

QSITE Report for ACCE



Queensland Society for Information Technology in Education (QSITE)

The first semester of 2016 has been very busy for the various QSITE chapters, schools and organisations in Queensland. This section discusses how two different Queensland schools have approached the introduction of MakerSpaces within their schools, and then goes on to share a summary of the recent Queensland Digital Technologies Summit 2016: Initial Teacher Education.

Over the course of the last twelve months many suggestions have been put forward on ways to enact the new technologies curriculum in Australia with a focus on digital technologies; not the least of these has been MakerSpaces. A MakerSpace is space where people gather to share resources and knowledge, and build or make things. The location may provide the materials, tools and space for collaboration with others. MakerSpaces are defined and enacted in various ways both in the community and within schools. Some school examples include:

- A teacher or librarian supervising library games at lunchtime;
- Library construction activities involving commercially available construction kits such as Lego or K-Nexs;
- A teacher supervising coding clubs or tinkering as a lunch or afterschool activity;
- A classroom teacher having a 'construction Makerspace' in their classroom;
- Gifted and Talented small group sessions some with withdrawal time from class supervised by Teacher or enthused other;
- Art and craft activity sessions after school with parent or artist instructor; and
- Using regular class time sometimes as a non-contact relief for primary classroom teachers.

Two schools within the Toowoomba QSITE chapter, successfully applied to be one of 14 state schools in the Makerspace Trial organised by the Department of Education and Training's Learning Technologies Dream Factory (<http://www.education.qld.gov.au/smartclassrooms/working-digitally/dream-factory.html>). The objectives of the trial were to provide opportunities for 21st century skill development by assisting schools wanting to implement a makerspace and evaluate the efficacy of MakerSpaces to develop teacher and students' Science, Technology, Engineering, and Maths (STEM) related skills.

Harristown State High School in Toowoomba, Queensland, were provided with a makerspace kit consisting of:

- Intel Galileo computing boards and sensors (such as temperature and light sensors; <http://www.intel.com/content/www/us/en/embedded/products/galileo/galileo-overview.html>);
- Oculus Rift DK2 (virtual reality goggles; <https://www.oculus.com/en-us/dk2/>);
- Leap Motion (hand sensor to allow interaction with virtual environments; <https://www.leapmotion.com/>) ; and
- MaKey MaKey kits (boards and cables allowing keyboard emulation with any conductive material; <https://littlebits.cc/bits/makey-makey>).

After selecting staff to be involved (Head of Department of ICT, the teacher librarian, an ICT teacher, two technical officers), the staff unboxed everything to see what goodies had arrived. The most immediate drawcard was the Oculus Rift, the most expensive and cool piece of kit. It requires a high end machine to run, but to test it out, it was plugged it into a teacher laptop (which has HDMI but quite low end graphics) and the barebones 0.8 SDK software was installed, a profile added, and the demo scene, launched which is a virtual reality emulation of an office. There was lot of juddering, but that was to be expected on a low end machine.

From there, the 0.8 SDK was installed and the sample world (Tuscany) was loaded up. Pressing the space bar brings up the stats, and the result was only 14fps (75fps is required for good experience). The image was also very blurry and red/green shifted. Personalising the goggles through the profile setup didn't really help.

