Gender Differences in Computer Related Majors at the University of Wisconsin–La Crosse

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ABSTRACT

This study is a primary data analysis of a survey administered to 182 introductory sociology students in the fall semester of 2003. Several factors influence whether or not a person will choose a computer-related field of study. Two dependent variables were used to test likelihood of entering a computer-related field of study. The first was reported likelihood of choosing a computer related field of study and the second asked if the respondent had ever considered entering a computer-related field of study. Overall findings confirm expectations and previous research. For females, whether or not they had played video games regularly was significantly related to considering a computer-related field of study.

INTRODUCTION

In the fall of 2002 there were almost eight times as many males as there were females majoring in computer science here at the University of Wisconsin-La Crosse. Adjusted for disproportionate enrollment there were over eleven times as many males as there were females in computer science (Nyatepe-Coo 2003). Not only this but the percent of females in the computer science major has fallen from 22% in 1991 to 11.3% in 2002. Obviously, here at UW-La Crosse males are going into computer-related fields (also over five times as many males in Information Systems when adjusted for enrollment) at a much higher rate than females.

The problems associated with a gender disparity in academic majors can be understood by studying the problems of unequal gender distribution in different fields or careers. First, this is a problem as the economy of this country has certainly seen a shift toward computer related fields and away from much of the industrial and manual labor seen in the past. Women should be equal candidates for these types of jobs, but are present in small numbers (Women's Educational Equity Act Equity Resource Center 2003). This limits the career possibilities for women as well as perpetuating gender based wage inequalities as computer related fields are often well paid (US Department of Labor: Bureau of Labor Statistics 2003). Also, the exclusion of a significant portion of the population is damaging to progress of technology, as women are not utilized. This underutilization of women as a human resource is a social problem in the development of technology (National Science Board 1998; National Science Foundation 1998; UNESCO 1996; cited in Ramirez and Wotipka 2001). This fear is substantiated as national economic development is influenced by variations in program enrollment (Schofer, Ramirez, and Meyer 2000 cited in Ramirez and Woptika 2001).

Much explanation has been geared toward what is called the math/science pipeline. This argument states that the math and science requirements are seen as too cumbersome to women, as males perform higher on average than females. However, socialization may well play a factor as the differences in math and science achievement are not seen until early high school (Bimber 2000). These differences are seen at UW-L. A fall 2003 enrollment analysis (the enrollment numbers best representing my sample) showed that males performed better on average on the math portion of the ACT entrance exam, but only by about one point[1] (Sjoquist 2004). At UW-L (fall of 2002) men were enrolled in mathematics 2.5 times more often than females. This compared to the over 11 times as many males in computer science helps to show that the mathematics pipeline explanation is not sufficient for explaining the gender gap in computer science.

The literature seems to be inconclusive since it can be found that there is a difference in math scores and this gap is not due to socialization (Felson and Trudeau 1991) or that there is no gender difference whatsoever (Hall, Davis, Bolen, Chia 1999; Skaalvik and Rankin 1994). The moderate view says that a difference in scores only explains part of the gap (Turner and Bowen 1999).

[1] Males held a mean score of 25.64 with females at 24.49.

HYPOTHESIS, VARIABLES, AND METHODOLOGY

This study is a primary data analysis of a survey administered to 182 introductory sociology students in the fall semester of 2003. This sample attempts to be representative as the classes surveyed were general education courses that are taken by students from a range of studies.

Several hypotheses were tested in this study:

1. Males will be more likely to consider a computer-related field of study
2. Males will be more likely to have considered a computer-related major
3. Perceptions of gender differences in math and computer competence will be exaggerated from the smaller real differences.
4. Males will have been exposed to video game greater than females
5. Males will have played video games regularly at a higher rate
6. Data will show a stereotype of who can enter computer-related fields and video game experience will be a part of this stereotype.

Two dependent variables were used to test likelihood of entering a computer-related field of study. The first was reported likelihood of choosing a computer related field of study (on a Likert scale) and the second asked if the respondent had ever considered entering a computer-related field of study. Along with these two dependent variables, thirty independent variables were used which tested areas covering video game experience, perceptions of computers-related majors, perceived computer-related job outlook, perceived gender differences, and perceived importance of computer skills.

