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Implications of Gender Consciousness for Students in IT Programs

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Abstract

Previous studies conclude that heightened gender consciousness helps promote women's careers. One professional arena in which women are seriously underrepresented is information technology (IT). This study investigates the effects of gender consciousness among students preparing for IT careers in 18 programs at five U.S. universities. Based on in-depth face-to-face interviews, we assess the overall level of gender consciousness among the IT students and identify characteristics of students with high, median, and low gender consciousness. We then analyze the relationship between level of gender consciousness and students' self-confidence and ambition as regards their education and future IT careers. Our findings suggest that gender consciousness is related to students' lived experience, and has positive implications for women's educational and professional success.

Introduction

Gender consciousness is the recognition that one's physical sex shapes one's relationship to the political world. Similar to other forms of group consciousness, it entails identification with others like oneself, a positive affect toward them, and a sense of connectedness with the group and its well-being (Tolleson Rinehart, 1992). Gender consciousness is a necessary precondition for feminism (Hogeland, 1994), but individuals can reject the label of feminist while still being quite gender conscious (Prindeville & Bretting, n.d.).

In previous studies women have been found to exhibit low levels of gender awareness when reflecting on their career experiences (Bierema, 1999, 2003; Caffarella, Clark, & Ingram, 1997). These studies conclude that greater gender awareness can help promote women's careers. At the same time, Hogeland (1994) speculates that awareness of vulnerability and difference may hinder women's self-determination and freedom. This, in combination with societal expectations (Watt, 2002), could cause women to choose less ambitious career paths and avoid professions traditionally dominated by men.

One professional arena in which this paradox plays out is information technology (IT). Women are seriously underrepresented in IT educational programs and careers, especially at higher levels (Bentson, 2000; Camp, 1997). Lack of confidence in working with computers and a purported lack of interest in the masculine world of computing are

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among the reasons proposed to explain the paucity of women in IT (Kramer & Lehman, 1990; Turkle, 1988). As yet, however, there has been no investigation of gender consciousness among IT students, or its relationship to the gender gap in computing.

To begin to address this lack, in this study we investigate the effects of gender consciousness among students preparing for careers in information technology at five public universities in the United States. We assess the overall level of gender consciousness among the IT students, and identify characteristics of students with high, median, and low gender consciousness. We then analyze the relationship between level of gender consciousness and students' self-confidence and ambition as regards their education and future IT careers. Our findings suggest that gender consciousness is related to students' lived experience, and has positive implications for women's educational and professional success.

The overall approach taken in this research is empirical feminism. Both quantitative and qualitative evidence is adduced to demonstrate and analyze issues of gender inequality in IT education, with the ultimate goal of promoting more gender-equitable outcomes.

Literature Review

Gender consciousness and feminism

The terms 'gender consciousness' and 'feminism' are often discussed together. According to Hogeland (1994, p. 19), however,

> [g]ender consciousness is a necessary precondition for feminist consciousness, but they are not the same. The difference lies in the link between gender and politics. Feminism politicizes gender consciousness, inserts it into a systematic analysis of histories and structures of domination and privilege.

Similarly, Gurin (1985; cited in Reid & Purcell, 2004) defines feminism as *politicized gender consciousness*. It is characterized by (a) a sense of interdependence and shared fate with other women, (b) recognition of women's relatively low status and power compared to men, (c) attribution of power differentials to illegitimate sources, such as institutionalized sexism, and (d) an orientation toward collective action to improve women's position in society. Reid and Purcell (2004) note further that in order to identify as feminist, women must also hold positive (or at least not negative) opinions of the social group "feminists" – one reason many women who agree with the ideals of feminism may hesitate to take on the label of feminist. Another is fear of reprisals following from involvement in politics (Hogeland, 1994).

Gender consciousness, a form of group consciousness, can play a support role in leading women to take political action. In the words of Tolleson Rinehart (1992, p. 139),

> If women require special resources to overcome the lack of welcome they may find as they try to become political, gender consciousness can provide them.

> Gender identification and gender role ideology furnish these means by providing an intrinsic belief system: I can and should participate; and a sense of extrinsic support: I do this with and for others like me.

According to Carroll (1989), gender consciousness raising typically takes place in three phases. First, the individual begins to identify with women, acknowledging common interests. Second, s/he notices disparities in how women are treated and feels this is unjust. Third, s/he recognizes that "the problems women face demand collective, political solutions and cannot be solved through individual efforts" (p. 328; see also Gurin, 1985).

Gender consciousness can also play a facilitating role in educational contexts. In Brody et al.'s (2000) study of three Catholic high schools about to transition from single-sex to co-educational, "participants' consciousness of gender issues was heightened: faculty and administration were formally and informally discussing gender concepts and students were talking about male and female issues." The researchers found that "the combination of leadership, staff and curricular awareness, and an understanding of gender fair and gender affirmative practices can serve to improve institutional effectiveness and lead to higher levels of student achievement."

