Showing girls IT’s amazing

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Showing girls IT’s amazing

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Abstract
The importance of encouraging students, especially females, into the ICT field cannot be understated. Throughout Queensland and Australia, mentoring programs and other initiatives have been instigated in order to encourage girls into ICT study paths and careers. Three initiatives targeting different groups of female primary and high school students in various ways have been described in this article. All of these initiatives have provided optimistic results in the interim in terms of promoting positive ICT attitudes and/or encouraging females into ICT careers and study paths.

Keywords
Education, role models, mentoring, hands-on activities, school, students, girls and ICT

INTRODUCTION
It is a sad situation when an innovative country such as Australia faces the problem of declining enrolments in Information and Communication Technology (ICT). The future of this problem points to critical shortages in qualified ICT professionals as the demand for ICT professionals rises and the education sector is unable to keep up with the demand. This incongruity has the potential to have a significant impact on the ‘Smart State’ concept by stifling the knowledge and information economies. The problem of declining female ICT enrolments is especially dire, as female participation is waning at a steeper rate than that of males. Investigation into the declining number of females entering ICT study and career paths has been underway for over two decades, yet we seem to be no closer to solving this conundrum than we were twenty years ago (Clayton, 2006).

Previous studies have investigated various points of view and factors that may influence female ICT career decisions. Some of the factors identified include: culture and socialisation issues; poor quality ICT career information and vague ICT career expectations; stereotypes; pedagogical and curriculum issues; and the need for appropriate and visible ICT role models. Another factor that complicates this problem is that the society that the students live in and the ICT industry are constantly evolving. If you add to this capricious mixture, the changing and individual needs of the students, the problem becomes increasingly complex. A number of these studies have made recommendations for change, some of which have been implemented in various initiatives, but it has been recognised that there is no one size fits all strategy (Cohoon and Aspray, 2006). Throughout Queensland and Australia, a large number of mentoring programs and other initiatives have been instigated in order to encourage students, especially females, into ICT study paths and careers. Three of these initiatives created and implemented in Brisbane are described in this article.

THE CURRENT SITUATION
The current cohort of Australian school students are in general technologically savvy and most, if not all, have had ICT integrated into their schooling since preschool. These students have been described as digital natives; they are ‘native speakers’ of digital language (Prensky, 2001) and many do not know of a world without ICT. However, the widespread adoption and acceptance of ICT into the everyday life of these students has apparently not translated into a desire to create new technologies and be involved in ICT educational and career paths. Females make up an equal component of the population (Queensland Government, 2004) and the number of women enrolling in tertiary institutions is increasing. Yet, less than twenty percent of ICT enrolments are female and this percentage is diminishing (Thorp, 2003). Should the trend of falling tertiary ICT program enrolments continue the ICT industry is facing a chronic shortage of qualified workers in the coming years. The ICT industry requires access to a sizeable workforce to fulfil its needs and this is only possible if an increased number of women join the available pool of ICT workers. It is also desirable to have designers coming from diverse gender and ethnic backgrounds, as this will improve universal usability by enhancing creativity and production through a rich mix of perspectives and ideas (Schneiderman, 2000).
One of the major inhibitors to increasing the uptake of ICT in education or as an occupation is the widespread stereotyping of the characteristics of people involved in the ICT industry. The ICT field is beset with negative stereotypes, some of which are justified, while others are grossly incorrect. ICT is commonly thought to be boring and ‘geeky’ (Countryman et al., 2002; Joshi and Kuhn, 2001; Multimedia Victoria, 2001; Myers and Beise, 2001; Newmarch et al., 2000; Standley and Stroombergen, 2001) while ICT professionals are simply seen as programmers who work long hours in social isolation (Cuny and Aspray, 2000; Harrelson, 1999; Jewell and Maltby, 2001; Miller et al., 2000; Multimedia Victoria, 2001; Myers and Beise, 2001; Nielsen et al., 2001; Teague, 2002; Young, 2002). In fact, most of the stereotypes related to ICT (Gürer and Camp, 2002) and reinforced by the media are unattractive (Multimedia Victoria, 2001). An example of how the media is continuing to support negative ICT stereotypes is the 2006 sitcom, The IT Crowd, which currently has air time on the Australian free-to-air television network. According to Multimedia-Victoria (2001) these stereotypes are able to continue merely because of the absence of alternative and more positive stereotypes. A major aim of the initiatives described in this article is to debunk these commonly held stereotypes and replace these perceptions with factual descriptions of the true nature of being involved in ICT through the use of role models.

