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'E-Textiles: There's the Bling of the Thing'

Review by
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CONFERENCE DETAILS
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Title: e-Textiles Workshop
Location: University of Canterbury, Aotearoa-New Zealand

REVIEW
Most young people in the Millennial Generation of the developed world are immersed in consuming digital technologies from birth. But the interconnectedness of everyday life is not being translated into a passion for STEM- science, technology, engineering and maths. And women are the largest under-represented and under recognised group in the STEM professions[1]. Similarly, there's no overwhelming empathy in this generation for pressing global issues of poverty, sustainability, overcrowding, political and social upheaval and to living more simply so we can simply live[2]. For Aotearoa-New Zealand polytechnics and universities, this attitude translates into a shortfall of able[3] students committed to creating technologies that will be the real tools for the rest of the 21st century; predicted to be a time of scarcity, restraint, and needing to be underpinned by fully functioning communities. Against this background, this author attends a special e-textiles workshop in Christchurch, South Island, to see STEM lights go on in Kiwi Millennial young women's eyes. In this workshop the lights quite literally do go on.

The room is quiet with a sense of anticipation. Christchurch and Canterbury girls from 12 to 15 years of age have gathered together at the University of Canterbury for a Friday night and Saturday workshop, on 10-11 May 2013, to work with textiles and computing.

Piles of brightly coloured felt, kits of Arduino Lilypad electronic components, Google pens, white sketch paper and hanks of embroidery thread festoon the front of the room. Engineering student Dan Scally pops in to see his mother Victoria, Head of Department in technology at Kaiapoi Borough School, with her colleague Fiona and student Aimee. He says- "I've had tutorials in this room many times, but it's never looked like this!"

The workshop has been three years in the making. Initiated by Professor Niki Davis, and organised by Professor Tim Bell, an international authority on demystifying Computer Science, it is based on the work of award winning Associate Professor Leah Buechley, director of the Hi-Low Tech Research Group at MIT's Media Lab.
E-textiles or electronic textiles are "computers that are soft, colourful, approachable and beautiful", (Amazon.com, 2014). Novices learn about computing and electronics through embedding computer and electronic parts into clothing, furnishings, and artefacts which they create.

The LilyPad Arduino toolkit has been developed over the last seven years as an alternative means to engage more diverse groups to create their own artefacts with e-textiles. Recent innovations include conductive paint, paper and printed fabric circuitry, with endless ways to help us "fall in love" with technology through our creativity.

This approach may provide innovative and diverse pathways into adopting STEM careers. In the very least, E-textiles can promote better understandings of ways that we can integrate our own crafted and programmed computer technologies into our everyday lives. We can perhaps make the shift from adopting and consuming, to innovating and adapting in a sustainable world.

ITTIP Institute's director, Dr Mano Talaiver, (Institute for Teaching Technology and Innovative Practices ITTIP, Longwood University, Virginia) instigated the workshop, which is based on Hernand (2008, January). An engineer by vocation, Mano is passionate about STEM, as recognised by her educational awards. Through a Hewlett Packard STEM catalyst award, Mano has conducted workshops in STEM Learning and 'Scratch', a visual programing language, in South Africa, Ghana, her native India, Australia, as well as Virginia. This Christchurch workshop is the only one in New Zealand.

Introducing themselves, the girls show a wide range of attitudes towards computers, from expertise in 'C' as a coder, to strong dislike, unless using social media. Paula Leach, an ITTIP STEM educator, listens carefully, in a warm, encouraging, and inspiring manner. Her role is to facilitate the workshop. We are about to combine technology and textiles to create or enhance our own personal products, using the package of electronics in front of us. We are going to be creators of digital artefacts, rather than users of computer apps. This difference in emphasis is significant.

Paula walks us through the process. First, we discover how to connect lights to the battery operated Lilypad Arduino Controller. Then we must design and sew our creation in a way that successfully connects the electronics. Finally we will code the way the lights will flash, and showcase what we have made to parents who visit us in the final session. We are shown examples from other workshops such as flashing T-shirts, Christmas hangings, nicknacks, and soft toys by Mano and Paula's husbands, who help in the background. We are launched into a world of circuits, pins, LED lights, conductive thread, and powerpacks. We are encouraged to pick up each

component, play with it, look at it, and understand it. There's no fear, embarrassment, or holding back. The young women engage, explore, ask questions, and give cheers of joy at making their circuitry power up their lights. They are miles ahead- can sew, know about serial and parallel circuits from science, and are already familiar with the mode of discovery learning from their middle school technology training.

The women technology teachers, from as far away as Picton[4], a five hour drive north, sit behind, launching themselves into their projects, having as much fun as the young women. What is making the difference is that everyone in the room has been grounded in technology as a process. Understanding the sequence of researching, planning through design, iterative testing and reframing and having a viable finished product has already been learned through the food, materials and textiles strands of the national Technology Curriculum. The creative process continues over pizza and through the next day. Battery power is sewn into our creations. Circuits are created with conductive thread and must be correctly linked to the battery pack and the controller, so that programing can take effect.

