Anita Borg Workshop for Primary School Girls

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Abstract

In 1999, Anita Borg visited the School of Computer Science and Engineering at the University of New South Wales, and conducted a workshop to encourage young girls to engage with science and technology. The workshop has since run every year, and had various additions and improvements. There are many positive results of the workshop, as well as future plans. The success of this workshop could be replicated by other groups throughout Australia.

Keywords

Primary school girls, science and technology, workshop

INTRODUCTION

The aim of this paper is to share our implementation and experiences of these workshops, which encourage primary school girls to engage with technology. The workshops have also been conducted as The Primary School Girls Workshop in Science and Technology. It has similar aims to the Go For It gURL strategy (Christie and Healy, 2004). It provides a tested formula that we have developed, and building on this success, we aim to provide inspiration for others to start their own workshops. The final outcome is to help increase the participation of women in the IT industry and in academia.

The first workshop was conducted in person by Dr Anita Borg during a visit to the University of New South Wales (UNSW) in 1999. Dr Borg was a brilliant academic and pioneer for women and their involvement with technology. She founded the Anita Borg Institute for Women and Technology (ABI, also known as IWT), whose aims are:

- to increase the impact of women on all aspects of technology,
- to increase the positive impact of technology on the world’s women.

The workshops fulfill both these aims. Firstly, it encourages girls to engage with technology, and to become future creators of new technology. Secondly, the workshops demonstrate to the girls the positive impact new technology can have on their lives, and the lives of those in their community.
Our first workshop was similar to those also run earlier by Dr Borg, and others, through the ABI (ABI, n.d.). One of these workshops was part of a larger project run in 1999 at Texas A&M University (Morgan and Martinez, 2000). From the initial workshop, academics and staff members from The School of Computer Science and Engineering (CSE) have made additions and improvements, and the result is the successful workshops that are still run four times a year.

The details of the workshops are described in the following sections, including the workshop participants, activities, location and frequency of the workshops. A description of the workshop results and an analysis of the workshop feedback then follows. After this is an overview of some problems encountered while running the workshops over the past eight years, as well as a description of our improvements and future plans.

THE WORKSHOP

Workshop Aims

The two main aims of the workshop are:

- to provide a valuable experience for the attendees,
- to provide tangible results or outcomes.

Through the positive feedback of the survey results shown in the Results Section, it is clear that the workshops do provide a valuable experience for the attendees. In addition, the outcomes of both the morning brainstorming session and the afternoon hands-on lab experience are tangible results; a design for a new piece of technology and a movie made by each pair of girls.

Workshop Participants

The girls who attend the workshop range in ages from 10 - 12 years old. This group was targeted as girls of this age are starting to think about their transition to high school, and are considering which subjects they would like to focus on in the future. Girls of this age have not yet formed their ideas of what to do later in life. It is therefore a good time to encourage the girls to consider science and technology as an important way to contribute within society.

A local school was invited to attend the first workshop, and the second workshop involved schools which had a connection with staff at the School of Computer Science and Engineering. The success of these initial workshops prompted us to issue invitations to schools through the Department of Education and Training’s network of public school computer co-ordinators. Places are allocated on a "first in, first served" basis and, with the growing success of the workshop, there is now a waiting list of schools that would like to participate.

Each workshop can accommodate around 40 girls, who generally come from two or more schools, or two or more classes from the one school. Although, for duty-of-care reasons, the girls are accompanied by teachers from their schools, the teachers are encouraged to leave the brainstorming session or, at most, be observers only. The advantage of the teachers’ absence is outlined in the section addressing Problems. The teachers accompany the girls on the campus tour and, during the afternoon, assist in supervising the girls during the technology task.

Workshop Facilitators

There are several people who work together on the day to make it a success. The workshop facilitator is responsible for overall co-ordination, and begins with an initial talk that introduces the girls to the aims and tasks of the day. Our workshop facilitator has always been a female academic from the School of Computer Science and Engineering.

