Institute of Industrial Arts Technology Education

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Inside this issue of the IIATEJ

The BBC micro:bit Control Technologies
My Professional Learning Journey LittleBits
Teaching at Lightening Ridge

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Acknowledgements

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IIATEJ Contributions

This journal welcomes contributions from authors regarding all aspects of Technology Education. The journal aims to educate its readership by providing a balanced view of contemporary issues relating to Technology Education.

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Editorial

Where has this year gone?

As I put this issue to bed, I know the ‘partial’ relief felt by the many Stage 6 teachers out there who have either witnessed and/or donated the ‘blood, sweat and tears’ in guiding students through to the completion and submission of their major projects for assessment. Firstly, congratulations on your fine effort, your students do appreciate it!

This issue has certainly been a stimulating one with the main topics certainly challenging me to step outside my comfort zone. Not before time as you will soon read, so I am definitely not complaining.

The journal is always seeking for good stories that promote its members. This issue we are showcasing an up-and-coming pre-service teacher (this time from the University of Newcastle), and we then head to the north west of NSW to check in with a teacher out there to inform us about what it is like to teach in opal mining country.

Whenever I look at images like the one below, not only am I reminded of some of my colleagues, past and present (jokes), but I often reflect on the time I spend sitting down looking at a screen. As a pre-service teacher, and in my beginning years of teaching, I certainly didn’t envisage I would be spending so much time on this machine, but education doesn’t seem to be the only industry that the computer has impacted upon.

This issue certainly has the theme of computerisation, and as I sit on my backside looking at a screen, I can see the trend in the workplace heading in this direction also. This trend is supported by research, and a look at the documents found in the ‘Relevant Publications’ section of this issue will verify that.

The ‘take-home’ for all teachers, not just us in TechEd is that change is inevitable, as curriculum is a construct of the needs of society, the environment and the economy at a given point in time. These needs change, and so does our curriculum to cater to this. As teachers looking to maintain expertise, and prepare ourselves for curriculum change, the best position we can take is to know what changes are likely to occur, and how can we position ourselves for these changes?
The name of our learning area alone ‘Technology’, indicates the predisposition of the content to evolve and change over time as the technology we use evolves. I fondly recall the tools in the workshop tool rack and how they have changed over time.

Quoting specific examples can be contentious as we all like to do things a particular way, however what immediately comes to mind for me is the equipment such as the ratchet brace, the plotter, the shaper and the egg-beater hand drills that were once prevalent in school tool racks, have now made way for alternative contemporary devices.

At times, when a particular student(s) was not following instructions, I sometimes hoped for a stash of a few of the ‘egg-beater’ hand drills, in an attempt to educate these wayward students in the benefits of following instructions or replicating the demonstrated, and safest practical procedure, that one would term as ‘best practice’.

I laughed when I was searching for an image of the hand drill (left). What was so amusing was when the “modern hand drill” found on page 383 of one of my favourite woodworking text books was referred to as an “antique egg-beater hand drill” on the ETSY.com website. The point I am making here is that technology, and the skills and knowledge associated with that technology make way as new technologies become more commonplace.

I hope you enjoy the issue, remember we are continually looking for contributors to the journal. If you feel as though you may have a good story that would make a suitable article, feel free to contact me. My details are found on page 2.

Dave Ellis

“If you can’t explain it simply, you don’t understand it well enough.”
Albert Einstein
Disruptive technology’ a term commonly used these days. For those of us who have been around a bit longer, let us use this cartoon to understand what these technologies are:

Text excerpted from the Wikipedia article Disruptive technology. 21 May 2007
The President’s Report

Over the past few months I have been invited to several conferences regarding STEM education. They have been mostly attended by Maths and Science teachers, however, this the most positive time in history for Industrial Arts, Technology and Engineering education.

During 2015, the following reports have highlighted the economic imperative to have a workforce which is "STEM" trained.

In June 2015, the Committee for Economic Development of Australia (CEDA) released a report titled, *Australia’s future workforce?* The report evaluates the impact of digital technologies, and emerging technologies on the workforce and the type of skills which will be needed in the not so distant future. The report suggests that the jobs of the future will be those that require "social intelligence, creativity and detailed perception and physical manipulation" (CEDA, 2015, p. 21).

Deloitte Access Economics was commissioned by the Office of the Chief Scientist to understand the skills requirements of Australian businesses with regards to STEM. One of their key findings show that employers are particularly looking for capabilities in active learning, critical thinking, complex problem-solving and creative problem-solving, all of which correlate closely with STEM qualification based skills and all of which are the cornerstones of our Technology syllabuses.