Role models are one of the most powerful factors influencing career choices of secondary school students (Gürer and Camp, 2002; Newmarch et al., 2000). This is reiterated by Eccles (1994) who found that educational and vocational decisions are influenced by role models such as teachers, parents and peers. Teachers are a particularly important role model for students (Downes, 2004). They need to inspire and engage students who look up to them by showing that they are capable and enjoy using ICT. Dryler (1998) also established that many girls gather career knowledge from family members who act as female role models in a variety of professions. However, few girls know of any female ICT professionals who could act as role models. The lack of family members who can act as female ICT role models is especially important considering that young people often model their own behaviour on their same-sex parent (Moorman and Johnson, 2003). The events described in this paper encourage the attendance of teachers and parents provide them with information about the nature of ICT and ICT careers. Student perceptions and attitudes towards ICT are as also affected by the views of friends or peers (Margolis and Fisher, 2002). These friends and peers play a role in student course decisions and according to Margolis and Fisher (2002, p. 115), “...some of the best recruiters of girls [in ICTs] are other girls.” By providing the girls who attend these events the opportunity to try out hands-on activities, the expectation is that these girls could go back to their school and share their positive experiences with classmates, as well as their siblings.

It is recognised that secondary school is one of the key places where barriers to ICT careers are established (Chan et al., 2000). Most importantly, according to de Raadt, (2004) secondary school students need assurance that the outcome of their tertiary studies will result in a well paid, respected position. However, these students generally fail to recognise the full scope of ICT careers and the way that ICT could fulfil their career goals (Young, 2003). One of the problems is that students are receiving inadequate information about ICT subjects and career options and there is a need for more appropriate and available vocational advice (Van Der Vyver et al., 2004). They also exhibit limited understanding of the nature of established ICT job roles and areas of specialisation (von Hellens et al., 2004), not to mention nascent opportunities, and therefore cannot comprehend how their talents and skills apply (Jepson and Peri, 2002). This is an increasing problem, as new technologies are being developed which in turn create new and unusual vocational opportunities. However, describing the ICT area, including job roles and specialisations, is a non trivial exercise, even for experts in the area (Spencer, 2003). The initiatives described below recognise the importance of exposing both students and teachers to real life situations where they have the opportunity to speak with industry professionals and see the workplace and opportunities that are available first hand.

Three initiatives which attempt to remove stereotypes and give good ICT study and career information through the use of role models, hands on activities and industry visits are described in the next section. The first initiative ran in 2004, the second is still in progress in 2006 and the third is an annual event which has been running since 2003.

GET SET

In 2002, Griffith University sought and obtained funding from the Queensland Government to deliver a schools-based mentoring pilot program in an attempt to redress the significant gender imbalance confronting the Science and ICT disciplines. The program, which ran in 2004, recognised that early intervention is required to inform and attract female high school students into senior secondary and tertiary Science and ICT studies. Two government run schools from vastly different demographics, each close to a Griffith University campus, were chosen to take part in the pilot study.