The Gender Computing Gap

Nowhere are levels of student engagement and achievement of greater contemporary concern in the United States than in the arena of information technology, where girls and women have been left behind with seemingly few prospects for catching up. Women drop out at rates faster than men at all levels of educational and professional advancement, resulting in a gender gap that is especially pronounced at the highest levels of the computing workforce, and that has not narrowed appreciably in over 20 years (Camp, 1997; ITAA, 2005; Vegso, 2005). Despite efforts to move more women into the pipeline at lower levels (e.g., Margolis & Fisher, 2002); girls and women still express less interest than boys and men in studying computer science and in pursuing IT careers (Bentson, 2000; Vegso, 2005).

In research on gender and computing education, this persistent state of affairs has been attributed to both structural and individual factors. Based on a survey of research on women and computing from the 1990s, Dryburgh (2000) identified eight groups of factors affecting women's computing experiences: interest/motivation; attitudes; experience; role models/mentors; culture (class, lab, and general computer culture); stereotypes/sex role beliefs/(knowledge of the field); historical/structural factors; and sex discrimination. At the elementary level, research has tended to focus on structural factors such as lack of gender-equity policies, lack of diversity in curriculum, and lack of female role models in computing. At the post-secondary level, there has been an increasing focus on social psychological factors such as attitudes, experience, the effects of role models and encouragement (cf. Shashaani, 1994). What motivates and interests women in computing is also studied more often at higher levels (Dryburgh, 2000).

Confidence is an individual factor often related to women's computer avoidance. Women

tend to understimate their abilities in traditionally male domains such as mathematics and computing, resulting in "learned helplessness" behaviors (Kramer & Lehman, 1990). Ring (1991) found girls to have lower self-confidence than boys using educational software. Fisher et al. (1997) found an experience-related gender gap in confidence among first year college students; men were more confident about their ability to master the course material, and were more likely to claim an expert level of knowledge of a programming language. A recent Web survey of 1,768 IT majors at U.S. universities found that women still report lower levels of computer efficacy than men (Herring, et al., 2006; Ogan, et al., 2006). However, persistence in the program, and extra feedback along the way, may mitigate the negative effects for women of having lower self-efficacy and less computer experience (Fisher, et al., 1997).

Individual agency can also play a positive role. Bussey and Bandura (1999) propose that gender conceptions are constructed from life experiences together with motivational and self-regulatory mechanisms. Rather than being passively shaped by these influences, however, "people contribute to their self-development and bring about social changes that define and structure gender relationships through their agentic actions within the interrelated systems of influence" (p. 676). This view recognizes the possibility not just for gender-conscious individuals to overcome the obstacles faced by women in IT, but for their actions to bring about societal change.

Predictors of career success

Past research has repeatedly demonstrated a correlation between high self-efficacy, academic persistence, and career success (Aycan, 2004; Multon, Brown, & Lent, 1991; Zeldin & Pajares, 2000),[2] including in IT fields. Confidence in one's abilities generally enhances motivation (Bénabou & Tirole, 2002). Career motivation, in turn, can positively affect performance effectiveness (Day & Allen, 2004).

Women have been claimed to be less ambitious than men in pursuing prestigious, high-paying careers. In a study of career aspirations and planning among non-managerial women, Hite and McDonald (2003) found that career goals are often adapted to meet other life circumstances, such as family responsibilities. Bentson (2000) claims that women in IT are motivated more strongly to do meaningful work than to earn large salaries. Even in comparable positions, however, women tend to trail men in pay, promotion, benefits, and other economic rewards (Bierema, 2003).

Bierema (2003) argues that gender consciousness can improve women's career experiences. Women often exhibit low levels of gender awareness when reflecting on

[2] More generally, "perceived personal efficacy influences the choices people make, their aspirations, how much effort they mobilize in a given endeavor, how long they persevere in the face of difficulties and setbacks, whether their thought patterns are self-hindering or self-aiding, the amount of anxiety and stress they experience in coping with taxing and threatening environments, their vulnerability to depression, and their resilience to adversity" (Bussey & Bandura, 1999, p. 690).

their careers, even when reporting experiences of gender-based hardship, discrimination and harassment (Caffarella, et al., 1997). According to Bierema (2003, p. 4), "Women's uncritical career development not only causes them to adapt to a masculine model, but also prevents them from addressing power differentials or claiming a career on their own terms as women." She proposes, along with Caffarella and Olson (1993, p. 145), that "raising the consciousness of women about the 'glass ceiling' for women in organizations [could] affect their life dreams and what they believe they can achieve."

