Where are the girls? The gender digital divide and professional IT

By Janice Todd

Introduction

'I don't think of myself, first and foremost, as a woman but as a geek.'
Marissa Mayer, First female engineer hired at Google, (Swartz, 2008)

Around the world many women and girls "are excluded from participation in science and technology activities by poverty and lack of education (at all levels), or by aspects of their legal, institutional, political and cultural environments" (UNESCO, 2007, p. 15). In our society, however, gender itself "no longer appears to be a source of disadvantage in terms of access and use of computers in schools" (Johnson, 2004, p. 1). In fact, children in the 5 to 14 year age group access the internet and use a computer in almost equal numbers (Australian Bureau of Statistics, 2006a). Yet, by the early to mid-teens, evidence suggests that a gender difference has opened up (Livingstone and Helsper, 2007; Bain and Rice, 2006/07) and, without intervention, "technology inequities occur from the moment teenage girls enter the room" (Farmer, 2008, p. 28).

Older girls avoid the study choices which lead to careers in IT. One quarter of the 2008 HSC students studying 2 Unit Information Technology and 9% of the students studying Software Design and Development 2 Unit were girls (Board of Studies NSW, 2008). Of the 11,171 students Australia-wide who began studying IT at undergraduate level in 2007, only 17.7% were female (Department of Education, Employment and Workplace Relations, 2008).

Unlike the traditional male-dominated professions of law, science, medicine and architecture, which attract increasing numbers of women, IT is an unappealing career choice for most young women. According to Australian Labour Market statistics, 85% of the people working in ICT are men (Australian Bureau of Statistics, 2006b) and, while the number of male ICT workers grew between 2004-05 and 2005-06, the number of females fell by 8%.

Why is there a gender digital divide?

Although Johnson, in a small study of upper primary school students, concluded that "Girls are on a par with boys in terms of their self-efficacy, and their comfort with using computers" (2006, p. 8), she observed that the computer experts identified in each class were male. From a young age, boys dominate computer usage at home and at school, creating 'boys clubs', intimidating girls (Leech, 2007, p. 9) and sowing the seeds for a gender-imbalanced IT workforce.

The cause of this dominance may be partly biological. Teenage boys, for example, tend to be better at mathematics and spatial tasks than girls (Terlecki and Newcombe, 2005; Stenstrom, Stenstrom, Saad and Cheikhrouhou, 2008). Their dominance of computer gaming, where they outnumber the girls 2 to 1 (Australian Bureau of Statistics, 2006a) appears to have a biological explanation. McKay (2008) describes a testosterone surge in utero which causes the male communication cortex to be much smaller than a female's – an explanation for the male propensity to solve problems by retreating "into the cave of his mind" (McKay, 2008, p. 213) and, also an explanation for the teenage boy's obsession with computers as observed by Margolis and Fisher (2001, p. 35).

It's unlikely however, that biological differences account for girls' under-representation in IT. McGrath Cohoon (2003) notes that their participation varies over time and place. It can be increased by limited study choices and economic necessity. In the republics of the former Soviet Union, for example, the problem does not exist (Gharibyan, 2006). Margolis and Fisher describe the phenomenon of the "counterintuitive persisters" (2001, p. 95), girls who are complete computer novices, mostly from international backgrounds, who are so motivated that they succeed in computing science majors, despite societal "expectations and assumptions about who can and will succeed in a competitive computer science program" (Margolis and Fisher, 2001, p. 96).

The reasons for under-representation of girls in professional IT are more likely to be found in the social conditions, stereotypes and misperceptions that surround the discipline of computer science. Research (Beyer, Rynes and Haller, 2004; Weinberger, 2004) shows it is not girls' ability that keeps them from studying IT but rather a complex set of interrelated causes which includes their lack of confidence with being able to do the coursework, their belief that it would be an unfulfilling career choice, the perception that the courses 'are not interesting to me' (Weinberger, 2004, p. 31) and their concern about the male-dominated classroom climate. Similarly, Leech (2007, p. 5) concludes "the problem stems largely from misinformation about the potential careers in IT; an uninspiring, irrelevant curriculum; and a pedagogical approach unsuited to girls' learning styles".