There are also a number of group facilitators who direct a small group of girls through the morning exercise, as well as conducting the university tours and assisting during the afternoon session. The group facilitators have been a mix of undergraduate students, postgraduate students, department staff members and professionals from industry. All the facilitators have been female. The facilitators receive training before the workshop, by others who have been involved in previous workshops, and all facilitators complete relevant “Working With Children Check” declarations prior to their involvement.
Workshop Activities

The activities for the workshop run over about five hours, and correspond to the outcomes of the NSW Board of Studies Stage 3 Science and Technology curriculum, as shown in the Appendix. The day is divided into three parts, the morning session (including the RoboCup talk), a campus tour and the afternoon session.

The purpose of the morning session is for the girls to design a new piece of technology that can be used to solve a problem for someone in the community or to enhance their lives. The girls are guided, through the use of the Thinking Environment explained in the next section, to identify existing technology and to think about how it is made. They are then invited to improve existing technology or create something entirely new. These inventive and useful new ideas are then presented to their peers. The overall running sheet for the morning exercise is shown in the Appendix. The workshop facilitator takes a few of these ideas and discusses the skills that are needed to create such new technology, such as software engineers, electrical engineers, industrial designers and materials experts. Finally, each of the group facilitators explains their work or area of study to the girls. The focus of the morning session is to empower the girls into realising that girls can and do enjoy working with technology.

The campus tours are conducted after a short lunchtime. This emphasises to the girls the idea that a university is like a small town. The campus tours guide the girls through the university campus and include the library, the biggest lecture theatre, a computer lab, the post office, the bank branch and the food and stationary stores. The focus is on showing the girls that a university has a village atmosphere and is an exciting place to work or study.

The aim of the afternoon laboratory is to create something tangible and valuable using technology. The afternoon is comprised of two related parts. The first part is a brainstorming session about the processes and the people that are involved in making a movie. An academic guides the brainstorming session by creating a mind map, on a whiteboard, of the ideas that the girls contribute to the discussion. Afterwards the girls are given a chance to implement part of the movie-making process by using a computer to create their own movie. Video footage of their schools is available to them to combine into a movie sequence. Special effects, sound clips and rolling credits are added by the girls as part of the editing process. By the end of the session each pair of girls has made a movie that will be sent on to the school for distribution to the girls. These movies can be shown to their parents and friends, as a reminder of a fun day, and as confirmation that they are able to create something useful by using technology.

The Thinking Environment

All the exercises from the morning section use the Thinking Environment (Kline, 1999). The Thinking Environment is the framework to provide a place of structured discipline for the students. It ensures everyone has a chance to explain their ideas without being interrupted. In the Thinking Environment, each girl has a chance to voice her ideas while the others are looking at her and listening. This is done by defining a token as a thinking object; only the holder of the thinking object is allowed to speak, and everyone has a turn to hold the object. Often the thinking object is an interesting piece of technology, such as a transparent mouse or a stick of computer memory, which provides interest and is another opportunity to illustrate the impact of technology in their lives.

Workshop Location

The workshops are conducted at the School of Computer Science and Engineering building at The University of New South Wales. This enables the girls to be welcomed into an actual university environment, where there are students and staff working as part of their normal day. Another advantage is the close proximity to the computer hardware that is used during the afternoon laboratory exercise. The library tour is an important part of the day, which is easily included as the girls are already on campus.

Workshop Timing and Frequency

Each year there are four workshops; two in March and two in July. The workshops overlap the school term and the first week of university session. The main constraint is the use of the computing equipment, which is needed for use by the university students during the remainder of the session. Initially, one workshop was run in 1999. Due to increased demand and interest from schools, the workshops have been running four times a year since 2001.
RESULTS

The results of each workshop have been positive. Both of the workshop aims are accomplished. The girls are asked to give feedback at two specific points throughout the day. At the conclusion of the morning section, the girls are asked to say one word that describes their impression of the day so far. At the end of the day the girls fill out a two page survey that asks their opinions on each part of the day, and where they would like to see changes. The one word feedback from the girls helps to improve the positive recall of the workshop. The extended feedback survey is invaluable for monitoring success of the workshop, and for future improvements.