Paradoxically, awareness of vulnerability and difference may also hinder women's self-determination and freedom, especially for younger women with less experience and self-confidence (Hogeland, 1994). This, in combination with societal expectations (Watt, 2002), could cause women in professions traditionally dominated by men to choose less ambitious career alternatives. In this study, we investigate the implications of gender consciousness for students majoring in IT fields. Specifically, we ask: a) How gender conscious are IT students? b) What are the characteristics of high and low gender conscious students?, and c) What relationship, if any, exists between gender consciousness and IT students' self-confidence and ambition, identified in previous research as predictors of educational and career success?

Methodology

To address these questions, we conducted in-depth, face-to-face interviews with students in 18 IT programs at five U.S. universities. The five universities in the study were all Doctoral Extensive public research institutions with a computer science program and at least two out of four applied IT programs: informatics, instructional technology, library and information science, and management information systems. The interview data were collected as part of a larger project comparing the "women-friendliness" of computer science and applied IT programs (Herring, et al., 2006; Ogan, et al., 2006).[3] The interview results are reported here for the first time.

Subjects and interview protocol

One hundred and thirty-six students (87 women, 49 men) were interviewed on-site at their home institutions over the course of seven months during the 2004-2005 academic year. Women were oversampled at a ratio of two women to every man,[4] in order to focus on the attitudes and experiences of women in IT. The interviewees ranged in age between late adolescence and late middle age; most were white, with 18% being East or South Asian, and 2% African American. The largest portion of the interviewees came from computer science (N=56), reflecting the fact that all five of the participating universities have a CS program. The next largest group was information systems majors (N=26),

[3] National Science Foundation IT Workforce Grant #0305859, "Toward Gender Equitable Outcomes in Higher Education: Beyond Computer Science."

[4] Due to a shortage of women in some of the programs at some of the institutions, the 2:1 ratio was not perfectly attained.

followed by information studies[5] majors (N=24). Fifteen students each were interviewed from informatics and instructional technology programs. The interviewees were roughly evenly spread across academic level, with 47 undergraduates, 47 Master's, and 42 Ph.D. students.

Students were recruited for the interviews in one of four ways: They took part in a web survey about IT students' experiences and attitudes conducted during the previous academic year by members of our research team; they were recommended by faculty or staff member in their programs; they were recommended by friends who had already agreed to participate in the study; or they responded to a general invitation to participate in the study sent by a faculty/staff member to a departmental mailing list. The invitation to participants did not foreground gender as an issue; it indicated only that the researchers were interested in studying "the experiences of women and men in IT programs at major U.S. universities."

A study information sheet, and (where required by the institution) a consent form, were given to each student prior to the interview, and a few minutes were set aside at the beginning to answer any questions and address any concerns the students might have. Students were assured confidentiality in the reporting of the study, and were told that they were free to stop the interview at any time. All of the students who started the interview finished it, although one male student did ask that the recorder be turned off while he answered a question on gender, and one female student asked for the recorder to be turned off while she composed herself after becoming distraught while relating some of the problems she was having in her program that year. In both cases, the recorder was eventually turned back on and the interview resumed. Each interview lasted for approximately 45-60 minutes and was digitally recorded.

The semi-structured interview consisted of approximately 50 questions asking about students' reasons for choosing their major program of study, their experiences in their IT programs, their early computer experiences, and a series of questions about gender and computing (see Appendix A). The semi-structured format allowed the interviewer (the second author) to follow what seemed to be promising or interesting conversational threads. In cases where time did not permit all questions to be asked, the questions about gender were given priority.

Data analysis methods

The interviews were first manually transcribed, then the students' answers to each interview question were content analyzed using N6 (Nud*ist) qualitative data analysis software. Three types of demographic information were also recorded for each interviewee: gender (female or male), IT discipline (computer science, informatics, instructional technology, library and information studies, or management information systems), and level of study (undergraduate, Master's, or Ph.D.).

[5] A category combining schools of Library and Information Science, Information Schools, and Schools of Information.

In addition, overall attributes were coded for each student, including ambition and self-confidence. Based on previous research (see Multon, Brown, & Lent, 1991 for an overview), these two attributes are considered to be good predictors of academic and career success. 'Ambition' was coded on the basis of students' responses regarding their future goals and their personal measures of success. Specifically, ambition was coded from answers students gave to questions about why they had chosen the school that they had (with reasons like the reputation of the school indicating higher ambition), what their plans were after graduation and why (both "making lots of money" and "saving the world" were considered to indicate high ambition), and how they defined success for themselves as students (with higher standards indicating higher ambition). In addition, some students made comments about responsibilities they had personally taken on (especially, although not always, regarding gender disparities that they saw), which suggested that they were comparatively ambitious people.