The students belonging to the first school came from a diverse range of socio-economic, cultural and ethnic backgrounds. It is a large school (1600 students) with a reputation for academic, performing arts and sporting success. Many of the students from this school already have family members who can act as professional role...
models. One Year 10 Science class of 26 students (23 female) from this school was chosen to participate in the pilot study. Throughout the year, several female students left the class, whilst others joined. Other female Year 10 students were to participate in the ICT strand of the program, but access to these girls was restricted. Instead, Year 11 and 12 female ICT students were invited to take part as an alternative strategy.

The second, smaller school (700 students), also catering to students in the Year 8-12 range, is situated in a low socio-economic area with high unemployment and various other social problems. Students enter this school from forty-two feeder schools and it has a very transient population. The school is very proactive in implementing programs and initiatives to encourage the students to become productive members of society. These include trade apprenticeships and traineeships, distance education and community courses. It also has a very large special education unit assisting students with physical, intellectual and learning disabilities. Far fewer students at this school have family members who can provide professional role models and some students reportedly come from third generation unemployed families. Eleven high achieving female students from this school were chosen to participate in the program, which included ICT and Science components, during inter-school sport time.

In order to stimulate motivation and enthusiasm to be involved in Science and ICT in the future, the program was structured to offer the students at both schools an opportunity to visit the Science and ICT facilities at various Griffith University campuses and speak to academics and university students. The invitation to visit the facilities was extended to other female Year 10 students at the schools, but the number of students who could attend was limited because of transportation and other resources available. Fourteen current and graduate Science, IT and Science/IT dual degree students were recruited to support the program. These women used Short Message Service (SMS) and Instant Messaging (IM) to supplement personal meetings with the students, and supported various Science and ICT activities designed to tantalise the younger students. Activities included creation and experimentation with lasers made with electronic kits, water quality testing and web page development. The mentors also accompanied the students on several industry visits to a large multi-national IT firm and biomedical and pharmaceutical companies. Surprisingly, the students appeared to prefer mature aged mentors as “it shows us how they turn out and those that have been in the career for a while, what path that they have taken.”

Several issues created problems throughout the program. Firstly, access to students was restricted at one school because of lack of support from school staff and difficulties with organisational procedures. The second school was much more supportive of initiatives and opportunities provided to them and provided a large amount of school support. A teacher from the first school who refused the opportunity for the students to attend industry visits said that it was just “too hard”. It was found that the process to allow students to be excused from normal school classes and arranging for students to be involved in field trip activities, on top of obtaining the parental permission, is very time consuming at a school level. It is much easier to arrange school visits; however, the students do not receive the same experiences and workplace exposure as they would during field trips. Consequently, there must be a project champion with status and power at the school who is able and willing to surmount bureaucratic difficulties. The second issue related to the cost of taking students on field trips. It is quite difficult and costly to arrange transportation of large groups of students to off campus locations. Providing transportation can cost upwards of $10 per person and when this is added to the cost of replacing the accompanying teachers, it can be an expensive operation, especially if multiple field trips are necessary. Thirdly, reliable communication with the teachers at the first school was difficult. Some teachers did not regularly check their email accounts and it was difficult ensuring that phone messages were passed on to the relevant teachers. The teachers at the second school provided multiple methods of reliable communication. Finally, while the numbers of females entering Science and ICT fields continues to decrease, high achieving students are increasingly called upon to participate as mentors in initiatives such as Get SET. They give generous amounts of their valuable time to assist with these initiatives and care must be taken that these women do not burn out and that the time sacrificed out of their busy study or work schedules is not undervalued.