FINDINGS

Overall the data confirm expectations. Gender and likelihood of choosing a computer-related field of study held a significant relationship (See Table 1.1) with 85.1% of females saying it was somewhat or very unlikely (compared to 70.5% of males). There was also a significant relationship with whether or not they had ever considered going into a computer-related major (See Table 1.2) with 86.8% of females reportedly never having considered it (compared to 63.3% of males). There was a significant relationship between being male and having played video games on a regular basis (See Table 1.3) as well as between gender and every having owned a gaming system (See Table 1.4). A significant relationship was found between being male and feeling comfortable with computers, with 26.1% more males reporting being “very confident” with computers. Findings were also significant between gender and whether they felt they would fit in with people in computer science or not (See Table 1.5) (with 21.3% males to 6.6% females agreeing). There was a significant relationship between having played video games on a regular basis and likelihood of choosing a computer-related major (See Table 1.6) and with having ever considered a computer-related major (See Table 1.7).

There was no significant difference between males and females with regard to whether or not they were required to take math 050 or 051 although females reported “not sure” 10.8% more often. There was no significant difference for gender and having a computer in permanent home. There was no significant difference with regard to years of access to a computer. No significant gender difference was found in pressure to get well paying job. There was no difference with how important computer skills were thought to be, how computer related jobs compare to others, if they feel they could do well at almost any major at UW-L, or how prepared they felt for college with computer skills. Males and females did not differ when asked if they felt their personal strengths were better for computers. Both similarly used software when younger, both felt it important to train children in computers. Also, both used computers often with 82% of males and 74.4% of females using a computer daily.

Results showed that males seemed to underestimate females. Males were three times more likely to “strongly agree” that the difference in computer competence was genetic (9.8% to 3.3% - See Table 1.8). The same was true of male estimation of differences in math performance with 19.7% of males saying they either strongly agreed or agreed that the differences were genetic (compared to 10.0% of females) (See Table 1.9). There was a significant relationship for gender when asked if males automatically know more because of how they were raised (See Table 2.1) with 14.8% males and 1.7% females agreeing. This male underestimation although there was no significant difference in those required to take math 050 or 051.

Males were found to be three times more likely to “strongly agree” that differences in computer competence and math performances are genetic. Even if not genetic males perceived gender differences in computer knowledge to be something that was taught early on. If we now consider that expectations have an effect on performance

(Cadinu, Maass, Frigerio, Impagliazzo, Latinotti 2003) we can see that socialization can certainly have an effect on creating and/or magnifying the gender gap in mathematics scores.

Interestingly, females who had played video games regularly were more likely to consider going into a computer related major. For both males and females more of those who had played video games also considered a computer-related major, but it was significant for the females (See Table 2.2). Females who had ever played video games regularly were twice as likely to have considered a computer-related major.

DISCUSSION

There is a male perception that believes males are more competent than females in this arena. Robert Merton (1972:20) said that discrimination consists of treating functionally irrelevant characteristics as if they were relevant. If genetics or differential education is seen as a relevant point to a perceived gender difference in computer or math competence, the discrimination is not understood because it is not seen as "functionally irrelevant". Therefore, potential (future) employers, although they may be now taught to shun discrimination, may not see treating women differently as discrimination since it could avoid the label if we use Merton's acceptable definition. This misnomer should be focused on lest we raise another generation of men with the idea that women are, for one reason or another, inferior at math and computers.

This perception also affects the gender role socialization of females. Gender role socialization is the "process by which families, peers, schools, and the media teach a society's expectations of 'appropriate' dress, speech, personality, leisure activities, and aspirations for each sex" (Weitzman 1979 cited in Reskin and Padavic 1994). When roughly half of a woman's family, peers, school, and media are male, this male misconception will contribute significantly to their specific gender role socialization and will teach them what others feel is an appropriate aspiration for their sex. Considering this misconception, we can assume the recommendation won't be to enter a field where they are seen as inferior (even if it isn't "their fault").

To further understand and to specify the problem we must understand where this attitude comes from. Consider the example of typesetting. Typesetting used to be a male dominated craft for centuries. When it was computerized in the 1970's and 1980's the workforce changed from 17 percent female in 1970 to 70 percent female in 1990 (Reskin and Padavic 1994: 61). This is what is called "deskilling" (Reskin and Padavic1994: 166). Through this deskilling females have inhabited this now computerized workplace. This example shows us that it is not that women are seen as incompatible with computers; it is rather the level of skill involved. When typesetting was a skilled profession, it was inhabited by men, when it became less skilled via the use of computers, females dominated. Consequently it is probably not the computers that are keeping women away from identifying with computer science; rather it is a highly skilled position and seems to remain largely for males.