In contrast, 'self-confidence' was coded based on the students' behavior during the interview, as well as on reflections about their own abilities and likelihood of academic and career success. During the interviews, the interviewer noticed that some students made more direct eye contact and had a more relaxed manner and bearing, communicating higher self-confidence. From the recordings, it was also apparent that some students spoke fluently and confidently, while others made more pauses and false starts in answering questions, and used more qualifiers, hedges, and "I don't know" fillers, conveying an overall impression of lower confidence. The self-confidence coding also took into account interview content; for example, statements such as "I don't think I'm a very good student" were taken to indicate low self-confidence. A single code of high, median, or low for 'ambition' and another for 'self-confidence' was assigned for each interview, taking into account all of the above-mentioned behaviors.

In our analysis of the interviews, we further distinguished two aspects of gender consciousness. These correspond to the second phase in Carroll's (1989) formulation: The individual *notices disparities in how women are treated and feels this is unjust*. In our interviews, we noticed that the first part of the formulation was often evident without the second part. Thus we distinguish between students who both notice gender disparities in IT programs and are bothered by them, and students who notice gender disparities and are not bothered by them. This classification allows a third type to emerge: students who do not notice gender disparities, and are (therefore) not bothered by them. We refer to these levels of gender consciousness as high, median, and low, respectively.

Decisions about which category a student belonged in were based on several considerations. Did gender emerge spontaneously in the interviewees' answers as a factor in their student life, prior to questions about gender being asked? How easily were they able to articulate or give examples of gender-based differences in their IT disciplines or programs? What was their manner and tone of voice when discussing gender issues? Were they able to hypothesize about the reasons for gender-based differences in IT fields, and how well-informed were their hypotheses? Had they done anything personally to try to effect change?

Individuals in the 'low consciousness' category were aware, at some level, of gender differences in their programs or fields. What resulted in interviewees being coded into the low category was not that they failed to notice that there were more men than women in IT-related fields, but that when asked to elaborate upon or explain the effects of these differences, they could not. Moreover, they expressed no concern about gender disparities in IT when these were pointed out to them by the interviewer's questions. A small number of (male) students in this category responded defensively, denying that gender disparity existed.

Individuals in the 'median consciousness' category, in contrast, were able to provide detailed examples, when asked, of how male and female lived experiences in their programs or fields were different, and could hypothesize as to why that might be so. However, they did not indicate that they were bothered by this, sometimes explicitly concluding a response with the words, "…but it's not really a big deal."

The students in the 'high consciousness' category, finally, expressed frustration with the gender-unequal status quo, could offer interpretations of it informed by an awareness of power disparity, and in some cases had taken concrete action (e.g., participating in women oriented events or programs) to effect change. These students were most likely to mention gender as a factor in their experience before it was raised by the interviewer.

At the beginning of the coding process, both authors together with a research assistant coded a subset of the interviews and achieved inter-rater agreement of over 95%. The reliability of the coding scheme thus established, the reminder of the interviews were coded by the second author. Descriptive statistics were generated to analyze the three gender consciousness categories with respect to the demographic categories and different levels of ambition and self-confidence. Because of the small numbers in some of the categories, it was not possible to conduct tests of statistical significance. Tables summarizing the descriptive statistics can be found in Appendix B, except for those summarizing the results central to the analysis, which are presented and discussed in the following sections.

Findings

Overall gender consciousness

Our first question asked, *how gender conscious are the IT students overall?* In all, 29 individuals (21%) were initially classified into the high gender consciousness category, 80 (59%) in the median category, and the remaining 27 (20%) in the low gender consciousness category. Thus the majority of students expressed an awareness of gender asymmetries in IT, but did not seem to feel that they were unjust.

These initial numbers included five male students classified as 'high gender conscious' because they met the criterion of being bothered by the gender gaps they saw in their programs, but for reasons different from the others: They perceived women as receiving (undeserved) special treatment, or they were unhappy because the scarcity of women

made it harder for them to find women to date. We assessed these concerns to be qualitatively different from those of others who associated the gender gap with an unfairness towards women, and a decision was made to exclude them from further analysis.[6] After this adjustment, the distribition of gender consciousness was: high (18%), median (61%), and low (21%).

This overall median level of gender consciousness may seem high for a science domain populated, according to stereotype, by socially-unaware "geeks" and "nerds" (Kendall, 1999; Turkle, 1988). However, the gender computing gap has received a certain amount of attention in the mainstream media in recent years (e.g., Vegso, 2005), and has started to enter the cultural consciousness. Most of the IT students had heard about the gender gap, and could suggest explanations for why it exists.

Gender consciousness and student demographics

Our second question asked, *what are the characteristics of high and low gender conscious students?* Not surprisingly, gender consciousness correlates with student gender. Five times as many women expressed a high level of gender consciousness as men, while three times as many men as women expressed a low level of gender consciousness. Women and men are found in the median gender consciousness category proportionately equally. This distribution is shown in Figure 1 and Table 1.