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Education's curriculum and pedagogical approaches are simply reflecting beliefs and stereotypes which already exist in our society and which must be constantly questioned. We can situate girls' avoidance of professional IT within wider gender discourses. IT joins disciplines such as mathematics, engineering and the sciences which traditionally exclude the feminine. Rowan (2007, p. 61) draws attention to the "necessity of continuing to document and circulate performances of 'girl' and 'boy' in contemporary schooling which transgress normative understandings of gender and ... CIT".

Divide or difference?

Take a few moments to imagine a society, past and present, in which the contribution of women engineers, scientists, doctors, artists, politicians etc is equal to that of men. If female students continue to avoid studying IT they'll be yet again excluded from participation as "cultural architects" (Timms, Courtney and Anderson, 2006, p. 3) and the consequences will include "products that fail to meet the needs of all, a lack of diversity in development teams, processes not being invented and products not being built" (Craig, 2006, p. 33). They will also be excluded from another high income career.

There are already examples from science and engineering which demonstrate how "development groups that are not representative of their users can go wrong" (Craig, 2006, p. 32); for example, the first airbags, untested on the smaller bodies of women and children, resulted in injuries and death. With so little initial female input into their development, computers and the Internet display male bias which can impact on females' use of technology; for example, men pay greater attention to dynamic web elements like interactivity and animations and benefit from websites with deeper navigational structures (Stenstrom et al, 2008).

The talent of IT professionals underpins the development of knowledge economies, seen by many as the key to future prosperity, and so, with a continual shortage of IT professionals, the gender digital divide has become more than a gender equity issue. It is also a "pragmatic concern with potentially far-reaching implications for the competitive advantage of firms, regions, countries and economic blocs" (Anderson etc, 2005, p. 4).

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However, by viewing the gender digital divide from a deficit perspective, is it possible that we are missing the more positive aspects of gender difference? With the rise of the internet as a social and educational space, girls now use it in equal or greater numbers than boys and, in some areas, girls' usage heavily outweighs that of boys. For example, they are four to fivr times more likely to use social networking sites (Tufekci, 2008).

So far, this enthusiasm for the internet has not translated into an enthusiasm for studying IT. Honan (2006, p. 23) goes some way towards explaining this by questioning the way girls are being taught to be "passive consumers of the technology rather than agentic producers". She points to the increasing relevance of narrative in the production of new digital texts and believes the devaluing of narratives as 'girls' work' threatens the generation of "the creative ideas that will lead to economic success" in the 21st century (Honan, 2006, p. 24). It could also be argued that boys are being disadvantaged "in relation to the development of their social and cultural capital" (Collins, 2000, p. 42) by choosing a narrow and vocationally-oriented subject like IT and that it is vital for society in general that IT curriculums change to incorporate traditional female strengths like communication skills, emotional sensitivity, connectedness and responsiveness (McKay, 2008).

Building bridges

It appears that girls' avoidance of professional IT is a complex phenomenon which besets girls around the time they enter upper primary/lower secondary schooling. Schools have a major role to play in helping girls retain the enthusiasm, confidence and interest in IT which they displayed in their earlier years. Interestingly, Leech (2007, p. 9) points out that the University of Technology, Sydney, has high rates of female enrolment in IT and more than 90% of these girls attended single-sex girls' secondary schools. Co-education, which is known to benefit boys more than girls, has society's support and gender equity policies covering female issues appear to have dropped off government policy agendas (Seaton, 2004). Until this situation changes, individual schools and classroom teachers may need to take a large part of the responsibility for promoting girls' use of IT.

