Increasing female participation in ICTs

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Abstract:

The low level of participation by females in ICT education, training and employment has been a concern for female ICT teachers and others for many years. This paper will describe a range of strategies which are currently being used to promote ICTs as a worthwhile future for female school students. These intervention strategies call for long term support beyond individual classroom teachers or schools. A range of partnerships and a transformation of the culture and perceptions of those who work in the ICT field can assist in increasing the female participation in ICTs.

Introduction

The disproportionate participation by females in information communication and technology (ICT) education, training and employment has been an issue for decades. In the last 10 years or so, the sand seems to have shifted with the tide in terms of females' attitudes towards and access to ICTs, and females now see authentic reasons for interacting with computers. Nevertheless the overall gender balance has not changed, and Newmarch, Taylor-Steele and Cumpston (2000) comment that we need to assist girls in "making the shift in perception" from using ICTs to considering ICT in their future education or career. The American Association of University Women Educational Foundation Commission on Technology, Gender and Teacher Education (2000) reveal that learning and working in the digital age means that all our "students must be trained to be literate citizens in a culture increasingly dependent on computers".

Education Queensland has recognized the need for equitable access and participation in ICT use for Girls and other groups. The implementation of the ICTs for Learning strategy, the Girls and ICTs Network and the Girls and ICTs community website invite students, teachers, industry representatives and members of the wider community to join their network and collaboratively "encourage more girls to consider studying and using ICTs". (Education Queensland, 2004) If you are interested in joining or reading more about this network this network go to:
http://education.qld.gov.au/itt/learning/explore/girlsicts.html.

The American Association of University Women Educational Foundation Commission on Technology, Gender and Teacher Education (2000), Dorman (1998), Farmer (1998), Meredyth, Russell, Blackwood, Thomas and Wise (1999) and many others report on how girls and boys interact differently with ICTs. Table 1 below indicates some of these differences.

Table 1: Gender differences in ICT use

Girls:	Boys:
• see immediate advantages to word processing, expression and creativity	• prefer games and entertainment that build on competition and contest
• dislike step by step learning of programs	• find the machine and its workings as interesting as its uses
• see ICTs as a medium to connect and converse	• see ICTs as a source of power and control
• are more likely to use computers at school than home	• are more likely to use computers at home
• use ICTs to solve real–life problems	• are more likely to take risks
• worry about ICTs' effect on nature	• see ICTs as a force to conquer nature
• have few role models on TV, in software and in real life	• are more likely to fix computers
• see ICTs as a means to an end	• see ICTs as an end
• ask "What can ICTs do?"	• ask "What can ICTs do for me?"
• prefer high skill	• enjoy high kill

In addition to the differences indicated above, there appears to be a distinction between the male and female student ICT self talk. Farmer (1998) observes that when working with a computer that is not functioning boys can be heard exclaim, "The computer is broken", whereas girls are more likely to comment, "I think I broke the machine." Although this difference in the use of language is subtle, it does have an effect on the students' self confidence and attitudes towards computers. Farmer (1998) also asserts that this disparity of language occurs with positive uses of computing where boys may declare "See how great I am!" and girls might remark, "Computers are great--I'm lucky".

Gorriz and Medina (2000) go much farther in their argument. They suggest that the significant under-representation of women in the computing field may be a direct result of the early experiences that girls have with computer games. The games for the most part have a gender bias towards males and hence the girls have a negative initial experience which impacts on their ICT attitude in the long term. In 1998 Dorman suggested that "80% of entertainment and learning software was purchased by boys for boys". A scan of clientele in most of the local computing shops or computing sections in department stores would indicate that not much has changed today. On the other hand, Mattel and others have made inroads to 'pink' interactive software and web sites that are more likely to capture the attention of young girls.

We must remember that computers themselves are non-judgemental. They will behave the same irrespective of the users' race, economic status, IQ or gender. However,

Dorman (1998) explains that "the ways we use them can often reinforce gender bias. Parents and teachers should be sensitive to these cultural biases and strive to expose both girls and boys to the advantages of ICTs".

Newmarch, Taylor-Steele and Cumpston (2000) identify four key barriers to increasing the participation by females in the ICT industry. These are: a lack of girls studying ICT courses at the tertiary level; sex role stereotyping; the image of the industry; and the impact of how ICT subjects are taught in schools.

What are the attempts to address this inequity?

An examination of the contemporary research indicates that an array of models is being trialled in an attempt to increase the number of females participating in ICTs in education, training and employment. This section reveals a range of strategies which are for the most part affirmative action models based in schools.