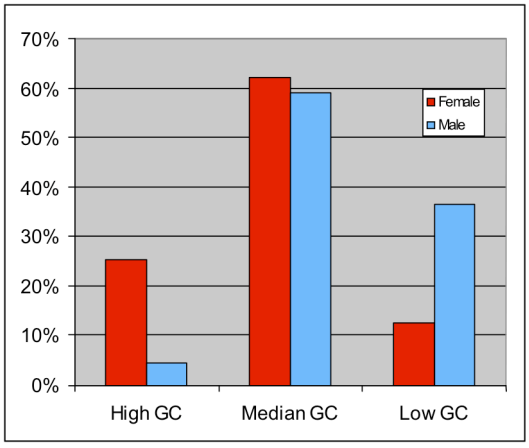

Figure 1. Distribution of gender consciousness by gender

Gender	High GC		Median GC		Low GC		Total	
Female	22	(25%)	54	(62%)	11	(13%)	87	(100%)
Male	2	(5%)	26	(59%)	16	(36%)	44	(100%)
Total	24	(18%)	80	(61%)	27	(21%)	131	(100%)

Table 1. Distribution of gender consciousness by gender

Computer science was the discipline with the highest level of gender consciousness, with 41% of the CS women interviewed falling in this category. Again, this may seem

[6] Table I in Appendix B summarizes the characteristics of these five males.

counterintuitive in light of popular stereotypes. However, CS is the discipline with the lowest female enrollments in our study (between 10-20% of students), giving female students plenty of opportunity to experience gender disparities first-hand. In contrast, students in instructional technology and library and information studies, programs with higher female enrollments, were less likely to indicate that they noticed or were bothered by gender disparities. CS men, but few CS women, were also found in the low gender consciousness category. The distributions of informatics and information systems students were proportional across the three categories of gender consciousness.

Academic level of the students in our study also appeared to correlate to some extent with gender consciousness, although the trends are more suggestive than conclusive (see Appendix B). Ph.D. students were most common in the high consciousness category, while Master's students predominated in the median consciousness category. Undergraduates are slightly overrepresented in both the high and the low categories.

These results suggest that gender consciousness in IT programs is related to students' lived experiences. Women, especially in male-dominated fields, have greater gender consciousness than men because as the minority they are more affected by gender disparities. In contrast, the women in programs with high female enrollments were less likely to report being bothered by gender disparities, perhaps because the high numbers of women in the program make it less likely that they will experience gender-based discrimination, and provide a stronger support network if they do. Likewise, doctoral students, who have had more experience in academia than students at lower levels, have had more opportunities to observe or experience gender discrimination first-hand. The finding that undergrads are also proportionally well represented in the high consciousness category was somewhat unexpected. This may be an artifact of the high number of CS majors in the category, many of whom were undergraduates.

Gender consciousness and self-confidence

Our third question asked, *what relationship, if any, exists between gender consciousness and IT students' self-confidence and ambition?*

The interviewees generally presented themselves confidently, with 61 individuals (47%) coming across as highly self-confident, 62 individuals (47%) demonstrating median self-confidence, and only eight individuals (6%) appearing low in self-confidence. The high confidence level projected by the interviewees may reflect the fact that they were volunteers, and highly confident individuals are more likely to volunteer to participate in face-to-face interview studies. No overall differences were found in self-confidence based on gender. On a scale from 1 to 3, where 3 is 'highly self-confident', both women and men averaged 2.4.

However, student gender mediates the relationship between self-confidence and gender consciousness. In general, the higher a student's gender consciousness, the higher their self-confidence, especially for women. The most highly self-confident women tend to have high gender consciousness, contrary to concerns that awareness of gender disparities

could undermine women's self-efficacy (Hogeland, 1994). In contrast, the most highly self-confident men have median gender consciousness. The men we interviewed seemed most confident when they knew about – but were not concerned about – the gender gap in computing. Given that median gender consciousness could be said to support the male-dominant status quo, it is not surprising that men with this level of consciousness would feel comfortable and confident of their ability to succeed in their IT programs. Both women and men are least likely to be highly self-confident when they have low gender consciousness, especially men. The pattern for median self-confidence complements that for high self-confidence, increasing for both genders as one moves from high to median to low gender consciousness. (The numbers for low self-confidence are too small to allow for any generalizations.) These findings are represented graphically in Figure 2 and summarized in Table 2.