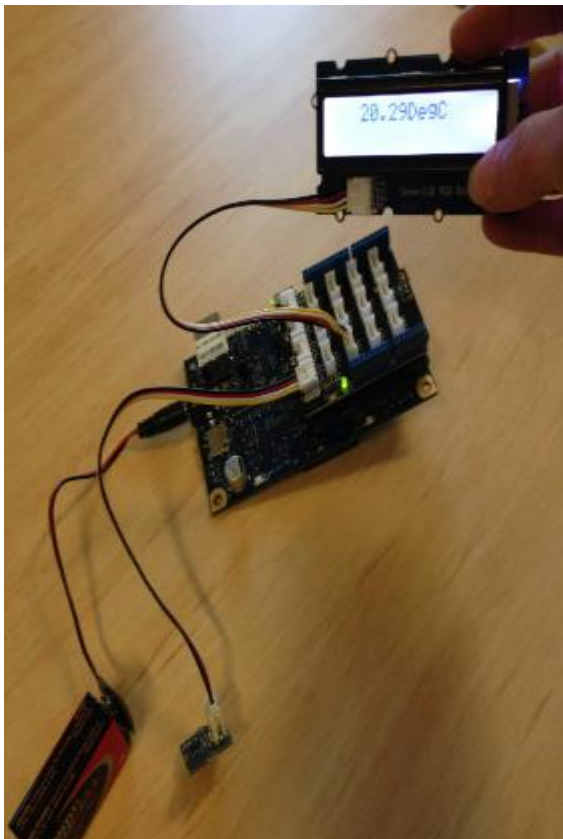
The Oculus Rift was then plugged into 4 different desktop machines, and all failed to power on or recognise the OR in the SDK (even when the older SDKs 0.5, 0.6, 0.7 were tried). A quick bit of research revealed the video card drivers were not up to date enough (and it wasn't possible to bring them up to date as the newest drivers didn't support the video cards in these machines). The next day, one of the staff brought in a personal computer from home (i5 3570 CPU and AMD 7970 video card). The results were mind-boggling - 75fps, crisp image, no juddering.

A great resource for free games and experiences is share.oculus.com, however a lot of the EXEs were compiled using pre-0.6 SDK and simply refused to work. After a day of testing, some students and staff were successful in riding the SnowCoaster and facing their fear of spiders in Don't Let Go! One of the technical officers had also made a game in Unity and used the VR export feature to quickly turn it into a game compatible with the Oculus Rift.



Two classes (year 11 IPT and year 12 IPT) spent a lesson walking around ‘Tuscany’. They were super impressed. After more testing, funds were committed to buy an AMD 290 video card to put in a spare i5 3550 machine leftover from a previous project. This has been set up on a mobile trolley.

More recently, the full SDK has been released, and it is now quite simple to run applications (old and new) using Steam’s Virtual Desktop (which is no longer free). Other Steam games have had updates released to make them compatible with the Oculus Rift, and staff and students have had some fun blasting around Bathurst in Project Cars with a Logitech steering wheel and pedals. This is still the beginning of the exploration phase for the Oculus Rift, with the aim to get students to make 3D worlds in Minecraft to solve a set of problems, and if time permits, one day get the students programming in Unity. It would be good to also integrate the Leap Motion, but so far only the demo applications have been explored.



Meanwhile, one of the technical officers came to grips with the Intel Galileo, hooking up the temperature sensor and the LCD component and implementing some basic coding to display the temperature. This was placed on the front counter of the library for students and staff to play with to generate some buzz around the MakerSpace.

The ICT teacher involved in the trial then took the boards home to tinker and become expert enough to run sessions with the students. These sessions initially began as virtual programming and will lead into a Robotics Olympics, where students will compete in a series of challenges using the boards, sensors, some Lego, and because the school already has a 3D printer in the library, perhaps 3D printed components. Challenges might include events like getting a robot from the start to the finish line in exactly 10 seconds (rather than a speed race), navigating around obstacles, and finding the exit to the room.

The third major component of the kit is MaKey MaKey. Only two kits were supplied, so an additional five were purchased to allow up to 14 students to work at once in pairs. After much brainstorming, the context of music was decided upon, where students will use the kits to create miniature musical instruments. They will initially use them to control web applications like piano or drums, and then will ultimately use Scratch to program their own controllable instrument.





Harristown State High School has named their MakerSpace ‘STEAM Lab’ (science, technology, engineering, arts and mathematics) and it is run at lunch times three days a week (a day with the Galileo boards to prepare for the RoboGames formally RoboOlympics (<http://robogames.net/index.php>), a day with the Oculus Rift and Leap Motion working towards creating 3D virtual environments, and a day with MaKey MaKey creating and programming musical instruments).

There are still some hurdles to overcome. Time allocation is difficult, with a 40 minute lunch break only giving students time to scratch the surface. It is hoped STEAM Lab can be integrated into some of the junior ICT subjects in second semester and ultimately into Digital Technologies when the school implements it next year.

It can be a steep learning curve, but given enough time, money and effort, a MakerSpace can be an effective way of engaging students in cross-curricular activities that foster their creativity, improve their problem solving skills, and lead to better outcomes.