One of the more important statistics to come out of the report is that 82% of employers value STEM qualifications even if they are not a prerequisite for the role. The full report is worth reading as it goes on to discuss the importance of people in the workforce being able to innovate, and have the flexibility to work with and implement innovations (Deloitte Access Econonics, 2014, p. 3).

In June of this year, a report commissioned by the Australian Computer Society launched a publication called *Australia’s Digital Pulse*. While this report is aimed at looking specifically at ICT, we should take heed of the fact that digital technologies is one of the fastest growing sectors of Australia’s economy, and that the demand for ICT professionals is increasing at about 5% per year. This means that between now and 2020, numbers needed are predicted to rise to approximately 700,000. (ACS, 2015)

The Price Waterhouse Coopers report *A Smart Move* similarly says; "A STEM education underpins innovation and plays a critical role in economic and business growth. But Australia is lagging on key indicators of STEM" and "Critical thinking and problem solving, analytic capabilities, curiosity and imagination have all been identified as critical ‘survival skills’ in the workplace of the future" (PricewaterhouseCoopers, 2015, p. 14). The report makes the same point as all the others, that Australia needs a workforce that is technologically savvy and able to innovate. One of the best ways to do this is by improving capabilities in STEM.

Australia’s Chief Scientist, Ian Chubb has been on this path for some time now saying we have missed the boat and probably have a lost generation. I have to agree with Chubb but have to constantly remind people that when he says SCIENCE he means big science, not the science that we as ‘schoolies’ understand, but mathematical science, technological science and engineering sciences. When Chubb says science he is talking STEM.

The growth in the "Maker Movement" is also on our side in promoting learning through making. These things are of course no surprise to our members who typically learn by doing. I have often been
surprised that the public, who must have attended school at some stage, do not realise that all schools have existing "Maker Spaces" with a broad range of tools and technologies.

The publicity that STEM education is now receiving is something that all of us need to be aware of and bask in, as we have after all been teaching STEM to our students for well longer than I have been teaching. However keeping this in mind, I do think that we don’t market ourselves very well. Most people making public policy regarding STEM education, don't know what we do in our classrooms. They are often surprised when shown the depth and breadth of our curriculum, the project based, student-centered learning that takes place. You can make a difference!

School Inspections

Government schools are now under the same jurisdiction as non-government schools. BOSTES have on their site the registration "manual", it is worth a look, especially if your school is nominated for inspection. The government system will work like Catholic Education, where the system, the diocese or the region, will put in place a method of checking schools. BOSTES “spot check" schools.

Conference and Web site

The conference committee have been hard at work organising yet another brilliant line up of activity. Thanks to work by Alesha Bleakley, Professor Marc deVries (the world's best known researcher in Technology Education) is a keynote speaker. Marc will provide you with some language, and academic research to support your faculty and discussions at executive level in schools. He is inspiring and not to be missed.

The conference activity has highlighted for us the need for a professional officer. As President I thank all members for their patience with the web site membership activity. We knew that the transition to a new system would cause some difficulties but did not expect that the Department of Education spam filter would eat the membership notifications.

The Teacher Excellence Award is one of the highest honours given to technology and engineering education classroom teachers, and is presented in recognition of an outstanding contribution by a teacher to the profession and their students. The Teacher Excellence Award provides public recognition from local through to international levels. Don't forget to nominate someone you believe to be deserving of recognition!

I would like to congratulate all the organisers of our InTech Display, The Wood Show Challenge and the Aeronautical Velocity Challenge. I am looking forward to attending the DesignTech display. These initiatives provide a great opportunity to showcase the great work being carried out by inspiring teachers in our curriculum area. So I would also like to congratulate all the teachers who entered teams or mentored students to the completion of great pieces of work.

I hope you have had a productive year so far and I'll see you at the upcoming Conference.

Ruth Thompson

IIATE President
Benjamin Bloom and the BBC micro:bit

On the 6th of July, 2015 the BBC (British Broadcasting Company) and its partners revealed their plan to issue a pocket-sized device to every Year 7 (up to 1 million) in the UK. The device called the BBC micro:bit can be described as a pocket-sized computer that will enable students to learn programming, whilst requiring no prior knowledge of computing.