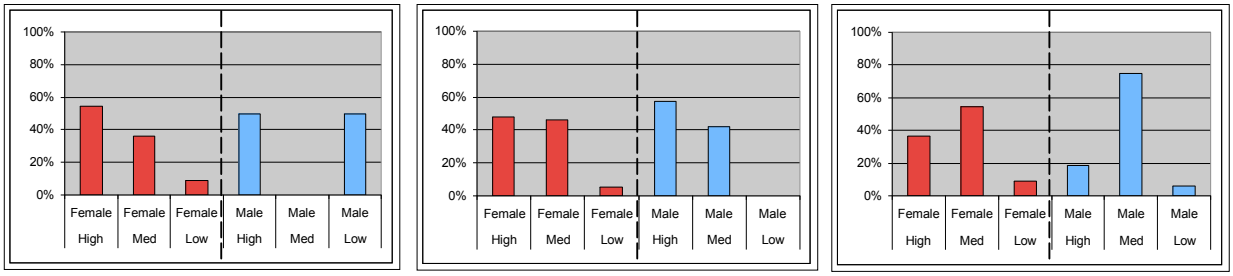

Figure 2. Gender and self-confidence of high, median, and low gender conscious students (percentages of students of each gender in each consciousness category)

Self-Confidence		High GC		Median GC		Low GC	
High	Female	12	(55%)	26	(48%)	4	(36%)
	Male	1	(50%)	15	(58%)	3	(19%)
Med	Female	8	(36%)	25	(46%)	6	(55%)
	Male	0	(0%)	11	(42%)	12	(75%)
Low	Female	2	(9%)	3	(6%)	1	(9%)
	Male	1	(50%)	0	(0%)	1	(6%)
	Total	24		80		27	

Table 2. Gender and self-confidence of high, median, and low gender conscious students (percentages of students of each gender in each consciousness category)

It should be noted that since there are only two men in the high gender consciousness category, their percentages are not very meaningful.

Gender consciousness and ambition

The distribution for ambition follows a bell-shaped curve, with 34 individuals (26%) expressing high ambition, 87 (66%) expressing median ambition, and 10 (8%) expressing a low level of ambition. Consistent with previous research, the women we interviewed were not as ambitious as the men, although the difference was slight. On a scale from 1 to 3, where 3 is 'highly ambitious', men averaged 2.3 and women averaged 2.1.

The pattern for ambition in relation to gender consciousness is similar to that for self-confidence. Higher levels of ambition correspond to higher levels of gender consciousness, overall; however, this manifests somewhat differently for women and men. Highly ambitious women are overrepresented in the high gender consciousness category: The high consciousness category only accounts for 18% of the analyzed population, but nearly half (42%) of the highly ambitious women are there. Highly ambitious men, in contrast, tend to fall in the median consciousness category, and the men in this category are notably more ambitious than the women. This reflects the larger status quo in IT (and many other professions), and our category of median gender consciousness seems to support the status quo, by not questioning gender inequities. Finally, low gender consciousness is associated with a decrease in ambition, especially for men. Median and low ambition both show the complementary pattern, tending to increase as gender consciousness decreases. These findings are represented graphically in Figure 3 and summarized in Table 3.

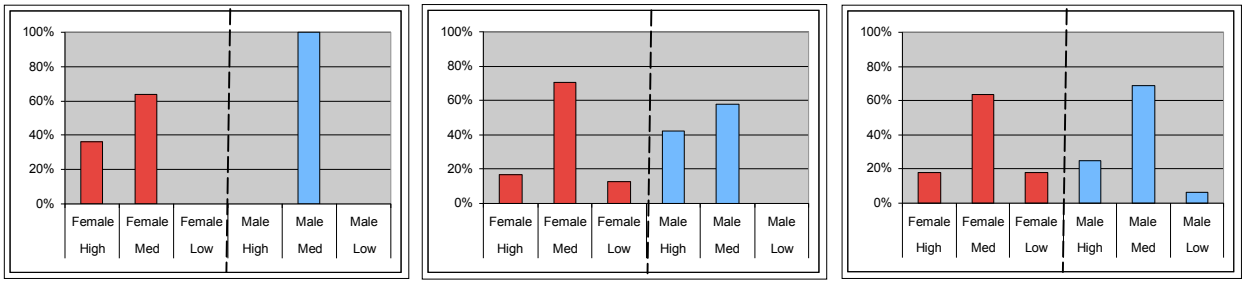

Figure 3. Gender and ambition for high, median, and low gender conscious students (percentages of students of each gender in each consciousness category)

Ambition		High GC		Median GC		Low GC	
High	Female	8	(36%)	9	(17%)	2	(18%)
	Male	0	(0%)	11	(42%)	4	(25%)
Med	Female	14	(64%)	38	(70%)	7	(64%)
	Male	2	(100%)	15	(58%)	11	(69%)
Low	Female	0	(0%)	7	(13%)	2	(18%)
	Male	0	(0%)	0	(0%)	1	(6%)
	Total	24		80		27	

Table 3. Gender and ambition for high, median, and low gender conscious students (percentages of students of each gender in each consciousness category)

Again, because there are only two men in the high gender consciousness category, the percentage for men in this category should not be given much importance.