On an individual level, female teachers can act as role models by developing their own IT skills and confidence with IT. All teachers can act as mentors by identifying and encouraging female students who would benefit from individual attention. They can ensure that software which appeals to girls is used in their classrooms and create IT lessons which incorporate girls' learning preferences and strengths, for example, group work and language-based activities. In addition, they can encourage parents to support their female children's interest in IT and access to computers at home.

Teacher-librarians, in their role as leaders within their schools and their profession, can help to identify when policy areas like the gender digital divide need to be addressed at both the school and governmental level. On a day to day basis, teacher -librarians, like classroom teachers, can influence their individual female students' IT skills, abilities and attitudes.

Schools can encourage girls' computer use by making sure IT is integrated across curriculums and linked to curriculum outcomes (Anderson, 2008). They can form gender-friendly computer clubs and "if necessary . . . establish sex segregated computer classes" (Lane, 2005, p. 14). They have a major role to play in educating girls about the nature of ICT careers which, in contrast to the stereotype, "increasingly draw on variety, communication and other 'people' or 'soft' skills" (Redmond, 2006, p. 16), workplace characteristics which appeal to females. To combat IT's male geek image, schools can invite women who are working in the area to speak to students and they can organise work experience programs so that female students develop a realistic picture of what's involved in an IT career.

At the tertiary education level, effective interventions include: actively recruiting women, encouraging women to persist, and mentoring for the purpose of overcoming under-representation (McGrath Cohoon, 2003). Beyer, Rhnes and Haller (2004) suggest that computer science departments need to change stereotypes and that courses which emphasise student collaboration need to play a prominent role. The field should capitalise on women's strengths: interpersonal skills, cooperative, democratic, interactive styles. "It is of utmost importance that CS educators help increase women's computer confidence" (Beyer, Rhnes and Haller, 2004, p. 27).

Research shows that women students link their interest in IT to a wider societal framework. Margolis et al (1999/2000, p. 14) conclude that higher education needs to revision computer science so that it "incorporates and values women's perspectives as well as men's".

Teachers, schools and tertiary education providers can employ a range of strategies to improve girls' attitudes and participation in professional IT but, in the long term, it is unlikely that change will occur without the development of stakeholder-backed policies to guide practice. Society recognises the importance of imbedding IT into our children's education and "there are vivid messages given in the current policy environment about the importance of technology to student learning, student citizenship, and to student employment opportunities" (Johnson, 2004, p. 2). Society also recognises the need for policies such as the NSW Department of Education and Training's Boys' and Girls' Education Strategy (2008) which asks teachers, students and parents to "examine and understand the impact of gender in their school context on boys' and girls' decision making, participation and achievement".

However, just as boys' underachievement was targeted by the Federal Government's Success for Boys initiative, so the gender digital divide needs to be addressed directly, rather than remaining implied in gender equity and IT educational policies. A good example of this is the Queensland Government Department of Education and the Arts' Girls and ICT Framework for Action which "seeks to redress the under-representation of women in ICT careers and university and training courses by encouraging action at a young, school age" (Queensland Government, Department of Education and the Arts, n.d.).

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Conclusion

The Australian Library and Information Association and the Australian School Library Association's Statement on school libraries and information and communication technologies (2009) states that: "A key focus of school libraries is to ensure equitable access for all school community members to engage in the world of technology-enhanced information environments". Equitable access for girls, however, requires a definition which is not usually given in IT policies. Although the problem of physical access/equity has been largely solved in most Australian communities we should never forget the necessity of addressing the complex and interrelated issues which result in older girls' avoidance of pursuing IT careers.

These issues will not be resolved by a single approach or by a range of "unsystematic strategies in isolated locations" (Lane, 2005, p. 17). The Federal Government's initiative to provide computer access to all school children is just the first step along a journey which involves not only curriculum and pedagogical reform at all levels but also a change in the way society views the relationship between girls and IT and the value it attaches to the contribution women can make to our society by taking up a career in professional IT.

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