The results of three of the survey questions are outlined below, and include specific, useful and relevant feedback information. The data was taken over three years, from 2004 to 2006. Each group contains about 40 girls, however where questions were not answered no response is counted.

The first survey question is "Has your experience today made you more interested in a future career in science and technology?". The possible answers were "Yes", "No" and "I was already interested". The results are shown in Figure 1. Over the three year period the majority of the girls consistently agreed that the workshop has made them more interested in a science and technology career. This is a positive endorsement for the workshops, and indicates their value in encouraging future female participation in the Information Technology industry.

The second survey question is "How did you like the imovie computer lab?". The possible answers were "It was excellent", "I liked it", "I'm not sure", "I didn’t like it" and "It was awful". There were no responses in the last two categories, and the results are displayed in Figure 2. Again, the results were steady over the three year period, and show that all the girls either found the imovie task excellent or liked it. This is important since this is where the girls actively were engaging with technology, and enjoying it. Hopefully this will lead to a desire to undertake a career that engages with technology in the future.
The third survey question is "Was it interesting to meet women who are studying engineering and science?", and the possible answers were "Yes" (Y) or "No" (N). In each year, the girls responded with a majority "Yes" as shown in Figure 3. This indicates that the girls benefit from interaction with older role models, which may be an important means to encourage future female participation in the Information Technology industry. Another useful idea would be to enhance the links between schools and universities to encourage more opportunities for mentoring.

Another important outcome of the workshop is that girls are interested in using technology in their lives. All the girls are capable of using computer technology in the movie-making exercise. They realise that using existing technology can be creative, exciting and fun. In addition, they are able to create new technology in order to improve the lives of those in their society. These girls have the ability at this young age to become the creators of the technology of the future.

Specifically, one of the movies made at the workshop won a community film award, which culminated in the girls walking the red carpet in honour of their achievement. Another group of girls used the skills learnt during the workshop to create a video clip for a music sound track they had recorded. This occurred twelve months after the original workshop. These girls retained and extended the lessons learnt at the workshop and used technology to create an astoundingly good music video to make something meaningful for them.

These workshops also serve to improve community networks. The facilitators provide positive and real role models from whom the girls learn in a personal way. Professional women are also great models for students still at university. The success of these workshops is also a good example of university and industry collaboration to encourage more women and young girls to join the Information Technology industry in their working lives. It also provides a practical link for alumnae to stay involved with their place of tertiary study, as some of the professional women are graduates of CSE.

The workshops also teach the girls about professional working life in Australia. The girls learn that women are successfully using technology in their careers every day. A university degree in science and technology is also shown as an effective stepping stone from high school to women’s participation in the IT industry.

The workshops have proven to be a great success. There is currently a waiting list of schools that wish to participate. There are schools that have come back with a new group of girls each year for a number of years. Many student and professional leaders also return to participate in further workshops, even as alumni.

Finally, the girls write their comments about the day. Here are some quotes from the girls:

- “I thought boys only do science.”
- “Normally I only see men studying engineering and science.”
- “Usually men do all the engineering and women just design.”

This is true; most people working in science and technology careers are men. However change is possible, as other
girls have said:

- “Women today are big scientist[s] as well as men.”
- “… not only men can do everything, girls can too.”

**PROBLEMS**

There have been a number of problems encountered during the past eight years of running the workshops. Many of these have been solved by the improvements to the program, which are outlined in the next section. A few problems still remain, and devising solutions to these problems is a major part of our future plans, which are outlined in the Future Plans Section.

The initial workshops included the morning session only. The girls and teachers attending suggested that it was too short considering the transport time involved in travelling from the school to the university. We realised the need for extra related activities that could be run in the afternoon as well. In our first attempt to add the movie-making afternoon session we used the pre-packaged tutorial that was included in the software. The girls found this boring, though it was agreed that the concept itself was good. It was clear that further improvement was necessary, and our solution is outlined in the Improvements Section.