As a result of this initiative, the participating students at both schools were generally encouraged to study Science and/or ICT subjects in their senior high school studies. At the first school, of the final 22 Science students participating in the project, 12 students intended to take at least one Science subject in Year 11. Of the 11 Year 10 students who participated at the second school, all of these students intended to take at least one Science and/or ICT subject in Year 11. The mentors also believed that they gained out of the program by developing employment networks and contacts through the visits to industry partners. Some of these mentors also received early notification about graduate positions available with these industry partners and expressed intent to apply for these positions. One of the mentors also enrolled in a graduate diploma of education when she completed her PhD qualification. This diploma will enable her to teach Science subjects at secondary schools and she stated that being it was her involvement in the Get SET project that had encouraged her along this career path. The teachers who attended the industry visits claimed that they gained valuable career knowledge and insights about working in the Science or ICT fields and visiting the university refreshed their knowledge of university life that may be passed onto students.
Parents and family members who attended a final joint event also provided very positive feedback regarding the participation and work that the students undertook. The second school also reported receiving enquiries about future programs from the parents of female Year 10 students commencing in 2005. The students at the second school spoke about parental support for their participation in the program: “my parents have been really encouraging” and “it seems like they are really proud of me.” A student from the first school also said: “I think it made me more fond of Science … I think I would like to study Physics next year … we hadn’t really done much hands-on type of thing, so it made it real. It opened our minds to other things.” The students also appreciated the mentors contributions saying that the mentors “were really inspiring and showed us we can achieve [in Science and ICT]” while another said “I would even continue this after I finish high school. I’ll do it in my own time … I want to be the next mentor.”

GIRLS BUILD IT

The Australian government has recognised the problem of the declining interest of Australia’s youth in Science, Mathematics and Technology areas. They have provided 33.7 million dollars of funding of to run the ASISTM (Australian School Innovation in Science, Technology and Mathematics) program over seven years (DEST, n.d.). Funding of between $20000 to $120000 is available for individual projects through this program. These school based projects involve universities, industry, business or teacher organisation partners and/or school clusters working together to increase student interest in Science, Technology and Mathematics and encourage students to consider career paths in these areas. Funding was obtained by Holland Park State High School in Brisbane to run a project over 18 months specifically targeted at girls to increase their confidence in technology and encourage them into ICT career pathways.

Three primary schools from the Freeway Schools Coalition joined Holland Park State High School to participate in the program. Eight Year 8 girls from Holland Park State High School and eight Year 6 girls each from Junction Park State School, Marshall Road State School and Wellers Hill State School were chosen to take part. To be selected, the girls first expressed interest to their teacher and the final attendees were chosen from this group. The 32 students were then split into two groups of sixteen, groups A and B. Before the girls began their hands on activities, the teachers attended a confidence building training session where they familiarised themselves with computer hardware and terminology to allow them to provide support to the girls. Both of the student groups attended five full day sessions. The girls were split into pairs to take apart and rebuild an old computer, build their own computer from scratch, install the operating system and required drivers and test that the computer was working properly. The girls tackled the task with enthusiasm and the teachers supported the students throughout the process. After completion, the girls took the computers back to their school for use in the classrooms or library. The girls took great delight in claiming ownership and naming the computers individually.

On the final day the girls also learned how to make network cables. While some good natured frustration was expressed when trying to arrange the wires in the correct order and crimp the ends of the cable, this exercise was generally enjoyed and the girls seemed to take great pleasure when the cable was completed and it tested as being correctly wired.

On the final day of the hands-on building activities, one girl was dropped off by her mother rather than arriving with the others in her school group. The mother confided in one of the teachers that at first she was worried about her daughter missing so many of her scheduled class days to attend the Girls Build IT project. However, the mother happily reported that since being involved in the project, her daughter’s confidence has significantly increased with not only technology, but also other areas in her life. Furthermore, it appeared that many of the teachers who attended with their students also gained valuable knowledge about computer hardware and installing computer software. These teachers appeared to be far more comfortable with building and troubleshooting computers by the end of the five day hands-on exercises and could take these skills and positive attitudes back to their schools. Programs such as Girls Build IT go a long way towards breaking down stereotypes and dispelling fears associated with tinkering with computer hardware and software.