Richard Kelly, Acting Head of Department ICT & Resources, Harristown State High School

Darling Heights State School, Toowoomba, Queensland established a Makerspace which focussed on identifying ways to engage all of the students in the upper half of the primary school in the maker movement in some form or another. This focus had ramifications for what to engage students in making, how to blend instruction with creativity, how to link digital and non-digital aspects of making, as well as time, resourcing, space and storage.

A three phase approach was devised as a developmental instructional model:

- Phase 1; construction techniques and safety;
 - Parallel to this teaching paradigm was introduction of 3D printing;
- Phase 2 lighting and motors; and
- Phase 3 controllers added to made objects.

A small aside was also conducted with the year four classes using the Little Bit (<http://littlebits.cc/>) kits provided as part of the MakerSpace trial. Because of the limited number of kits, four kits (of two basic designs), and that the activities included in the booklet required up to two hours each and meant that the kits could only be used by one class at a time. The class was divided into four groups each of six children, each with their own small kit. It was planned to rotate these kits with the other year four children throughout the year. The models suggested by the kits had children using tools that they were not familiar with including razor knives (box cutters) and hot glue guns. Some of the Little Bit components were not rugged enough to use in the class setting including the Vibra Motors (both of which broke on the first usage).

Phase one included two aspects. Introduction to precision model making and the ability to add one’s own creative flair. Following on from the CLOHE European model (http://www.clohe-movingtoys.eu/www/Home_EN/Home.htm), simple automata were the base of the precision modelling. What the automata machinery moved, was where individual and group flair came to the fore.

The first automata base was a simple cam and cam follower model which required precision use of tools such as scissors and hole punches, and hot glue gun. These simple models provided a platform for adding objects that twirled or flew created by the children in pairs. It also provided opportunities to discuss the safety requirements of the Makerspace.

In reality prior knowledge and skill level of the students were not at the level expected, with even the most basic of expectations were not realised. Some children struggled to handle scissors correctly, from holding the right way up to manipulating them accurately, and some even not realising they were wearing their safety goggles upside down.



scissor grip



Constructing with masking



tape broken wires



Little Bits hand grip
Box cutter

These and other issues slowed the planned introduction of MakerSpace to the whole group down, though in phase 2 there was great interest in making LED lights switch on, especially after they worked out how to insert batteries in the battery box. Once the children were able to turn them on they were able to discuss where on their models they might use them. Some of the ideas included necklace (wearable technology, in conjunction with 3D printer), car lights, fireworks, eyes of dragons, skeletons and animals, and signage (Justin Bieber was popular here).

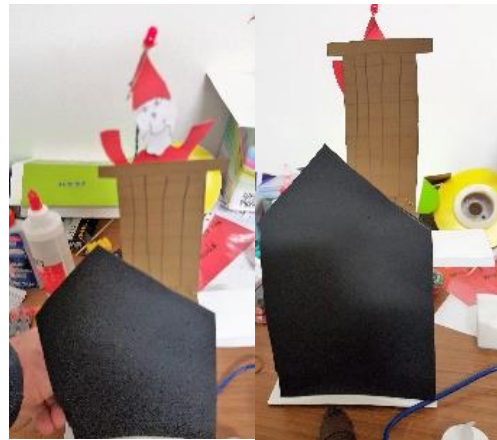
The struggle with the 3D printer was getting the children to realise that they needed to come up with a design first before you push any buttons to print. The method used was to get the children to draw a simple 2D design, transfer it to graph paper, mark all turning points on the diagram, record the ordered pairs, upload to Openscad (<http://www.openscad.org/>) and, in the first instance, linear extrude, save as an STL file and send to the 3D printer. Some of the children's designs included the Eiffel Tower, a house and a stegosaurus. Cheap jewellery components allowed these then to be transformed into earrings, brooches and necklaces.

Phase three began with letting children engage with the Arduino 101 (<https://www.arduino.cc/en/Main/ArduinoBoard101>) in small groups to get their LEDs to flash. This it turned out was more complicated than just placing the components on the table and letting the children solve the problem themselves. Some were able to get their LEDs to light up but the majority did not persevere and move on to making their light flash.