In the large computer suite, the teaching and learning conditions for programing are challenging, but not overwhelming. Not all the students feel comfortable locating their programing files, and nor do the technology teachers. Some avoid logging on and Facebook friends on Smart Phones. Quickly, the obstacles are managed. The screen size is enhanced. The young women are encouraged to come forward to follow the PowerPoint instructions. They surge forward on their computer chairs. Some teachers are still bewildered and hang back. Later, some ask for instructions in writing.
The magic that is programing unfolds into the logical steps that tell the LilyPad controller what to do. In this case, we are programing the exact order and duration of time that we want the LED lights to flash. These steps are prompted out loud by Paula, repeated by the young women, and then coded into the computer program template. Senior computing students from Professor Tim Bell's computer science programme move through the lab as facilitators. They are encouraging those mystified by their first time experience and praising those who surge ahead. The world of computing is beckoning us all strongly.

By the mid-afternoon, students and teachers have identified any design flaws. Shorts and low blinking lights are examined, fiddled with, circuits unpicked and resewn, and, in the main, problems are solved in discussion with the workshop facilitators. Coding is completed, saved, and uploaded, to be taken home on a flash drive for future projects. Teachers compose shots and video with digital cameras, consider the scaffolding needed to translate the teaching and learning into their school workplaces, and discuss how to get a supply of the electronic components to carry on this stimulating work. Team work and mutual support are very much in evidence.

Some young women have had their first taste of telling a computer what to do. Their efforts, creativity and persistence have been rewarded by having a portable artefact to take home. In the final showcase session, Paula encourages the participants, row by row, to display their work to parents, who have come to pick them up. Among the thirty or so creations, we are treated to a panda with blinking multi coloured eyes, a crying soft toy, K9 from Dr Who, a green teddy with flashing parts, a daisy with blinking petals, owls, a cow, lantern, and rainbow; a variety of colourful bags, from white, mauve, purple, flowered, neon, and flamed; a satchel with blue lights, a flashing bike seat cover, a black mask, and a creative laptop cover. The teachers

showcase a wall hanging of balloons held by a child, a mobile question mark, a mermaid, and a cute critter.

Mano and Paula, as the workshop STEM educators, are very impressed with the productivity and creativity, and hope that the workshop had sparked an interest in computing, from this initial taster experience. As Mano says-

"Everyone had worked so hard, and we were impressed, so impressed. The passion and commitment of New Zealand teachers was tremendous, and the support for their daughters from parents, wonderful and important."

In summary, the strength of this approach is that project-based, problem solving learning already underpins technology as part of the New Zealand national curriculum. Connected education excites the participants, as these concepts are embedded in the workshop. Feedback from the young women participants is generally very positive, especially those who were there by invitation, rather than accompanying a teacher as a daughter, or who want to keep a computer as a tool rather than something with which they can create. Teachers guide and learn themselves, according to their expanding skills set. Such professional development and resources are essential to integrate and ignite passion for STEM into every day teaching and learning across the curriculum in the compulsory education sector Years 1-13, especially for young women. Full themes from workshop feedback can be accessed as a Wordle file listed in the references.

Jessica, who is at high school, says- "I really enjoyed the experience of merging my textiles work with the programing. I had not done the programing aspect before. I have many ideas for applications of this new technology… e-textiles was so much fun. Before that I thought programing was boring (because I didn't understand it). If local merchants started stocking the equipment and supplies for e-textiles I would buy for my friends and teach them what I know."

Sarah, who is in Year 8, (Junior High School) says- "At school I had done some programing work but textiles was new to me. I never thought I would enjoy it so much. This course has opened up a whole new world for me."

Aimee, who is also in Year 8, says- "I am excited because it was my first time doing sewing and electronics mixed together and I was at University… I worked with different girls and made friends with them. The course let me experience different things - making and programing the circuit to make the LEDs work at different times which was new to me."

ENDNOTES

1. The Ministry of Business, Innovation and Employment, (MBIE), formerly the Department of Labour) has identified that New Zealand has low multifactor productivity relative to countries in the Organisation for Economic Co-operation and Development (OECD). The MBIE's use of Etzkowitz's (2000) in Leydesdorff (2012) "triple helix" model of a collaborative ecosystem with strategic partners, including the Ministry of Education and universities, is silent on the need to recruit women into STEM careers and does not identify polytechnics as part of that model (Ministry of Business, Science and Innovation, 2012, p 9).

2. Carroll and Shabana (2010) outline the business case for corporate social responsibility, which does not appear to underpin much of the global corporate decision making where profit appears to outweigh social responsibility. Examples such as tax evasion, child labour, unsafe working environments, and poor toxic waste management are linked to global IT corporate unethical business practice, and the undermining of human rights as IT technologies are created for profit based on infinite individual consumption.

3. The Ministry of Education's most recent analysis, 2002-2006, indicated an ongoing trend of falling uptake in IT degrees, which had fallen from being in the top ten fields of specialisation, with lesser uptake by women than men, Scott (2009). Since then, the statistical analysis of tertiary education has been devolved and is calculated and monitored at institutional level by each tertiary provider, on behalf of the Tertiary Education Commission, which funds tertiary education. Thus, granulated analysis by fields of specialisation is carried out internally and through performance reviews by departments, according to the qualifications offered. Annual reports do not specify student recruitment, retention and completion trends by area of specialisation.

4. Tricia Winter, HOD Technology, Queen Charlotte College, published her impressions of the workshop online, and is listed in the references.

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See the development and completion of Fiona's mermaid and Aimee's teddy, on Fiona's blog at

http://creativeruralgirl.blogspot.co.nz/ Retrieved 30 July 2013.