Throughout the hands-on days, the girls completed worksheets and kept a journal to document and reflect on the learning process and experiences throughout the project. Instead of the originally planned industry visits, the organisers decided that it would be more beneficial for the students and teachers to attend the “Technology Can Take You Anywhere” event described in the following section. This allowed the girls to experience many hands on activities as well as be exposed to large numbers of female ICT role models and volunteers. An event to showcase and celebrate the successes achieved throughout the year was held in September 2006 and was attended by teachers, students and parents. It was very pleasing to witness the enthusiasm shown by the students and their parents at this event. The girls will also be encouraged to continue their ICT interest through a “Girl Tech Club”, chat rooms and to complete their Microsoft A+ technician certification. This project is still underway and is expected to finish at the end of the 2006 school year.
TECHNOLOGY CAN TAKE YOU ANYWHERE

Over the past four years, the Girls and ICT Brisbane local action committee have organised an annual event aimed at increasing the participation young women in the ICT field. The initiative commenced in 2003 when funding was obtained from the Queensland Government, the Association of Women Educators and Education Queensland to hold events across the state. The objective of these events was to engage girls, parents, teachers and guidance officers, build on existing successful Girls and ICT initiatives (e.g. GIDGITS) and foster links amongst local networks including industry groups. These networks include government departments, local educational and training institutions, universities, ICT associations, the Women in Technology group, IT organisations and individual participants. In the initial year, eight local action committees were formed throughout Queensland in Cairns, Townsville, Mt Isa, the Gold Coast, Toowoomba, Ipswich, the Sunshine Coast and Brisbane. Each of these eight committees was responsible for organising two events in their local region. The first event was for female students in Years 8, 9 and 10 and the second event was for teachers, parents and guidance officers.

The Brisbane committee organised their two events and held them at Cavendish Road State High School and they involved about 150 people. The first of the two events in 2003 was a breakfast function that parents, teachers and guidance officers were invited to attend. Information about ICT careers was shared at this event. During the second event a number of girls from Years 8, 9 and 10 from various schools were invited to attend an afternoon session. The students were split into groups of approximately ten and they sat together at tables with an assigned role model. The role model gave a five minute talk to the girls at their table about how ICT is used in their study or job, what they enjoy about ICT, how they became involved in it and what attracted them to it, what the most rewarding moment has been and what strengths females bring to the ICT area. After that the girls were able to ask the role models questions and after 15 minutes a bell was rung and the role models would rotate to the next table and speak to the next group of students. The students had the opportunity to speak to four different role models in the afternoon. During the event, multimedia software was also demonstrated to the students and they were given a sample bag including information about ICT, a trial version of the software as well as various promotional items. After an informal session that allowed the girls to mingle freely, afternoon tea was served and the girls left to return to their schools. One unexpected outcome of this event involved the Year 6 female students from a local primary school who assisted the organisers by acting as ushers during the event. These girls also appeared to benefit from the role models and left the event inspired and began their own computer club at their school.

In the second year an event was held at the University of Queensland in the evening. Parents, teachers, guidance officers and female students in Years 8, 9 and 10 from Brisbane, Ipswich and the surrounding areas where invited to attend. The event was limited to 300 participants because of facility restrictions. The participants enjoyed inspirational ICT role models who spoke about their involvement in the ICT area. During the second part of the evening, the students split away from the adults for individual programs. The students were divided into workshop groups where they enjoyed fun, hands-on ICT workshops including robotics, game development, biomedical and encryption workshops amongst others. The parents, teachers and guidance officers were given information about career and study opportunities for girls in ICT. An interesting outcome from this section was that a number of the adults asked how they could be involved in an ICT career. In an informal session at the end of the evening, the girls were able to mingle with role models and other attendees whilst enjoying supper before collecting a sample bag containing ICT information and other promotional items.