Teachers: The American Association of University Women Educational Foundation Commission on Technology, Gender and Teacher Education (2000) remarks that we should "prepare tech-savvy teachers". These teachers would be "sensitive to integrating gender-equitable computer use into classroom activities" (Green, 2003). Dorman (1998) mentions that teachers need to ensure that "girls play an equal role and have equal time in the classroom with ICT". Lanius (2001) suggests that teachers make a conscious effort to encourage girls in ICT activities. This can be promoted by making them lab assistants or software experts and calling on girls more often, even if they don't volunteer. The female teachers need to move beyond 'talking the talk' and to be seen to be actively 'walking the walk'. Newmarch, Taylor-Steele and Cumpston (2000) report that this modelling of "non-technophobic behavior" and the introduction to a variety of ICT uses can have a significant effect on the confidence of girls' use of ICTs.

ICT pedagogy: Newmarch, Taylor-Steele and Cumpston (2000) also suggest that the way that ICT is "taught in schools is a major barrier". Numerous female students find ICT subjects at school uninspiring, especially when they are delivered as 'how to learn software' which will often be obsolete within a short number of years. For most girls "pressing buttons successfully isn't enough" (Newmarch, Taylor-Steele and Cumpston, 2000). They need to become proficient and effective ICT users with skills to enable them to work with updated or new products without fear. Dorman (1998) suggests that we should be aiming to "teach girls how to creatively function within the new technology world". The involvement of girls in ICTs from an early age will assist them in moving to use ICTs beyond the location and presentation of information and look towards how ICTs can be "synthesize it into their lives and academic needs" (Dorman, 1998). Green (2003) asserts that classrooms which have effective use of ICTs "use…a variety of ICT tools, selecting what works best to meet the needs of the learner and the pedagogical objectives".

Integration: ICT integration across the curriculum should encourage risk taking and exploration of authentic or relevant ICT activities. Many teachers can be overwhelmed by the ICT presentation of work without noting the academic quality of the work and yet others give no credit for design and technical aspects of student work. Scott (1996) indicates that the ICT integration should "make explicit to students the connections between ICT subject content and the world of work". In Queensland and elsewhere there are a number of curriculum projects and models which promote ICT integration in an attempt to teach ICTs in a more interdisciplinary way. Gender and ICT curriculum projects are also very important. We should also remember to address online sexual harassment, staying safe online and e-bullying as part of the curriculum. Activities related to shopping online, chat and creating girls' magazines help keep many girls' interest in ICTs, just as games help keep many boys interested.

Single sex classes or areas: Zehr (1998) advocates that schools consider single sex computing classes. Farmer (1998) suggests timetabling of computer access for girls-only periods or creating a corner designated girls only, decorated by the girls with a territorial sign. Others advocate 'girls first' computer time.

ICT qualities and careers: The American Association of University Women Educational Foundation Commission on Technology, Gender and Teacher Education (2000) comments that the current and future use of ICTs in all vocations and professions is becoming increasingly prevalent. Therefore we need to educate students about the role of technology and in the working environment. ICT careers increasingly draw on variety, communication and other 'people' or 'soft' skills. These characteristics in the workplace appeal to females and we should encourage girls to see them as having characteristics which add value to positions or careers in the ICT industry. Commentary by Newmarch, Taylor-Steele and Cumpston (2000) on the myth and reality of working with ICTs reveals that "Women already working in IT find that they spend little time actually at their computer and much more time working in teams, directing, managing and interacting with clients". They reveal that parents are often "ill-equipped to advise students on what careers in ICTs really involve" because of lack of personal knowledge. Information about what is expected in an ICT workplace should be provided to parents, teachers and students.

Change the public face of computing: Make the public face of computing correspond to the reality rather than the stereotype. When considering the ICT industry, girls tend to imagine a nerdy male who lacks social skills. This portrait is preserved in images from popular culture where movies, advertisements, etc. show computer experts working in a typically male dominated, antisocial and deskbound world. The alternative image is of hackers, quirky loners or 'geeky' high school students. These images all reinforce females' beliefs that ICT careers are dull and have little human interaction. We need a range of ways to provide information for students about the world of work which challenges stereotyped perceptions of suitable careers and jobs for women in the area of ICT. Newmarch, Taylor-Steels and Cumpston (2000) notes that the "reality of ICT careers is actually quite different to the perception because employers place emphasis on teamwork and communication skills", which is what most females students want in their

career. The current image is a major problem and is discouraging females from joining the field. This image may be overcome by having female students enter into work experience in the computer industry at an early age.