Figure 1. A diagram showing both sides of the device (Engineering and Technology Magazine, 2015)
The BBC micro:bit may not look like your iMac or your laptop, but this little device costing approximately £2 to make (The Independent, 2015) has a USB plug and a Bluetooth antenna and can be programmed using a smart phone or a tablet.

This isn’t the first time that the BBC has been involved in providing technology in schools. From 1981 to 1984 the British Government wanted to prepare students of the UK for the ‘computer age’, and as a result (in conjunction with the BBC’s Computer literacy project), Acorn computing company was commissioned to design and built the computers. The use of these computers was an attempt to not only enable the encourage computing in schools, but to integrate the use of the computer across the curriculum, as a teaching and learning tool (Campbell, 1983).

What was a coup for British schools was that the government subsidised half of the cost of the computers on the condition that at least two teachers attended the Microelectronics Education Programme (MAP) training courses. The result of this was to ensure that teachers possessed an adequate amount of expertise, similar to the CREO training offered through the software provider PTC and enthusiastic trainers such as Ruth and Peter Thompson. The popularity of this programme meant that almost all secondary schools in the UK had at least one computer by the end of the programme. Given the positive outcomes of the BBC and the Government’s MAP initiatives, it is no wonder that both the BBC and the Government have an appetite for the BBC micro:bit.

This year the BBC has launched the ‘Make It Digital’ Initiative. The Initiative in collaboration with major IT organisations such as Google, Microsoft and Samsung aims to develop the digital skills amongst young British students with the overall aim at addressing an estimated digital skills shortage. The introduction of the BBC micro:bit is just one of a raft of activities under this initiative.
It is hoped that student engagement in learning coding to operate the BBC micro:bit will “inspire young people to get creative with digital; develop core skills in science, technology and engineering; and unleash a new generation of digital makers, inventors and pioneers” (BBC, 2015).

According to the BBC, the BBC micro:bit is completely programmable using a web-based editing (BBC, 2015)environment. These editors will also support other languages such as Microsoft Touch Develop, JavaScript, C++ and Python to name a few. To connect and programme the micro:bit, it can be ‘tethered’ either through cables, connected wirelessly to other devices, or using the 20 pin edge connector. To extend its versatility, it is compatible with Arduino, Kano and Raspberry Pi to name a few, as well as the ability to connect to a range of sensors. Once programmed, the device will operate on its own once a battery is connected.

Figure 3. Features of the BBC micro:bit (BBC, 2015).

- A 5x5 LED matrix with 25 red individually programmable LEDs
- Two programmable buttons
- On-board motion detector or 3-AXIS digital accelerometer
- A built-in compass
- Bluetooth® Smart Technology
- Five Ring Input and Output (I/O) including power (PWR) and ground (GRD)
- Edge Connector: 20 pins
- Micro-USB controller
- 2xAAA battery pack
- System LED x 1 (yellow)
- System push button switch x 1

(BBC, 2015)

What can you do with the BBC micro:bit?

View a short video on the possibilities of the BBC micro:bit here: https://www.youtube.com/watch?t=70&v=Wuza5WXiMkc
Benjamin Bloom and Higher-order thinking

Most of us in educational institutions are familiar with the term ‘higher-order thinking’. Those of us who frequent ESNET, and appreciate the odd tongue-in-cheek banter from our valued contributors, could propose an alternate definition to higher-order thinking, however I shall do my best to summarise its meaning in brief.

In 1956 Dr Benjamin Bloom led a team that developed a categorisation (taxonomy) of cognitive skills. These skills were ranked according to the difficulty of the thinking (cognitive) skill required by the learner, with the framework positioning the less demanding skills at the bottom to the more rigorous (higher-order) skills towards the top. As a result Bloom’s taxonomy of higher-order thinking skills was realised.

Though the look of ‘Bloom’s Taxonomy’ can change, as the various graphics may present the taxonomy as a pyramid, a rectangle or even a trapezium, it is the change of the wording used to describe the levels of cognition that are most important. In a review of Blooms taxonomy, researchers Anderson and Krathwohl(2001) aimed to align the taxonomy with the changing expectations of a Standards-based education in the United States (Anderson, 1999; Anderson and Krathwohl, 2001; Manthey, 2006). Similar to Australia, these Standards require teachers to assess student evidence and align this against a determined level of mastery of what the student knows and is able to do. As a result of this change, the revised taxonomy changed from nouns to verbs in alignment with the Standards (Manthey, 2006).

