An Empirical Study of Computer Anxiety among College Students: Differences between Academic Disciplines

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Abstract

The ability to interact with computer interfaces requires not only a basic understanding of computer concepts but also a basic familiarity with the most current hardware and software. Taking these factors into consideration, it's no wonder that a significant number of individuals find themselves anxious at the thought of having to operate a computer and effectively use its software. This computer-related nervousness has become so widespread and, in some cases, acute that it has developed into an imparity commonly known as *computer anxiety*. With the Internet and e-mail being the most influential factor in booming PC sales, the continued growth of the World Wide Web will only serve to bolster the demand for computers in almost every home in America. Not since television has a medium promised so much change in the way we learn, work, and play. While it may come as no surprise that some of the elder members of our society have failed to receive proper education in computing technologies, the substantial number of individuals from the current generation who fail to stay in tune with the swift pace of PC development certainly does call for alarm and the need to understand the factors that lead to the development of anxiety toward technology, specifically computing.

Keywords: Computer anxiety, academic disciplines, computer stress, computer attitudes.

The world currently finds itself in the midst of a technological revolution. Even those fields of study not traditionally associated with the computing industry find themselves immersed in the digital world. Marketers might implement vast databases to more finely tune their promotional efforts, statisticians are able to survey vast amounts of data and turn it into useful information more easily than ever, and even those in the more scholarly fields of history and literature harness the power of modern technology to share their ideas and stories with an audience more immense than ever imagined. Indeed, almost every aspect of our daily lives has in some way become connected to the digital revolution.

An astounding number of Americans use e-mail on a daily basis and even those who do not will surely find themselves interacting with computers in a more transparent manner through consumer devices, such as ATM/Debit cards. With computers and the Internet so pervasive in our society, it's no wonder that some people find themselves overwhelmed at times by the feeling that they must have a working understanding of computers and all of the mediums with which they interface. Everyone has at some point in his or her life

felt pressure to conform and perform. While the latest generation has had the privilege of exposure to computers from a young age, there are still those among them who struggle to keep up with a technology that seems to redefine itself every day. With Moore's Law holding true and computer processing power doubling roughly every 18 months, more complex applications are constantly being developed and the lack of a basic foundation from which to interpret these interactive medium has resulted in many being left in the wake of the Internet boom.

1. LITERATURE REVIEW

The variance of the level of computer anxiety a user experiences due to demographic differences has been addressed in studies that use processes similar to those implemented in this study. Rosen and Weil (1995) partook in an effort to discern differences in computer anxiety between various dissimilar. They found definite, measurable differences based on the culture of the society in which the technology resides. The finding that cultural disparities between nations of the world can greatly influence the rate and ease with which its

students acclimate themselves to technology begs the question of whether or not similar gaps in understanding might exist within a nation so diverse as the United States. Research has shown that even among individuals who may share similar cultural upbringings, factors such as gender and background experience may play a role (McIlroy, Bunting, Tierney, & Gordon 2001).

2. CONCEPTUAL DEVELOPMENT

Computer anxiety is the fear of computers when using the computer, or when considering the possibility of computer use (Heinssen, Glass, & Knight 1987). Most research indicates, however, that this anxiety is not an inherent emotion but rather a "state anxiety" that can be treated (Chu & Spires 1991). The research that led to the previous deduction also concluded that computer experience is the most consistent correlate in the measurement of the degree of anxiety experienced by PC users. There is also evidence that computer anxiety impacts the perceived benefit of using a computer (Bozionelos 1997b) and the user's computer competence (Bradley & Russell 1997). H.W. Chou (2001) implemented pre- and post- instruction measures of anxiety and used an analysis of variance to determine that an instruction-based (rather than behavior modification) approach proved more effective in reducing undergraduate students' computer anxiety levels and also improved their computer self-efficacy. Studies also exist suggesting a discrepancy in computer anxiety levels among different demographic sectors, most prevalently between men and women. A survey of computer anxiety levels in men and women undergraduate students since 1992 shows that while male levels of anxiety have decreased, those in women have remained fairly consistent (Todman 2000). This indicates that technology could prove a barrier for women in the workplace, thus limiting their potential for advancement. Perhaps even more important than students' reactions to traditional computing tasks is the projection of their anxiety onto the most pervasive computing application in today's technological climate: the World Wide Web. Students who encounter errors, such as the ubiquitous "404 Not Found," often cease their surfing in frustration and blame themselves for the roadblocks encountered.

Differences in computer anxiety among gender lines tend to suggest that disparities may also exist between various groups in academic circles. While it appears evident that students studying computer science will possess the lowest levels of technological anxiety due to their voluminous experience with the medium, there may also be dividing lines among other majors. The saturation of our society—and its workplaces—with computers calls for an evaluation of the levels of anxiety encountered in all fields of study, even those not traditionally thought of as associated with computing. In fact, prior studies have shown that higher levels of computer anxiety are correlated with lower student grades in the social sciences when those students are asked to use computers to perform certain tasks (Bowers & Bowers 1996). Earlier research has also indicated that computer anxiety is associated with different types of learning styles (Bozionelos 1997a), this may suggest that students with different learning styles may require different types of training to reduce computer anxiety and thereby increase their performance.

