduced it to a 20-item questionnaire. This scale incorporates terminology and computer tasks that are highly relevant to current generations, and has been found to have acceptable standards of validity and reliability in higher education.

Although significant gender differences were found with previously used scales (such as the CAS, and CSE), the WUSE has not currently been applied in a gender-specific context. Eachus et al. used the WUSE to study the development of web-based learning resources (Eachus, Cassidy, Norgate, Marrow, & Greene, 2008). The WUSE has also been used to study

the relationship between computer self-efficacy and achievement (Martinez, 2010). Although the WUSE is a recently developed scale, the rapid changes that have occurred in technology use in the past 5 years mean that even this scale needs to be revised to incorporate changes about new technology skills required to be literate in the 21st century.

Project Hypotheses

The proposed study will apply the revised Web User Self-Efficacy Scale to investigate gender differences in college students' feelings about their abilities related to technology. A modified version of the Computer Anxiety Rating Scale (CARS) will also be used to assess gender differences in computer anxiety (various questions on this scale are outdated in relation to currently used technology and will be updated accordingly). It is hypothesized that men will report significantly higher web-user self-efficacy and lower levels of anxiety than women, and that the responses to the WUSE will support the data from previously used scales. Additionally, age differences in computer self-efficacy and anxiety will be explored if an adequate sample is obtained, and correlations between computer anxiety and self-efficacy will be assessed.

Method

Participants

Approximately 200 participants will be recruited for this study. Participants will be restricted to college students over the age of 18. The participants will be recruited through the University of Alaska Anchorage Psychology Research portal and flyers posted around campus.

Design and Materials

Data will be collected using a survey. This survey will be conducted online using the University of Alaska Anchorage (UAA) Qualtrics survey tool. The survey will be posted on the UAA Psychology Department research portal. Data will only be collected from participants who fit the age range and who are currently enrolled in college. Eligible participants will be restricted to college students between the ages of 18 and 55.

The inventories used will be the modified Web User Self-Efficacy Scale (WUSE; 2006) and the Computer Anxiety Rating Scale (CARS). The questionnaire will also include a demographics section.

Procedure

Participants will access the study through the UAA Psychology Department Research Portal. The survey will be completed online. Participants will be asked to read an informed consent page before they are permitted to proceed with the survey. The survey will consist of a demographics form, the WUSE and the CARS. After the questions have been completed, participants will be directed to a debriefing form explaining the purpose of the study, as well as a link to the prize drawing and the extra credit portal.

Analysis

Data will be evaluated using Microsoft Excel and PASW software. Participant data that does not fit the initially decided criteria will be excluded, as will incomplete answers.

Initially, the gender ratio (males to females) will be calculated and participant comments indicating previous technological training will be noted. The necessary Likert scale questions will be reverse coded before any statistical tests are run. Afterwards, mean and standard deviation will be calculated for each of the items in the WUSE and CARS scales.

Responses will be sorted by demographic information. Overall scale means will be computed for each scale (each of the items on both the WUSE and CARS), and gender differences will be explored using the scale means as dependent variables in independent groups t-tests. The scale scores will also be correlated using Pearson correlations. Data will be reported using tables and figures.

Anticipated Results

Past research has found significant gender differences in computer (specifically web user, in the context of the WUSE) anxiety and self-efficacy. It is anticipated that men in this college student sample will report higher self-efficacy and lower anxiety, in keeping with previous findings. It is also anticipated that computer anxiety and self-efficacy will be negatively correlated. This project is applying a relatively new self-efficacy scale (the WUSE), which is more in keeping with modern technological requirements. However, there have not been many studies conducted that have implemented this scale, and this will be one of the first to use this measure to evaluate gender differences. Despite this consideration, it is still anticipated that the results from this scale will be similar to those from previously used scales.

Future Research

If the hypotheses are supported, there will be a significant difference between the genders. This could be indicative of a gender gap that exists in a college environment, where students are exposed to and required to use technology on a daily basis. These findings would point towards an existing problem, as well as problems in different populations.

One line of future self-efficacy and anxiety research could focus on defining the gender gap in non-college populations, such as grade school students and workplaces, as well as faculty in various locations. Other research could investigate practical applications of these findings, such as ways to reduce anxiety and increase technology self-efficacy, especially among girls in grade school.

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