![Figure 4. Revised Higher-order thinking skills (CIT Duke University)](image-url)
Higher-order thinking and TechEd

Those of us who have developed, or used past examinations are familiar with the use of higher-order thinking in assessing student learning. Not only do we teach the syllabus content, but the literacy around interpreting the requirements of the syllabus. To better explain this, we align specific terms with higher-order thinking expectations to determine student learning. We often explicitly see the use of terms that require implementation of higher-order thinking in external examinations from BOSTES, and these are weighted accordingly - the more difficult the task, the higher the mark. These external examinations assist in ranking our students according to their mastery of the subject outcomes.

An example of the implementation of higher-order thinking to assess student understanding can be found in the 2014 Stage 6 Design and Technology examination questions below:

![Image of 2014 Higher School Certificate Examination Design and Technology Section III](image)

Using the Revised taxonomy graphics in figure 4, we can see that the cognitive load (mental effort) required to answer question 13(b) is much greater than 13(a). As a result the question has been weighted heavier with more marks attributed to the successful answer of the question.

So what does higher-order thinking have to do with the implementation of the BBC micro:bit? To make this link between higher-order thinking and the BBC micro:bit, we need to peer through our TechEd lens to justify why we undertake practical activities in our classrooms/workshops?

Practical activities in education have solid and valid educational foundations. To underpin and justify our practical activities with educational theory, the hands on experiences (experiential education) we offer our students are firmly supported by early 20th Century educational theorists such as Jean Piaget & John Dewey, and this theory can be applied using Project-based learning methodology, or through...
related theories such as ‘experiential learning theory’ (David Kolb, 1984), or Constructionism (Seymour Papert, 1980).

To use constructionism as an example of the introduction of the BBC micro:bit, the device by itself does not provide information! It is the engagement by the learner that creates the environment where learning opportunities arise. Constructionism as a learning theory is closely tied to constructivism in that it resides around the personal development of knowledge structures, building on existing knowledge (from the ground up) as a learner gets to ‘know’ something (Papert & Harel, 1991) though more situated and pragmatic (Ackermann, 2001, p. 5). Founded by Semour Papert (a key contributor in the development of the LOGO software programming language, that has influenced contemporary programming languages), constructionism extends on constructivism where “learning is most effective when part of an activity the learner experiences as constructing is a meaningful product” (Sabelli, 2008, p. 78).

![Figure 6. Projects using the BBC micro:bit from 'Technology Will Save Us' (Sorrell, 2015).](image)

Given the opportunities for students to program their BBC micro:bit to do something, students can engage in higher-order activities such as problem-solving through analysis and creating solutions to solve a given design brief.

**How does this apply to us here in Australia?**

In the NSW curriculum, we have the opportunity to design and deliver units of work across a number of different technology areas under the Stage 4 Technology (Mandatory) syllabus. The beauty of this syllabus is that teachers and their schools can offer both a quality and interesting educational opportunity that caters for both teacher expertise and interests (not that it should be about the teacher- but it helps) and the plant and equipment facilities at the school. As a result of this buffet of
curricula offerings, Stage 4 in NSW enables teachers to design teaching and learning opportunities from a range of interesting technologies.

Examples of the diversity on offer include individually focused units of work, such as a programme incorporating ‘plant production technologies’, through to a broader offering where a ‘mixed material technologies’ approach provides students the opportunity to learn about more than one technology area. The syllabus can also cater for the nuances of specific localities, by placing the Technology curriculum in a local context with the study of ‘School-developed’ technologies’ (NSW Board of Studies, 2003).

Given this breadth of opportunity, a question for future IIATEJ publications will be what Technology experiences are we offering in Stage 4 students, and why? One could argue that past bias’s from influential factors such as teacher training and interests, school resources and timetabling, and traditional Stage 4, 5 and 6 offerings have resulted in students’ Stage 4 Technology experiences being heavily skewed towards a traditional Timber, Metal, Textiles, Food and Graphics Technologies.

It is acknowledged that we cannot teach everything in a two year programme, and the reasons for any continuation of these ‘traditional offerings’ are difficult to say, but the influential factors previously mentioned are quite relevant in a high school context.

It is acknowledged that classroom teachers- particularly Technology Education teachers are busy people, and a shift towards offering an unfamiliar technology experience may add to the workloads of teachers as they seek to develop expertise with unfamiliar content. An example of my journey is found in this issues article titled, ‘Control Technologies- My journey in Professional Learning (thus far)’.