3. HYPOTHESES

By empirically validating that differences among students within different disciplines exist, prescriptive actions could be taken by administrators or faculty to reduce computer anxiety among the groups that would most benefit from such action. Based on the results of prior research and the objectives of this study, the following hypotheses are presented, in alternative form, for testing:

> H1: There are differences in computer anxiety levels among students with different academic majors.

Just as previous research tends to indicate differences in computer anxiety levels across dividing lines such as nationality (Rosen & Weil 1995) and that of gender (Todman 2000), this study hopes to show that discrepancies also exist between students studying in different areas of academia.

> H2: There are differences in computer anxiety levels among students within the same academic discipline at different grade levels.

As mentioned in the introduction, almost all career choices made in today's business environment require at least a modicum of skill in using information technology. For this reason, the results of our surveys should yield evidence supporting the assumption that students that have achieved a higher-class ranking should show a marked decrease in computer anxiety and more positive attitudes toward technology.

> H3: There are differences in the level of computer anxiety levels between male and female students.

Both Todman (2000) and McIlroy et al. (2001) studied the relevancy of gender in determining levels of computer anxiety. This study will also consider gender in the analysis of the data collected.

> H4: There are differences in computer anxiety levels between students with different levels of computer course work.

Perhaps the most certain postulation this study will test is the notion that students who have taken more classes

involving the use of computing applications will necessarily acquire experience that will allow them to work more easily and efficiently than those who lack their technological training.

> H5: There are differences in computer anxiety levels between students from different universities or branch campuses.

Given that different areas of the country vary in terms of modernization and overall availability of computing facilities due to lack of funding and other factors, the results of the research should indicate variances among levels of computer anxiety from one region of the nation to the next.

4. RESEARCH DESIGN

The instrument used to collect the data is based on the Computer Anxiety Rating Scale (CARS) developed by Heinssen et al. (1987) and validated by Chu and Spires (1991). Since its development, the instrument has been updated and administered to thousands of university students, school teachers, secondary school students and business people throughout the United States and university students in 22 other countries (Bradley & Russell 1997; Rosen & Weil 1995; Weil & Rosen 1995). It has also played an integral part in research into the very structure of computer anxiety (McIlroy et al. 2001). The discriminatory capabilities of the CARS survey has been praised in research conducted regarding predictors of computer anxiety and performance in information systems (Anderson 1996). Rosen continues to use the efficient and accurate CARS-C (the latest revision of the survey) in his inquiries into computer anxiety across varied cultures (Rosen & Weil 1995).

The CARS survey's high reliability in measuring computer anxiety stems from its format of a series of questions designed specifically to measure an individual's apprehension toward computers. The CARS instrument is a 19-item, five-point self-rating scale used to assess the subject's computer anxiety level and is presented in Appendix A. The original instrument was modified to update the item descriptions for changes in technology since 1987 and an additional scale item added based on suggestions from prior researchers (Rosen & Weil 1995). Students responded to a series of statements, such as "Getting Error Messages From a Computer," based on how anxious the statements made them feel (from 1=Not at All to 5=Very Much). With a maximum score of 100, ratings in excess of 70 were considered to possess moderate to severe anxiousness when confronted with a task involving computer-related work. The same readability that allowed the CARS to be applied to a study of individuals of separate genders and backgrounds to determine the effect of those variables on computer anxiety will enable us to measure the correlation between fields of study and nervousness toward computing (McIlroy et al. 2001). This instrument was administered to students across different academic disciplines at large midwestern university.

5. DATA ANALYSIS

Each of the hypotheses presented are being tested using the SAS ANOVA procedures. Pilot data has been collected and is being processed to check for anomalies. This data, once properly evaluated, will provide a sound basis for improvement of testing procedures in future surveys. By the time of the conference, it is the sincere hope of the researchers that enough data will have been collected to present preliminary results of the study. Full analysis of the data to fully extrapolate all valuable information contained may take longer.

6. IMPLICATIONS

This study should be of interest to researchers, university administrators, educators, and to the business community and society in general. The results of the study will determine the degree of differences in levels of anxiety among students from academic disciplines. For researchers, the results will further validate the CARS instrument for studying computer anxiety levels of individuals. For university administrators, the results will show which areas may benefit from additional computer training or other forms of intervention to prepare students for life in a highly technological society. For educators, the results will provide some direction in using technology, i.e. they may wish to adjust their assumptions regarding the use of technology in the classroom. Lastly, for the business community and society at large, the results will provide knowledge regarding the levels of computer anxiety that valuable human resources may possess. This newfound knowledge will allow managers or advisors to design training programs to maximize the investment in these resources.

7. ACKNOWLEDGEMENTS

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