In 2005, the Brisbane local action committee joined with the Women in Technology (WIT) organisation, which had successfully run similar events in the past, to provide an all day event promoting ICT to girls at Griffith University. The event was rebranded to become the “Technology can take you Anywhere” event. Funding was provided by IBM and other sponsors to assist with the event where the anticipated attendance would be 750 girls in Years 7-10. However, due to an overwhelming response, approximately 1500 girls from South East Queensland attended, with especially strong attendance and interest expressed by the primary school students (Year 7). During the day, girls had access to role models and attended fun hands-on activities, workshops and presentations by volunteers from the Australian Federal Police, IBM, universities, and DNA Evidence to name a few. Some of the activities included dance studio, cryptography, robotics, DNA, animation, forensics and gadgets and gismos. Other activities included a break out session where the students could mingle with role models, speak to representatives of IT organisations and educational institutions, and have the opportunity to win prizes. Role models for the attendees included school students from Year 7 and beyond, university students and graduates as well as industry professionals who have entered the industry through various pathways. Students were again given a sample bag with promotional items and ICT career and study information. While it was encouraging to see so many students wanting to attend the event, many lessons were learned during this event including coordination of a large cohort of students of varying age and the type of activities that appeal and are appropriate to the varying age groups.
The 2006 event was held in late August at the Brisbane North Institute of TAFE (Technical and Further Education) college. It proved to be as positive as the ones held in previous years. As with the event in 2005, the Brisbane Girls and ICT committee again combined forces with WIT to organise the event with generous financial support from IBM and other sponsors. The lessons learnt from the previous events were implemented during the event this year. This year, the invitation to attend was also extended to the students in Year 6 and two streams of activities were held. The morning stream was for younger students in Years 6-9 whilst the second stream was for students in Years 10-12. The Year 6-9 stream had 3 strands running simultaneously. Each strand, which ran for 40 minutes, consisted of nine workshops, eight interactive presentations and two large group presentations. At the end of each 40 minute period, the students swapped between strands to allow each student to attend a workshop, an interactive presentation and a group presentation. In the middle of the day when the streams changed over, there was a joint presentation for all students to attend. The afternoon stream for the Years 10-12 students consisted of four strands of 40 minute duration. Each strand contained six workshops, five interactive presentations, three role model sessions and two pathway sessions. The students swapped after each 40 minute period to enable them to attend a workshop, an interactive presentation, a role model session and a pathway session. It was thought that this would provide the fairest spread of resources to all attendees. Strict limitations were enforced on the attendance numbers this year and more than 1000 girls attended. Rather than giving each girl a sample bag, the teachers were given a sample bag of resources to take back to their school. The committee recognised the need for more attention to be given to the evaluation of these events and this was made a priority for the current year’s activity. New evaluation forms were designed to cater for this, which focused on determining whether the event increased the attendees’ interest in ICT and ICT careers. A high level examination of the returned forms shows promising results. However, at the time of publication these forms are still being processed and further results are not yet available.

CONCLUSION

The importance of encouraging students, especially females, into the ICT field cannot be understated. Cohoon and Aspray (2006) also assert that we need to move forward by applying current knowledge, experimenting with programs and building on successes. Three initiatives targeting different groups of students in various ways have been described in this article. All of these initiatives have provided optimistic results in the interim in terms of promoting positive ICT attitudes and/or encouraging females into ICT careers and study paths. Furthermore, it should be remembered that positive changes from these initiatives may take years to transform into increased female ICT enrolments and involvement in the ICT industry. It is important that females participating in events such as these are followed up and monitored in the long term to determine whether these positive outlooks continue and whether further inroads to increased female ICT involvement are being made long term. It is extremely difficult, however, to access to student contact information to enable these follow ups due to privacy and confidentiality restrictions. Research conducted by Anderson et al. (2006) also confirms that despite the lack of formal and long term evaluation of special ICT events, these events do have a significant positive relationship with students’ plans to study ICT in the future. While it does not seem that the problem of under representation of females participating in ICT careers and study has been addressed, it may be that we are staunching the decline to some degree and the situation may well be significantly worse without special ICT programs and initiatives.

REFERENCES


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