This extra work is not an incentive for leaving the comfort zone, but a recent study of how susceptible jobs are to computerisation, Frey and Osborne (2013) ranked over 700 current occupations according to their percentage of probability in becoming computerised. An analysis of this data by PricewaterhouseCoopers in Australia stated that, “44 per cent (5.1 million) of current Australian jobs are at high risk of being affected by computerisation and technology over the next 02 years” (PricewaterhouseCoopers, 2015, p. 4).

With these statistics in mind it’s interesting to consider what us as curriculum developers are offering our students. The Australian Government is looking towards STEM as the vehicle for building the capacity of our future workforce. The publication of the June 2015 Consultation paper, ‘Vision for a Science Nation’ is an opportunity to see how the Government is interpreting the situation, and contributing to the discussion. With the STEM movement gathering momentum, and both Science and Mathematics teachers starting to see the benefits of contextualising complex concepts through practical means, it is important for Technology Education to lead the way in offering computerised technology experiences.
Like Britain and Australia, other countries are starting to position themselves to develop their future workforce. New Zealand is one example, where in response to the PwC data analysis mentioned above, the Government has established a two year ‘Future of Work Commission’ to look into the changing nature of work. Details of the objectives of the commission can be found by clicking on the following link: [http://www.futureofwork.nz/](http://www.futureofwork.nz/).

One way forward is to consider the introduction of Control Technologies as part of our Stage 4 Technology offerings. Developed in the early 2000s, for publication in 2003, the Stage 4 syllabus highlights the great vision of people such as Howard Kennedy (Board Inspector, Technology Education) who managed the development of the syllabus, and their forward thinking to realise how control technologies were to become so prevalent in today’s society.

### Control Technologies in the classroom

The curriculum infrastructure is there, but what are the impediments? A recent survey of 100 Technology Education teachers in NSW found that Control Technologies did not play a significant part in the Stage 4 Technology offerings. The reasons why have not been asked in the survey, and this is not the purpose of this article, however as professionals it is important to occasionally step back and assess why we offer the learning experiences we do?

In summary, this article elaborated on the initiatives undertaken by Britain in what some would say was its own version of a ‘Digital Education Revolution’ (DER). But what was its motives?

![Figure 8. Results of the Control Technologies survey](image)

From an economic and employment perspective, the PwC analysis of the 2013 study by Frey and Osborne, highlights the future disruption as a result of the computerisation of current occupations. The future impact of this technological disruption is motivating governments around the world to take a more proactive approach to skilling future workforces.
The educational take of problem-solving, creativity and innovation, through ‘coding’ and control technologies taps into the concepts of higher-order thinking, and reinforces the value that practical projects offer the curriculum.

Whether through labelling such as STEM, or specifically Technology Education we need to ensure that we are ‘marking our territory’ as we are best placed to provide such wonderful and deep learning experiences and not using ‘knowledge disavowal’ (Deshpande & Kohli, 1989) to avoid change.

References


Teaching at Lightening Ridge Central School

- with Chris Murray

Thank you Chris for agreeing to talk to us about your teaching experiences at Lightening Ridge Central School (LRCS). I notice that you have one of our esteemed members as the Principal – Kerry Adamthwaite. How many TechEd staff do you have at LRCS? And what TechEd subjects are you offering at the school?

I work in the diverse Secondary Studies faculty, of seven teachers. There are two of us (myself and Steve Markham, another SCU graduate from Coffs) that run the Wood and Metal workshops. Apart from Technology Mandatory, our Stage 5 subject selections are Industrial Technology Timber and Metal, Design and Technology, and in Stage 6, Design Technology, and Industrial Technology Timber and VET Construction.

Sounds as though you and Steve are kept busy. Given the educational experiences you are offering there, and building on a solid foundation in the Technology area, what do the students generally do with their education once they graduate from secondary school, and where do they go?

Students from Lightning Ridge Central School and the lives they follow are as diverse as the environments with which they live. Whilst students are still attending school, there are plenty of opportunities for part-time employment. There is always a group of students who are involved in the local industries such as, opal mining, broad-acre farming and vermin control (Roo and Pig hunting). Some students work 70 kilometres down the road at the Walgett Silos testing grain quality and quantity during the holidays. Similar to any small town the local supermarket, cafes and service stations are popular places of employment for anyone who wants to stay local.

After they graduate from school, we have students, who apply and go to university for Sports, IT Design, Game Design, Engineering, and Business to name a few. We also have students who are successful in obtaining electrical and plumbing apprenticeships.