The children did come up with some great ideas of where on their models they would like to install lights including rockets, fireworks and robots. The LEDs in the fireworks were able to flash brightly simulating the burst of colour of the fireworks, and in the rockets to sequence the lights to simulate taking off. The MakerSpace also included a Make-night with parents where each child made a lantern with working LED lights, and a Makerfaire where parents and teachers could see what the children had made and also the teachers could stay and make some simple automata.



Teacher viewing at Makerfaire



Santa moving up and down chimney with LED in hat



Springy octopus with LED eyes



Sample of 3D printing

Alwyn Powell

MakerSpace Teacher, Darling Height State School and University of Southern Queensland

This article provides a summary of the **Queensland Digital Technologies Summit 2016: Initial Teacher Education**, conducted on the 15th June 2016 in Brisbane, Queensland, Australia. The School of Education and Professional Studies, Griffith University, with the support of the Queensland Council of Deans of Education and the Queensland College of Teachers (QCT), hosted the Summit which brought together more than 300 key stakeholders to:

- identify and prioritise digital technologies challenges and issues in Initial Teacher Education;
- co-construct a shared digital technologies philosophy in Initial Teacher Education;
- co-construct a shared digital technologies framework for Initial Teacher Education; and
- identify shared actions and strategies for digital technologies learning and teaching in Initial Teacher Education.

The Summit program (<https://www.griffith.edu.au/conference/digital-technologies-summit-2016/program>), as distinct from a Conference, was deliberately designed to enable input and interactive engagement using technology, which captured and fed through participant responses and questions, including live polling. Presenters included guest speakers, panel sessions which stimulated group discussions, and case studies which provided stories of digital technologies in practice. To get a further sense of the Summit, view the video at https://youtu.be/_1A2bXDFHhs. Moreover, all participants were advised that a Summit Communique, when constructed, will be able to be accessed on the Summit website (www.griffith.edu.au/conference/digital-technologies-summit-2016), and it will be distributed to all participants to disseminate throughout their networks to influence action. The Summit made the distinctions between learning and teaching with digital technologies, the ICT Capability as a general capability to be developed across all learning areas, and the Technologies Learning Area, which includes the Design and Technology and Digital Technologies subject areas.

Figure 1: Adam Spencer (Digital Technologies Summit MC) engaging the Summit participants



Prioritising Digital Technologies Issues and Challenges in Initial Teacher Education

Following the Summit being officially opened by Professor Donna Pendergast (Head and Dean, School of Education and Professional Studies, Griffith University), the following speakers presented their perspectives to inform digital technologies in Initial Teacher Education:

- *Developing the digital workforce to drive growth in the future*
Ms Natasha Doherty (Director, Access Economics, Deloitte);
- *Horizon Report K to 12: What are the bigger trends and challenges? Why we need to address them*
Dr Jason Zagami (Director of Community Partnerships, School of Education and Professional Studies, Griffith University)
- *What the evidence based research is telling us?*
Associate Professor Katrina Falkner (Head of School, School of Computer Science University of Adelaide)
- *Evaluating a shared understanding on Digital Technology*
Associate Professor James Curran (School of Information Technologies, The University of Sydney)
- *Inspiring entrepreneurship through technology and innovation*
Taj Pabari (Sixteen year old educational pioneer of Fiftysix Creations)
- *Digital Technology across the Curriculum*
Anna Kinnane (Project Manager Digital Strategies, Queensland College of Teachers)

Participant responses, in rank order of importance, to the question - What do you consider is the **highest priority digital technologies issue/challenge in Initial Teacher Education?** – were:

1. Flexible, open, creative mindset for school students and initial teacher education (ITE) students (agile / resilient / coping with change);
2. Resources /access / infrastructure for the classroom / technology;
3. Alignment between initial teacher education (ITE) in universities and school practices;
4. Practical examples and preparing initial teacher education (ITE) students for the realities of teaching;
5. Digital technologies finding expression in curriculum, pedagogy, and assessment; and
6. Initial teacher education (ITE) students and school students need to be creators as well as users.

A Shared Initial Teacher Education Digital Technologies Philosophy, Framework and Actions

To develop a shared digital technologies philosophy, a panel discussion was facilitated by Professor Romina Jamieson-Proctor (State Head, School of Education, Queensland, Australian Catholic University) with the following panellists - Ms Julie King (Curriculum Lead, Technologies, ACARA), Professor Margaret Lloyd (School of Curriculum, Queensland University of Technology), Associate Professor Paul Newhouse (Centre Director for the Centre for Schooling and Learning Technologies, Edith Cowan University), and Professor Peter Albion (School of Teacher Education and Early Childhood , University of Southern Queensland).