Another problem was transferring the girls from the classroom to the workshop setting. Discipline in a new situation, under the guidance of a computer science student without similar teaching experience was a challenge. Even using the Thinking Environment, some of the girls were loud and overwhelming, while others were more quiet and shy. After further collaborations with the teachers, we found that these personalities were similar to their behaviour in the classroom. We realised that we needed to create a more open and equal environment, where all the girls would contribute. We also found that where the teachers were involved in the morning group activities, the discussions were more inhibited. The goal then, was to create an environment quite different to that of the classroom.

The resources needed to run the workshops are limited. The computer lab that is used during the afternoon holds 20 computers, which restricts the number of students that can attend. There is also limited group facilitators to assist each workshop, and fewer group facilitators lead to larger group sizes during the morning and less assistance during the afternoon session. The computing facilities are used by tertiary students throughout the rest of the semester, which also restricts the number of workshops which can be run.

Finally, obtaining long term feedback is a difficult task. The girls that participated in the first workshop would have now completed their years at high school. Some of these girls may have enrolled at a university, or pursued an Information Technology career in another way, but there is no mechanism to reach these older students. The main problem is that the students leave their schools within a few years of the workshops, and enroll in a variety of high schools. Therefore while we maintain contact with the schools after the workshops, we rely on the schools to make contact with their previous students.

**IMPROVEMENTS**

Since the first workshop in 1999, we have been adding improvements based on both our new ideas and feedback from the primary students. These improvements include improved group dynamics, the university campus tour, using the computers to make a movie, inviting women from the Information Technology industry to be group facilitators and a short presentation on the RoboCup tournament.

**Morning Group Dynamics**

We have found that the workshops are more productive when conducted outside the normal school environment. The girls are encouraged to wear casual clothes instead of school uniforms. We usually have two or sometimes three schools together for each workshop. Teachers accompany the students throughout the day but, instead of being group facilitators, they are there as observers only. Maintaining the small group sizes of six to eight provides enough girls to generate good brainstorming ideas as well as be manageable for one group facilitator. Mixing different friendship groups and girls from each school together in the same group removes any established interaction patterns from school, and places the girls as equals.
University Campus Tour

The campus tour introduces the girls to the university. Many of the girls have never previously visited a university. The tour is an effective way of showing the girls how large the university is, and how many people come to work and to learn there everyday. The biggest attraction is always the 14-storey UNSW Library. The girls are walked through some of the floors and also travel to the very top to admire the Sydney City views. Most importantly, the vast array of books are shown as a great resource that the girls can learn from when studying at university.

Making a Movie

By including the movie-making laboratory, the girls have a tangible piece of technology to take home. This serves to reinforce the idea that they are capable of using technology and that it can be fun. It also shows the girls that using technology is easy, and that technology can improve their lives. This section is overwhelmingly rated as the best part of the day by most of the girls on their feedback forms, as seen in the Results Section.

Invite Professionals from Industry

Originally the group facilitators were undergraduate and postgraduate students, mostly from the engineering faculty. Now half of the group facilitators are women currently working in the IT industry. These women come from the Sydney office of Avaya Inc (n.d.), a global communication systems company. Avaya has also been a financial sponsor for the past two years. The inclusion of group facilitators from industry provides an added dimension to the role models for the girls. It illustrates that there are women studying science and technology at university, as well as women who are enjoying a variety of careers in the Information Technology industry.

RoboCup Talk

RoboCup Four-Legged league (n.d.) is an international competition that is run each year, using teams of AIBO robotic dogs. Students from CSE have been entering very successful teams in the competition for the past eight years, achieving three first and three second placings.

The RoboCup talk started as a demonstration of one of the AIBOs walking with the ball in front of the girls and kicking goals. It now includes some footage of the AIBOs playing a RoboCup game, as well as images from the camera inside the dog. The girls are excited to see a real artificial intelligence application in front of them. It’s inspiring for them to see a real robot dog in action, chasing the ball and kicking goals. It is also emphasised that the AIBOs were designed to be a pet substitute, to provide companionship for humans. Again this emphasises the importance of technology that is meaningful and beneficial to the community.