As a teacher who myself has taught in ‘country’ schools for many years, there is that traditional ‘rite of passage’, where the next generation is lost to the big cities (whether it be a good or bad thing) to undertake further study, or seek employment opportunities. It is pleasing to see that there are local opportunities for the students as well.

I’m assuming that Lightning Ridge isn’t exactly Pitt Street Sydney. How has the location of the school influenced your preparation, the projects your students engage in, or even your teaching?

Knowing my students, and how they learn is key to success in western regions. Students in our area respond well to projects that they can use at home, or on their camps. In our metal programme, Motor
bike stands, BBQs, fire place utensils, nut crackers and tool boxes are highly desirable projects that students enjoy making. While our timber programme offers successful projects such as folding stools, bed side tables and dovetailed boxes. The dovetailed boxes we construct are tailored to suit everything from ammunition to mums jewellery. Students in Design and Technology enjoy the excitement of learning about and working with contemporary technologies. In Design and Technology we have implemented the use of 3D printers and a Universal Laser System 3.50. With these technologies, students have been designing and building mixed medium trebuchets that we test for distance and accuracy. I also challenge students to produce a flat-pack item, and build small components for other projects using computerised additive and subtractive manufacturing technologies. Students also enjoy racing CO₂ race cars and compressed air rockets.

I have recently embarked on creating a STEM (Science, Technology, Engineering and Maths) unit of work for Technology Mandatory with 3 other teachers from LRCS. A trial of this unit will be run at the end of Term 4, 2015 with a refined version to be offered in Term 1, 2016. Following this, the STEM unit will then be available for other schools to implement.

That is quite an impressive offering of learning opportunities for your students Chris. It is also impressive to see you encouraging your students to engage in using contemporary manufacturing technologies. I’m sure that our readers would love to see how your STEM unit comes along. Central schools can be great testing grounds for multidisciplinary initiatives.

Tell us a little about life in Lightening Ridge. What does a TechEd teacher do in their own time?

Figure 2. Canoe begin glassed
In recent times I have been helping some friends renovate their house. It is rewarding as it improves their living conditions, and I get to drive their 600 horsepower articulated tractor when there is cropping to be done. The renovations also keep me up to date with currency for my Construction teaching. Personal interest projects help with passing the time and skill development, this year I am building a cedar strip-canoe.

There are also a number of us that play the occasional game of golf on dirt fairways and sand greens. Another past-time is ‘trophy bowls’, once a fortnight some of the teachers, local miners and business people get together for a social game with bragging writes being the main prize.

Looks like it’s a good life there at Lightning Ridge. Also wondering if renovating in the context of professional learning could be classified as a tax deduction (disclaimer - I am not qualified to offer financial advice)?

Regarding Professional Learning and the establishment of Professional Learning Communities (PLCs), is there an active network of TechEd teachers from neighbouring areas that you can refer to?

Figure 3. The alluring ‘black’ opal

This is one of the challenges of our remote location, we tend not to travel from school to school however this is something for me to work on through Facebook, video conferencing and email. It will also be something for future staff to further develop. I have recently signed up to the TAS Leadership Network group, this will give me access to a mentor for developing skills and knowledge around policy and procedures within the TAS discipline.
Finally Chris, the area is famous for its black opals, unique characters (like Artist John Murray), and architecture (like castles and recycled bottle houses). As a result of the features unique to Lightening Ridge, are there any projects your students undertake that is significant to the local area?

The local community in Lightening Ridge is extremely diverse. There are 64 different cultures within the area, and all are friendly and open for conversation at the local bore baths if you wish to engage and learn more.

We have the opportunity to utilise local knowledge and access indigenous perspectives in our classes. This can be anything from learning about bush foods in our Food programmes, to the construction of shelters, clap sticks and boomerang making in Technology. These projects also enable our students to learn more about the local area through the incorporation of local timbers (flora) into the projects and development harvesting skills in finding bush foods.

Other ‘localised’ opportunities, outside the TAS KLA include lessons in flight, astronomy (Big sky country out here) and local fauna in Science, and indigenous games for PDHPE.

Local community members also engage with the school and ‘value add’ to the curriculum. Examples of this interaction include, local artists being actively involved in the design and painting of a large mural with the school Positive Behaviour for Learning (PBL goals)– Respect, Responsibility and Pride. From a LOTE perspective, local experts in the Yuwaalaraay language are used, as well as the opportunity to engage in local indigenous craft using traditional handmade tools in making a bark canoe.