Role models: In addition to mentoring, girls require a number of ICTs using female role models.   The direct and indirect contact with positive ICT role models will assist in dispelling inaccurate images of computers and ICT careers. Dorman (1998) reveals that "Exposing children to successful women in technology can provide inspiration and role models for young women". Currently it is difficult to access appropriate female role models in their homes, educational environments or popular culture. Role models are required for girls to see that they "can become *technology* experts without losing their femininity" (Farmer, 1998). These role models may be local (real life), virtual (real life but not local) or within the media.   Newmarch, Taylor-Steele and Cumpston (2000) have noted that senior students find parents and role models to be the "most influential factors over career choices". This compels us to ensure that information is available for parents and that we select role models carefully.

Mentor: Wood (2000) supports the idea that we start from an early age and that female mentors for girls of all ages will go a long way to disproving the traditional image of ICT professionals. These female mentors could be from the home, industry, business and education or students from upper secondary or tertiary educational environments. Alternatively peer mentoring programs can be established to enable students with more advanced skills to assist the development of these skills in others.

Computer ownership: It stands to reason that computer ownership will have an effect on the attitude of the computer user whether male or female. Increased access leads to increased skills. Milone and Salpeter (1996) found that experience with computers has a greater effect on student attitudes towards computing than gender differences. Girls of all ages can be involved in building or fixing their own computer. Whether at home or school, it takes only a screwdriver and some spare parts to reveal that tinkering with technology is not only for boys.

Parental leadership: Use parents as partners in the fight against the gender divide. Unconsciously parents may be more supportive of boys' than of girls' computer use. Dorman (1998) suggests that "parents should encourage both daughters and sons to use computers and interact with them regarding their computer use at home and at school". Placing the home computer in a centralised location and giving girls equal access to that of their brothers is as important as access at school.

Leadership of others: Begin a discussion on equity with all of the educational stakeholders. "A more equitable and inclusive computer culture depends on consciousness-raising within schools. Schools and education districts should put in place "institutional mechanisms that will facilitate such conversations in partnership with parents, community leaders, and representatives from the computer and software industry" (American Association of University Women Educational Foundation Commission on Technology, Gender and Teacher Education, 2000).

Girls only ICT clubs and activities: Lanius (2001) reminds us that "girls like to join clubs and take classes with their friends. A lone girl, who likes computers, is unlikely to join a computer club by herself". This requires club facilitators and teachers to "invite girls to join clubs or classes as a group". Arranging girls only nights and/or mothers nights will assist in developing females' confidence in using ICT amongst other females. In addition, girls can be encouraged to participate in extra curricular ICT activities before, during and after school or on weekends and holidays.

Conclusion

Given this range of strategies, there are two key questions to consider: Do these strategies improve the attitudes of females towards ICTs? And in the long term do they promote the increased participation of females in ICT related education, training and employment?

It is unlikely that the unsystematic strategies currently in use in isolated locations are adequate to effect the major changes required in the ICT culture of schools, tertiary institutions, workplaces and society. The practices and perceptions of girls, educators and people in the ICT field require a long term and committed investment in terms of curriculum planning, pedagogical reform, ICT access and ICT use. Lesley Clark (2003) explains that:

> there needs to be a more co-coordinated effort based on a common vision and commitment to specific objectives that leads to a change in policy and practice in order to bring about an increase in the participation and retention of women in science, engineering and technology careers.

Given that girls form many beliefs about themselves and what they are good at in early primary school and that the major barriers to students contemplating an ICT career are set in late primary/lower secondary schools, girls need opportunities to interact with ICTs in substantial ways (Newmarch, Taylor-Steele & Cumpston, 2000). A continuing focus on ICT through their schooling years is extremely important, together with strategies that include parents and communities who influence the girls' attitudes. To increase participation, Newmarch, Taylor-Steele and Cumpston also indicate that some of the key items which require addressing are: "a focus on the school years, making the shift in perception, whole-of school approach to teacher training and curriculum, strategies to improve the images girls have of the industry and continued government support" .

Farmer (1998) considers that "melding of 'high-tech' and 'high touch' provides a powerful base for gender equity and self-confidence". The 'soft skills' or attributes that females can bring to an ICT environment are characteristics required by the field, especially if it is going to lose its 'geek factor' stereotype and increase the proportion of females in the ICT field.

Many Girls in ICT projects use female ICT uses as role models, guest speakers, mentors etc to assist with demystifying the role if ICTs in education, training and employment in addition to promoting a different face of computer users. Systemic educational support

such as that provided in the Girls in ICTs Framework for Action (Education Queensland, 2005) and support from industry will assist in increasing awareness of the girls involved in these projects. But will it be enough to challenge the conceptions, roles and beliefs of the wider community and sustain a long term reduction of the gender divide?

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