With 23.5% more males having considered a computer-related major, the data confirm that women are not seeing this path as an option. There are several reasons for this, possible reasons will be discusses below. First off males were much more likely to have owned a video game system or to have played video games regularly. Males were 23% more likely to have owned a gaming system and 50% more likely to have ever played video games regularly. This shows a gap between access and use that has been seen with regard to computers where the gap in access was seen as due to socioeconomic statues but the gap in use was significantly related to gender (Bimber 2000:874). Bimber (2000) cites an "underlying gender mechanism" which can be understood as gender role socialization. Consider this difference with the finding that having ever played video games on a regular basis (the "use" as opposed to "access") was significantly related to both the likelihood of choosing a computer-related major and with having ever considered a computer related major. The data is, of course, inconclusive thus far as to how playing video games affects likelihood of choosing a computer-related field of study. However, the data does discuss this a bit further. There does seem to be a stereotype and expectation for a person considering entering computers. A significant relationship was seen when asked whether they thought they would fit in with people in computer science, with 15% more males saying yes to this question. Accordingly, it is not inappropriate to conclude that video games may play a role in how a person comes to identify with computer science being "appropriate" for them.

When we attend to those that responded that they had played video games on a regular basis, the data gets more interesting. There is a significant relationship between having played video games and considering a computer-related major (.001). With respect to the question of whether they had ever considered a computer-related major 38% of the males who had played video games regularly said they had considered it and 25% of the females said so. When we compare this to the gender numbers as a whole the females stick out. Overall 35% of the males said they had considered going into a computer related field of study (compare this to 38% who said they had considered going into a computer-related field of study). For the females the jump is much greater. Only 13.2% of females said

they had ever considered going into a computer-related field of study while 25% of those who had played video games on a regular basis had considered it (Compare Table 2.2 with Table 1.2). When gender is analyzed along with the variables "had played video games regularly" and "had ever considered a computer-related major", the female group is statistically significant and the males are not (See Table 2.2). So, if you are a female and have ever played video games regularly, you are about twice as likely to consider going into a computer related field of study. This substantiates the claim that playing video games is a part of an accepted characteristic that promotes one to consider a computer-related field.

Thus it is consistent to consider how to get the female half of the population interested in video games. Of course the precaution must be taken into account that video games like other media may have negative effects (Emes 1997; Ballard and Lineberger 1999; Anderson and Dill 2000) and females have so far largely avoided this negative influence (Roberts 2000). Video games have been linked to violence "as the dominant means to the end" (Gilmore and Crissman 1997: 193) and that video games support and reinforce the aging but still culturally significant ideology of male dominance (Gilmore and Crissman 1997: 194). However, video games may provide useful skills just as another activity that has generally excluded females, chess (Cassell and Jenkins 1998). Many think that women would benefit from an increased participation with video games (Cassell and Jenkins 1998). How to make this happen is difficult.

There are several problems and approaches with integrating females in this largely male activity. First off, the video game market is already flooded with successful male games and toys stores such as Toys R' Us© demand immediate success, a window of as little as a few weeks, or the game is taken off the shelf (Cassell and Jenkins 1998:14). This leaves little room for trial and error with respect to what works with girls.

One route is to encourage girls to play boys at "their" own games (i.e. the majority of video games available today), or we can create a "girls only" space (Cassell and Jenkins 1998:34) of games that market specifically for girls. These efforts have had minimal positive results (Subrahmanyam and Greenfield 1998). Another approach is to try to integrate more female characters so as to speak more to a female population. This request does not seem to be taken appropriately as women in video games are often available for the pleasure of the player (Berger 2002:66). Good looking, voluptuous women are chosen; very unlikely that this is to benefit a marginalized female population.

For example, possibly the most popular female character is "Laura Croft" of the game Tomb Raider. The term scopophilia can be applied here which is sexual pleasure from looking. The fascination with Laura Croft is likely scopophilia and the control of voluptuous women is a desire for men playing this game (Berger 2002). As the editor of *PC Gaming World* said in an interview, Laura Croft was "designed by men, for men" (Cassell and Jenkins 1998:338-9). And don't worry they have Laura's height, weight, and breast size listed on their website as "vital statistics" (www.tombraider.com/home.html). Clearly, female characters that are being created are inadequate attempts towards female integration into video games. The female characters must be available for more than just something to look at.