To conclude, this experience is reinforced by rewarding students at the end of the term with fishing and camping trips, where they can demonstrate their skills and knowledge.

Thanks for the opportunity to learn more about teaching at Lightening Ridge Chris. You are also to be congratulated for offering an enriching Technology programme there.

Figure 4. A sample of the local architecture – Amigo’s
Recent Publications

  

  NB> consultation is now closed, but still worth a read

- **Australia’s future workforce?** CEDA, June 2015
  

- **Workforce analysis by Price Waterhouse Coopers (PwC),** April 2015
  
  A Smart Move: Future-proofing Australia’s workforce by growing skills in science, technology, engineering and maths (STEM).
  

- **Horizon Report 2015 K-12**
  

  A report that examines emerging technologies for their potential impact on and use in teaching, learning, and creative inquiry in schools.

- **Deloitte Center for the Edge,**
  
  

- **Progressing STEM Skills in Australia,** March 2015
  
Control Technologies Part 1- My journey in Professional Learning (thus far).

*Dave Ellis with Aaron Hinchcliffe and Matt Scott.*

Have you ever experienced this situation where you needed to teach a topic that you knew very little about?

![Image of GrovePi connecting sensors to the Raspberry Pi by Dexter Industries](image)

**Figure 1.** The GrovePi connecting sensors to the Raspberry Pi by Dexter Industries

**Professional Learning and Emotions**

OK folks, it is time for me to step out of my comfort zone, and stop procrastinating. The point of this article is to document my journey or at the very best, ‘clear-a-path’ for others who may find themselves in a similar situation with control technologies. I’m the first to admit as technology educators ‘techeducators’, that the diversity of our learning area and it’s continual evolution is a challenge to maintain or develop expertise. Often for me personally for me, much of my professional learning
develops through what one would coin as my personal interests and the development of ‘foreign-orders’.

To begin, I shall start the journey by introducing the term ‘Control Technologies’ that is used by the NSW Board of Studies in the 2003 publication of the Technology Mandatory syllabus. If I was seeking to define what control technologies are, I would be satisfied with a reference to the Input-Processing-Output (IPO) system labelled as figure 4 in this article, and at this stage of my understanding, I could define control technologies as technologies that allow for the manipulation of inputs to process the data into a desired output response. I hope to revisit this definition as my understanding of the technology improves over time.

In viewing the syllabus, I note that ‘control technologies’ are not new to Technology Education. And as I peer through the 2003 Technology Mandatory Stage 4 syllabus, I know that I shouldn’t find this too daunting, considering I am an experienced and relatively intelligent (not a biased opinion of course) teacher. Keeping this in mind, I am of the belief that the study of control technologies is intended for 12 and 13 year old students engaged in the various activities associated with the Stage 4 Technology (Mandatory) syllabus, and therefore I should ‘pick-this-up’ relatively quickly.

As a teacher of technology, I am embarrassed to admit that control technologies have been an area that I have not engaged in as much as I probably should, but through casual observation, I have witnessed its growing presence in everyday items from the use of motion sensors to turn on lights to the new front door locks that can be opened via your mobile phone.

Benjamin Franklin (1789) once stated, “...in this world nothing can be said to be certain, except death and taxes”, and the true meaning behind this is change! Change is inevitable, and as the world, its industries and curriculum continue to change, I believe that as a professional teacher you need to adopt the mindset of a life-long learner and continue to engage in professional learning to maintain expertise.

"In this world nothing can be said to be certain, except death and taxes."

*Benjamin Franklin 1789*
Technology education is a learning area that as a result of technological change, the subject matter content will change too!

To explicitly state my process of professional learning (aligned with the Australian Professional Standard for Teacher Standard 2), I will document the steps that I am undertaking to develop my knowledge of control technologies so I can ‘know the content’ in this first instance.

It is also an appropriate time in this article to state, that my professional learning journey will evolve over time and not fit within the timeframe of this publication. I intend this article to be one of two parts that will conclude with a foundational understanding of the technology, and one that can be built upon.

In my Backwards Design approach to professional learning by keeping what I wish to achieve firmly in mind, I am incorporating some of the elements of Wiggins & McTighe’s Understanding by Design (UbD) approach to curricular planning. The idea is to not only keep my goals in mind, but to also assess my knowledge to determine the learning. This is proposed to occur in the 2nd article.

For more information on UbD, click here.