OUR FUTURE PLANS

We continue to try to improve the workshops, based on feedback from the girls, the teachers and the facilitators and there are still some planned future improvements. We would like to actively link this workshop with other initiatives designed to encourage school students to engage in using technology. The UNSW Programming Competition (n.d.) is an annual event where teams of high school students solve problems by writing computer programs. This would be a great next step from the workshops, and would boost the participation of females in this event, which has previously been male dominated. Follow-up visits to the schools to reinforce the message of the workshops would also be useful. A workshop designed for older high school students is another alternative, but will be harder to implement, given the pressures of HSC study at this level. Minimising the negative effects of peer pressure during this age also needs to be considered, in order to increase the interest in activities that may not necessarily be popular with friends and classmates.

CONCLUSION

The Anita Borg workshops for primary school girls have been a great success, bringing positive results for all involved. In the future, we hope to see further improvements, and other similar workshops conducted throughout
Australia. Finally, we hope to see greater participation of women in IT as a result of these workshops.

REFERENCES


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## APPENDIX

### Running sheet for morning brainstorming session

<table>
<thead>
<tr>
<th>Part</th>
<th>Mins</th>
<th>Start</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>10</td>
<td>10:00</td>
<td>The Thinking Environment</td>
</tr>
<tr>
<td>Small group set-up</td>
<td>10</td>
<td>10:10</td>
<td>Groups of 6–8, name tags, ice breaker.</td>
</tr>
<tr>
<td>Exercise in pairs</td>
<td>10</td>
<td>10:20</td>
<td>Each girl thinks/speaks for 1.5 mins with her thinking partner. (Q1 &amp; Q2)</td>
</tr>
<tr>
<td>Q1. Talk about something you are proud of or you have done well.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2. Talk about ways technology is being helpful to you and your community.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction to brainstorming</td>
<td>5</td>
<td>10:30</td>
<td>Emphasis the thinking environment. Pass the thinking object around the circle, each girl has a turn without being rushed. (Q3)</td>
</tr>
<tr>
<td>Q3. Name technology you find around your home.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building blocks</td>
<td>10</td>
<td>10:35</td>
<td>Explain how market products are produced: starting from the idea, progressing through development stages to the production of an industrial end product. Pick one item from the previous section (or have one prepared) and then lead the girls to discuss how it could be made.</td>
</tr>
<tr>
<td>Toilet break</td>
<td>5</td>
<td>10:45</td>
<td></td>
</tr>
<tr>
<td>Brainstorming new ideas</td>
<td>10</td>
<td>10:50</td>
<td>Group facilitator reminds the girls about aspects of their lives affected by technology (previous section) and asks how they could be improved. (Q4)</td>
</tr>
<tr>
<td>Q4. What new things should be invented, using new technology, to make your and the community’s life better?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise in pairs new ideas</td>
<td>10</td>
<td>11:00</td>
<td>Again with a thinking partner, each girl in turn discusses the idea she liked best. Between the two, decide on one idea.</td>
</tr>
<tr>
<td>The group’s idea</td>
<td>15</td>
<td>11:10</td>
<td>From the previous 5 ideas, the group facilitator helps choose one idea and a presenter (or presenters). The idea should be improved.</td>
</tr>
<tr>
<td>Reporting out</td>
<td>15</td>
<td>11:25</td>
<td>The presenter(s) has 2 mins. It should be stressed that the idea is the group’s, not an individual’s.</td>
</tr>
<tr>
<td>Wrapping up</td>
<td>20</td>
<td>11:40</td>
<td>Volunteers to the front, introduce themselves, give a short bio. Workshop facilitator leans on-the-spot brainstorming of one idea, link between career (Eng, CompSci) and innovation, brainstorming. Questions?</td>
</tr>
</tbody>
</table>
### Science and Technology Curriculum