Certainly there are difficulties in trying to represent what a "girl" wants in a game because we must then ask, which girl? To attempt to characterize what females want in a game is to assume the female gender construction is a thing that can be represented so easily as a single character in a video game. One approach is to suggest that the gamer would have the ability to create the gender of the characters by inputting information that the computer would use to construct it with (Cassell 1998). This allows gender to be employed in a personal way and to avoid its social construction. This may be a helpful way to get women involved in video games in a way that does not assume a specific gender identity. Further optimism says that these types of games may not be required since male participation of video games has been acquired without them, so could female participation.

It seems clear that gender differences are still in place within the upcoming members of the working class and that the "pre-industrial sexual division of labor has persisted throughout the twentieth century reflecting the importance that societies attach to gender" (Reskin and Padavic 1994: 60). Societies change slowly as social networks tend to include others of the same sex (Braddock and McPartland 1987) which perpetuates a gender inequality since a major part of hiring is referrals. Combine this with the fact that attitudes change slowly in a society and this one seems to retain many mistaken notions about the capacity of the female individual. Optimism lies in recognizing the factors that contribute to this gender inequality and seeing where changes can best be made.

LIMITATIONS

The study is primarily limited by the sample. I surveyed students in introductory sociology courses, and although they are general education, they are not representative of the larger population of women available for work in computer-related fields.

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APPENDIX: DATA TABLES

Table 1.1. Reported Likelihood of Choosing Computer-Related Major

	Very likely	Somewhat likely	Neutral	Somewhat unlikely	Very unlikely
Gender					
Male	0%	6.6%	23%	37.7%	32.8%
Female	1.7%	0%	13.2%	22.3%	62.8%

$X^2 = 21.698$, df = 4, p = .000

Table 1.2. Have Ever Consider Computer-Related Major

	Yes	No
Gender		
Male	35%	63.3%
Female	13.2%	86.8%

$X^2 = 14.112$, df = 2, p = .001

Table 1.3. Have Ever Played Video Games Regularly

	Yes	No
Gender		
Male	85.2%	14.8%
Female	35.5%	64.5%

$X^2 = 40.161$, df =1, p = .000

Table 1.4. Ever Had Gaming System

	Yes	No
Gender		
Male	96.7%	3.3%
Female	73.3%	26.7%

$X^2 = 14.5$, df = 1 , p = .000

Table 1.5. Would Respondent Fit in People in Computer Science at UW-L

	Agree	Neutral	Disagree	Strongly Disagree
Gender				
Male	21.3%	45.9%	26.2%	6.6%
Female	6.6%	41.3%	40.5%	11.6%

$X^2 = 11.135$, df = 3, p = .011

Table 1.6. Likelihood of Choosing a Computer-Related Major

	Very Likely	Somewhat Likely	Neutral	Somewhat Unlikely	Very Unlikely
Every Played video games regularly					
Yes	1.1%	4.2 %	21.1%	31.6%	42.1%
No	1.1%	.0%	11.5%	23.0%	64.4%

$X^2 = 11.671$, df = 4, p = .020

Table 1.7. Have Ever Considered Going into Computer-Related Major

	Yes	No
Has Respondent Ever Played Video Games Regularly		
Yes	30.9%	68.1%
No	9.2%	90.8%

$X^2 = 14.243$, df = 2, p = .001

Table 1.8. Difference in Computer Competence Between Males and Females is Genetic

	Agree	Neutral	Disagree	Strongly Disagree
Gender				
Male	9.8%	18.0%	29.5%	42.6%
Female	3.3%	9.9%	52.9%	33.9%

$X^2 = 11.025$, df = 3, p = .012

Table 1.9. Differences in Math Proficiency Between Males and Females is Genetic

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Gender					
Male	.0%	19.7%	24.6%	27.9%	27.9%
Female	1.7%	8.3%	11.6%	42.1%	36.4%

$X^2 = 12.775$, df = 4, p = .012

Table 2.1. Males Automatically Know More Because of How They Are Raised

	Agree	Neutral	Disagree	Strongly Disagree
Gender				
Male	14.8%	19.7%	31.1%	34.4%
Female	1.7%	11.6%	53.7%	33.1%

$X^2 = 17.88$, df = 3, p = .000

Table 2.2. Has Respondent Ever Played Video Games Regularly

Ever Considered Going into Computer-Related Major	Yes	No
Male		
Yes	90.5%	9.5%
No	81.6%	18.4%
Female		
Yes	62.5%	37.5%
No	31.4%	68.6%

Males - $X^2 = 1.019$, df = 2, p = .601
Females - $X^2 = 5.851$, df = 1, p = .016