Figure 2: Panel Discussion – (L to R) Prof Romina Jamieson-Proctor, Julie King, Prof Peter Albion, Prof Margaret Lloyd

The subsequent session was a panel discussion designed to provide stimulus for developing a shared framework for digital technologies to support the shared philosophy in Initial Teacher Education. This session was facilitated by Associate Professor Raymond Brown (School of Education and Professional Studies, Griffith University) with the following panellists - Ms Jenene Rosser (Executive Manager (Australian Curriculum), Independent Schools Queensland), Terry Gallagher (Director, Curriculum Teaching and Learning, DET), Mr Matthew Jorgensen (eLearning Manager Coomera Anglican College (on leave), Microsoft Teacher Ambassador, QSITE Emerging Leader 2015), and Sue Suter (Brisbane Catholic Education, Education Officer Curriculum Learning and Teaching Technologies Shared Actions—Strategies).

Shown in Figure 3 is the conceptualisation used to develop a shared digital technologies philosophy, framework, and inform the agreed strategies arising from the Summit. Those strategies related to Contexts of use, Ethical wellbeing & citizenship, Curriculum, teaching & learning, Communication & collaboration, Creativity & innovation and Initial Teacher Education (ITE) were developed. These were stimulated by the previous sessions and facilitated by Anna Kinnane (Project Manager (Digital Strategies, Professional Standards, QCT) and Bob Rogers, (eLearning, DET, Qld). Case studies included Nicola Flannagan (Oakleigh State School), Joel Speranza (St Joseph's Nudgee College), Paul Hamilton (Matthew Flinders Anglican College), and Dan Martinez (Junior School Teacher, Apple Distinguished Educator, St Hilda's School).

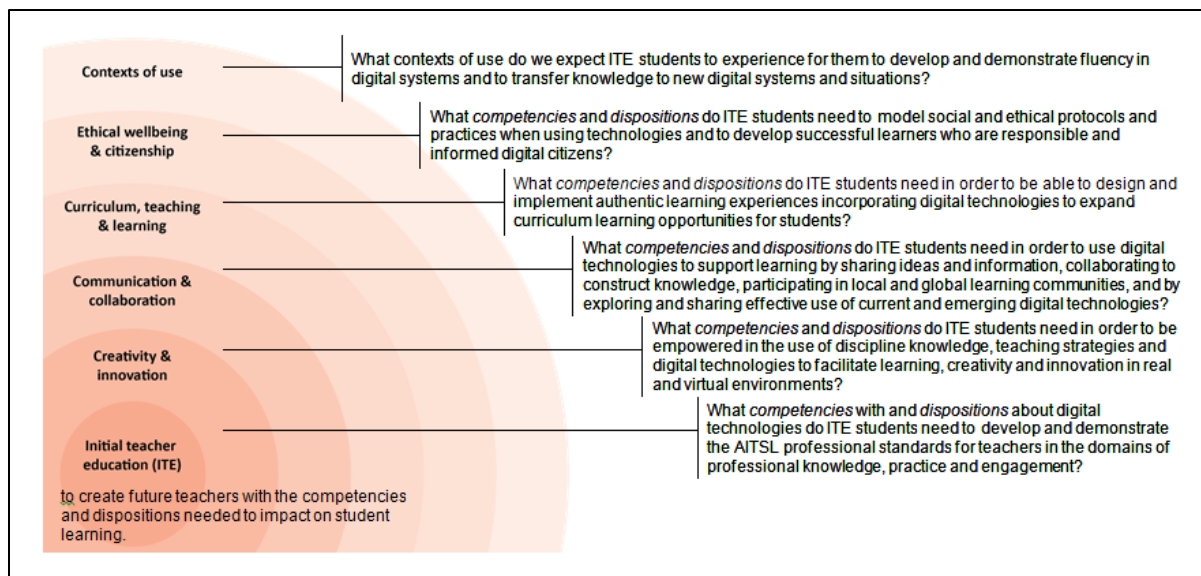


Figure 3: Summit Stimulus: Conceptualisation for co-constructing a shared digital technologies philosophy, framework and actions in initial teacher education

More detailed and specific outcomes will be disseminated through the forthcoming Summit Communique. However, the following presents the key strategies for digital technologies learning and teaching in Initial Teacher Education identified by participants at the Summit.