These findings have implications for how men and women optimize their experiences. For men, having a certain level of gender consciousness without being bothered by disparities seems conducive to high ambition, while for women, it is better to have a high level of consciousness. It seems that neither gender is particularly well served, in terms of ambition, by being of low gender consciousness, a finding that mirrors the results for gender consciousness and self-confidence.

Discussion

The findings of this study have implications for research on gender consciousness and its relationship to the gender gap in computing. The study introduced a distinction not made before in the literature, separating *awareness* of gender disparity from affective *response* to that awareness. This distinction proved useful in several ways.

First, it allowed the overall level of gender consciousness of the IT students to be identified as median, rather than low, as it might otherwise have been had we followed Carroll's (1989) definitions without modification. This is valuable in that it leads us to consider the encouraging possibility that popularization of the gender computing gap in the media has raised awareness of the problem to some extent, even if most students are not actively concerned about it.

Second, the three-way categorization afforded by this distinction separated female from male IT students at the extremes of high (aware + bothered) and low (not aware + not bothered) gender consciousness, while revealing median (aware + not bothered) consciousness to be characteristic of females and males in equal proportion. This makes sense, given that both genders must participate to maintain the status quo, and that median consciousness does not question the status quo. At the same time, female students can be expected to be more motivated to change that status quo, and being bothered by existing inequity is a prerequisite for initiating change. The existence of a low-consciousness group made up of students who are least affected by gender disparity – males in computer science, who enjoy a clear majority, and both males and females in relatively gender-equitable disciplines such as instructional technology and library and information studies – also makes sense in motivational terms.

Third and last, considering gender consciousness along a three-point scale allowed gradient patterns to emerge within and across categories. Specifically, we observed that both self-confidence and ambition tend to increase with an increase in gender consciousness. At the same time, women and men are served differently by having different levels of gender consciousness: women are most ambitious and self-confident when they are highly aware, while men are most ambitious and self-confident when they are moderately aware.

Demographics and student experience appear to predict level of gender consciousness to some extent. The high gender consciousness students in our study are disproportionately female, and disproportionately majoring in a male-dominant IT field (computer science, information systems, or informatics). They are mostly undergraduates and doctoral students. Median consciousness students are most likely to be studying for a Master's degree, but are otherwise diverse. Low gender consciousness students are disproportionately male, and more likely to be majoring in an IT field with balanced gender representation (instructional technology or library and information studies).

Such differences stand to have consequences for students' future success in their degree programs and beyond. Past research has demonstrated a correlation between high self-efficacy, academic persistence, and career success (Aycan, 2004; Multon, Brown, & Lent, 1991; Zeldin & Pajares 2000). It is encouraging that overall levels of self-confidence and ambition were roughly the same for women as for men in this study, in contrast with previous research suggesting that women in IT are less confident and ambitious.

Moreover, being aware of – and troubled by – gender disparities in IT does not appear to have undermined these women's self-efficacy or aspirations; on the contrary, it is associated with higher levels of both. This is a positive finding, suggesting that gender consciousness is good for women as individuals, as well as necessary to elevate the social, political, and economic conditions of women as a class. It implies levels of sensitivity and perception that could translate into higher intellectual achievement. High gender conscious individuals are also more likely to reach the third, political, phase in Carroll's (1989) process of gender consciousness raising, and to engage in activism to change the status quo.

Conclusions

The widening gender gap in information technology (ITAA, 2005; Vegso, 2005) can only be closed through concerted educational policy efforts. The finding that gender consciousness is positively related to student self-confidence and ambition, especially for women, should lead institutions of higher learning to consider incorporating gender consciousness raising into IT curricula. Just as exposure though coursework to feminism has been found to lead students to a greater appreciation of feminist perspectives (Reid & Purcell, 2004), exposure to reflections on the gender gap in computing could raise IT students' gender consciousness. Low gender consciousness serves no one's interests. At the same time, to the extent that male and female students are differently advantaged by high levels of awareness, proposals for such changes are likely to encounter resistance. Educational policy makers should be prepared to defend the benefits of having successful female IT students and graduates, on programmatic grounds as well to promote social justice.

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Appendix A: Interview questions

Can you tell me a little bit about yourself?

How or why did you come to choose your major?

Why did you choose this specific program at this university?

Did anyone encourage you to choose this major? Why did they do that? (What reasons did they give when they told you that this major would be a good fit for you?)

Do you like it?

What do you hope to do after completing your degree?

What made you interested in doing that?

Some of the things we want to discover as a result of this research are some of the factors that lead to positive or negative experiences for students in IT related fields. First of all, has your experience in your major been more positive or negative?

What has made it positive (or negative)?