<table>
<thead>
<tr>
<th>Strands and substrands</th>
<th>Stage 3 science and technology outcomes</th>
<th>Session</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Built Environments</strong></td>
<td>BES3.1 Creates and evaluates built environments, demonstrating consideration of sustainability and aesthetic, cultural, safety and functional issues.</td>
<td>Uni Tour</td>
<td>Discovers and evaluates the built environment of the university</td>
</tr>
<tr>
<td><strong>Information and Communication</strong></td>
<td>ICS3.2 Creates and evaluates information products and processes, demonstrating consideration of the type of media, form, audience and ethical issues.</td>
<td>Hands-on Session</td>
<td>Creates and evaluates movies and movie making process</td>
</tr>
<tr>
<td><strong>Physical Phenomena</strong></td>
<td>PPS3.4 Identifies and applies processes involved in manipulating, using and changing the form of energy.</td>
<td>Brainstorming</td>
<td>Identifies the need for manipulating, using and changing the form of energy for products</td>
</tr>
<tr>
<td><strong>Products and Services</strong></td>
<td>PSS3.5 Creates and evaluates products and services, demonstrating consideration of sustainability, aesthetic, cultural, safety and functional issues.</td>
<td>Brainstorming</td>
<td>Designs and evaluates products and services and their impact on the users</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hands-on Session</td>
<td>Creates and evaluates a movie about their own school</td>
</tr>
<tr>
<td><strong>Processes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Investigating</strong></td>
<td>INVS3.7 Conducts their own investigations and makes judgements based on the results of observing, questioning, planning, predicting, testing, collecting, recording and analysing data, and drawing conclusions.</td>
<td>Brainstorming</td>
<td>Makes judgements based on questioning, planning, predicting and drawing conclusions</td>
</tr>
<tr>
<td><strong>Designing and Making</strong></td>
<td>DMS3.8 Develops and resolves a design task by planning, implementing, managing and evaluating design processes. Brainstorming</td>
<td>Brainstorming</td>
<td>Develops the design of a new piece of technology by planning and evaluating design processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hands-on Session</td>
<td>Develops and resolves the design of a movie about their own school</td>
</tr>
<tr>
<td><strong>Using Technology</strong></td>
<td>UTS3.9 Evaluates, selects and uses a range of equipment, computer-based technology, materials and other resources to meet the requirements and constraints of investigation and design tasks.</td>
<td>Hands-on Session</td>
<td>Evaluates, selects and uses a range of computer-based tools to meet the design requirements of creating a movie</td>
</tr>
</tbody>
</table>

*Continued on next page...*
## Mapping of Board of Studies NSW science and technology stage 3 curriculum outcomes (BOS, 2006) to workshop activities

<table>
<thead>
<tr>
<th>Science and Technology Curriculum</th>
<th>Girls Workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Values and Attitudes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Strands and substrands</strong></td>
<td><strong>Stage 3 science and technology outcomes</strong></td>
</tr>
<tr>
<td><strong>VA1</strong> Demonstrates confidence in their own ability and a willingness to make and implement decisions when investigating, designing, making and using technology.</td>
<td>The Thinking Environment</td>
</tr>
<tr>
<td><strong>VA2</strong> Exhibits curiosity and responsiveness to scientific and technological ideas and evidence.</td>
<td>The Thinking Environment</td>
</tr>
<tr>
<td><strong>VA5</strong> Works cooperatively with others in groups on scientific and technological tasks and challenges.</td>
<td>Brainstorming</td>
</tr>
<tr>
<td><strong>VA6</strong> Shows informed commitment to improving the quality of society and the environment through science and technology activities.</td>
<td>Brainstorming</td>
</tr>
<tr>
<td><strong>VA7</strong> Appreciates contributions made by individuals, groups, cultures and communities to scientific and technological understanding.</td>
<td>Interaction with UNSW student facilitators</td>
</tr>
</tbody>
</table>