How do we ensure that ITE Students experience Context of use?

- Contexts of use that employ ITE students in the role of mentor;
- Contexts of use that require ITE students to create with digital technologies;
- Contexts of use that foster university / industry partnerships;
- Contexts of use that make real connections with real life issues; and
- Contexts of use that expose ITE students to professional networks through practical experience.

How can we support ITE students to develop the competencies and disposition needed to model Ethical Wellbeing and Citizenship?

- Understand the expectations of university and school policies relating to ethical issues;
- Ensure ethical considerations are applied in all learning areas not just digital technologies;
- Develop a professional profile/digital footprint that supports professional practice;
- Model the development and debate of ethical and policy positions as a problem solving process in digital technologies; and
- Understand and teach the appropriate uses of data, particularly student data.

How can we support ITE students to develop the competencies and disposition needed to be able to design and implement Curriculum, Teaching & Learning?

- Curriculum, teaching and Learning reliant on the student's needs and the school curriculum;
- Problem solving in engagement with technology in real world contexts, case studies and examples;
- Focus assessment on journey rather than end product; and
- Develop teaching experiences that allow students to critically evaluate and justify.

How can we engage ITE students with the competencies and disposition needed to support Communication & Collaboration?

- Thorough knowledge of the curriculum;
- Reflecting using digital mediums (professional learning networks) Twitter, blogs, etc;
- Teacher-led training like QSITE events;
- Working with school-based digital champions; and
- Forming Makerspaces with local schools.

How can we empower ITE students with the competencies and disposition to facilitate Creativity & Innovation?

- ITE students to be immersed in PBL tasks across the curriculum in both real life and virtual contexts;
- Academics need to model and provide opportunities for students to create and innovate;
- What's important is assessed so include creativity as an assessable aspect of all assessments included in GTMJ (guide to making judgments);
- Opportunities to explore DTs and hands on 'play' opportunities, valuing adaptability, flexibility, change, collaboration, communication and critical thinking; and
- Liaise with schools so ITE students can see how it works in schools.

How can we create future teachers with the competencies and disposition needed to impact on student learning?

- Encourage collaboration - with students, industry, schools, universities, peers;
- Provide access to quality mentoring;
- Provide authentic learning experiences and high quality examples;
- Model and demonstrate the pedagogies necessary to embed digital technologies; and
- Ensure depth of learning with regard to the curriculum.

The Next Phase—Commitment to Action

In terms of the purpose of the Summit, it achieved its objectives by identifying and prioritising digital technologies challenges and issues in Initial Teacher Education, co-constructing a shared digital technologies philosophy in Initial Teacher Education, co-constructing a shared digital technologies framework for Initial Teacher Education, and identifying the shared actions and strategies for digital technologies learning and teaching in Initial Teacher Education. The Summit also received considerable and positive media exposure, including the following:



- <https://au.news.yahoo.com/video/watch/31843362/south-east-digital-technology-summit/#page1>
- <http://tenplay.com.au/news/brisbane/2016/6/brisbane-news--15-jun-2016>
- <http://www.abc.net.au/news/2016-06-15/prep-students-in-queensland-to-learn-computer-coding-from-2017/7513938>
- https://youtu.be/_1A2bXDFHHs

Participants expressed a very strong commitment to action informed by these outcomes. There are important roles and actions needed by all stakeholders to positively enact this commitment. The next phase will involve the Queensland Deans of Education in collaboration with the Queensland College of Teachers in developing an action plan which progresses this important digital technologies improvement agenda. Those action plans will be inclusive of all stakeholders – including relevant Government, Higher Education Institutions, school systems, schools and their communities, teachers, Initial Teacher Education students - as a collaborative, collegial approach will be an underlying principle to achieve success.

*Professor Glenn Finger, Professor Donna Pendergast, and Dr Jason Zagami
School of Education and Professional Studies, Griffith University*