Do you feel that your experience is typical; that is, do you think that your peers think of this program positively or negatively for similar reasons?

How do you personally define success for yourself as you pursue your studies?

And do you feel that you're successful at what you do?

Why? (or why not?) That is, what are the factors that contribute to that success (or lack thereof)?

If you could change three things about your program, what would they be?

If you knew the program was going to be completely changed, but you had the opportunity to keep three things the same, what would they be?

Can you describe something that happened in your program (a specific instance) that made you feel valued?

Can you describe something that happened in your program (a specific instance) that made you feel uncomfortable?

Do you know of any students who have left your program (not necessary to mention names)? Why did they leave?

How much do you think your program values people and human needs, in general?

How good a job do you think your program does of making students feel valued and respected?

What is your social network in your major like? Do you have a lot of friends in your major? Do you work/play/study together a lot?

Do you consider yourself more of a social or solitary person? Which type of person do you think is more common in your field?

What are student/faculty relationships like in your program?

Are you happy with the student/faculty relationships as they are?

What would the ideal student/faculty relationship be like, in your opinion?

Let me ask about some demographic issues. Do you think that there's anything in your demographic profile, your gender, your race, your age, etc. that has worked either against or in favor of your having a positive experience in your program?

If against, have you developed strategies in order to compensate? What kinds of strategies?

Why do you think there are more men than women in IT fields?

Do men have an easier time in your program, in your opinion? Why or why not?

Could you describe the way the males in your program talk about their experiences and expertise with computing?

Could you describe the way the females in your program talk about their experiences and expertise with computing?

There is research that suggests that males start using computers earlier than females and on their own more than females. Is that consistent with your experience? (If so) Why do you think that is? (If not) What has your own experience been? Was that typical for your peer group?

In your experience, do men and women use computers differently? That is, do they do different things on the computer? (If so) What do men do? What do women do? Why do you think there is this difference? (If not) What are the tasks that the people you know typically use computers for?

Do you feel that your department is equally supportive of students in all demographic groups? [E.g., age, gender, race, ethnicity]

Is there anything your department could do to make students feel more supported?

Is there anything else you'd like to share with me about your experiences, good or bad, in this program?

Thank you for your time!

Appendix B: Data analysis tables

Level	Undergraduate=2 Master's=2 Ph.D.=1
Discipline	Computer Science=3 Information Systems=2
Self-Confidence	High=3 Median=2
Ambition	High=2 Median=3
	N=5

Table I. Characteristics of 'high gender conscious' males excluded from the analysis

Level	Gender	High GC	Median GC	Low GC	Total
Undergrad	Female	9 (32%)	15 (54%)	4 (14%)	28 (100%)
	Male	0 (0%)	10 (59%)	7 (41%)	17 (100%)
	Total	9 (20%)	25 (56%)	11 (24%)	45 (100%)
Master's	Female	3 (10%)	25 (81%)	3 (10%)	31 (100%)
	Male	0 (0%)	8 (57%)	6 (43%)	14 (100%)
	Total	3 (7%)	33 (73%)	9 (20%)	45 (100%)
Ph.D.	Female	10 (36%)	14 (50%)	4 (14%)	28 (100%)
	Male	2 (15%)	8 (62%)	3 (23%)	13 (100%)
	Total	12 (29%)	22 (54%)	7 (17%)	41 (100%)

Table II. Distribution of gender consciousness by academic level and gender

Discipline	Gender	High GC	Median GC	Low GC	Total
Computer Science	Female	15 (41%)	20 (54%)	2 (5%)	37 (100%)
	Male	0 (0%)	10 (63%)	6 (38%)	16 (100%)
	Total	15 (28%)	30 (57%)	8 (15%)	53 (100%)
Informatics	Female	2 (22%)	6 (67%)	1 (11%)	9 (100%)
	Male	0 (0%)	4 (67%)	2 (33%)	6 (100%)
	Total	2 (13%)	10 (67%)	3 (20%)	15 (100%)
Instructional Technology	Female	1 (10%)	5 (50%)	4 (40%)	10 (100%)
	Male	0 (0%)	3 (60%)	2 (40%)	5 (100%)
	Total	1 (7%)	8 (53%)	6 (40%)	15 (100%)
Library and Information Studies	Female	0 (0%)	15 (88%)	2 (12%)	17 (100%)
	Male	2 (29%)	3 (43%)	2 (29%)	7 (100%)
	Total	2 (8%)	18 (75%)	4 (17%)	24 (100%)
Management Information Systems	Female	4 (29%)	8 (57%)	2 (14%)	14 (100%)
	Male	0 (0%)	6 (60%)	4 (40%)	10 (100%)
	Total	4 (17%)	14 (58%)	6 (25%)	24 (100%)

Table III. Distribution of gender consciousness by IT discipline and gender