So the questions I am going to ask myself and the process I am going to follow is below. It is intended that this part of my journey may incorporate the first 5 questions (in red). For the purposes of making this article easier to read, I may address questions 3, 4 & 5 at the same time:

1. What do I need to know?
2. What do I already know?
3. How and where can I access the information?
4. Engage in learning
5. After I have engaged in the learning, reflect on, what did I learn from this?
6. Is my new learning adequate?
7. Can I test whether the information is valid?

**What do I need to know?**

In taking the first step, I am adopting a backwards design approach to my professional learning, by asking, ‘what is it that I need to know and be able to teach?’ (AITSL Professional Teaching Standard 2) I will address the ‘how to teach in the follow-up article, but in the meantime, I have perused the Stage 4 Tech Mandatory syllabus to identify the content that students will learn about in the technology-specific content under control technologies.

I have condensed it for the purposes of this article, but to explicitly state this, the syllabus document lists the content under the broad headings of tools, materials, techniques. This is the content that I **need to know**, but not necessarily how I am going to teach it. In some cases, prescriptive syllabus documents use verbs to assist teachers in the assessment aspects of their teaching. I will use the terms in the syllabus to deconstruct what I already know (or not) in answering question 2.
What I need to know in terms of Control Technologies Syllabus Content?

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Students learn about:</th>
<th>Students learn to:</th>
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<tbody>
<tr>
<td>3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects</td>
<td><strong>Materials/Inputs</strong>&lt;br&gt;· data types, formats and information as inputs of design and production&lt;br&gt;· component categories for hardware, including input devices, processors and output devices&lt;br&gt;· robots and other mechatronic devices, sensors, actuators such as motors, switches, lights&lt;br&gt;· programmable logic controllers (PLCs) and associated hardware</td>
<td>· identify and select appropriate data for use in a design project&lt;br&gt;· recognise, connect and use input and output devices to construct systems including sensors, switches, wiring, lights and motors for a design project</td>
</tr>
<tr>
<td></td>
<td><strong>Tools</strong>&lt;br&gt;· specific tools relating to control technologies&lt;br&gt;· the function, selection and correct use of a range of contemporary tools including&lt;br&gt;· simple programming languages&lt;br&gt;· simple programs that meet identified needs&lt;br&gt;· construction tools&lt;br&gt;· simple testing tools including multimeter</td>
<td>· select and correctly use tools appropriate for the construction, maintenance and management of systems for a design project</td>
</tr>
<tr>
<td></td>
<td><strong>Techniques</strong>&lt;br&gt;· program design&lt;br&gt;· compiling programs</td>
<td>· select and use appropriate program development techniques and structures for an identified need</td>
</tr>
<tr>
<td></td>
<td>· connecting interdependent devices</td>
<td>· connect interdependent devices for the purposes of a design solution</td>
</tr>
<tr>
<td></td>
<td>· modelling and prototyping systems</td>
<td>· troubleshoot problems with systems</td>
</tr>
<tr>
<td></td>
<td>· testing systems in the working environment</td>
<td>· test function of solutions for a design project</td>
</tr>
<tr>
<td></td>
<td>· industrial production methods</td>
<td></td>
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</tbody>
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Figure 3. 2003 Copyright Board of Studies NSW p. 28
Recognising Key Terms

I also need to familiarise myself with some terms found within the syllabus document. I anticipate that as I build on my existing knowledge that there will be other terms that I will need to familiarise myself with. As a starting point, I will use ‘reputable’ sources on the internet to define these terms. Questions 6 and 7 should assist in ensuring that my professional learning is accurate.

Building on the existing foundations: What do I already know?

To determine the foundations of my understanding control technologies, I will be referring to the syllabus content to determine which content I may already be familiar with.

A look at the syllabus under Materials/ Inputs refers to hardware components. Over the years I have found myself taking the odd replacement class of Stage 5 Information Software and Technology (IST). As a result I am familiar with the basic concepts found in this subject with regards to INPUT, Processing and OUTPUT devices represented in an IPO model of a computer system.

In determining whether my current knowledge is correct, and to be more efficient in my PL practices, I am also answering question 3, how and where can I access the information? In determining a simple definition, the internet appears to be a quick solution. I can always validate this information later on.

A simplistic definition of an INPUT device is, “any device that provides input to a computer” (Christensson, 2008), however, what an INPUT device or system has become can be difficult to distinguish as technology has evolved. An example of this is a separate keyboard, which can be now incorporated into the main device as a software application (app), essentially embedding the keyboard into the touchscreen.
I understand that in simplistic terms, ‘Processing’ is the central interpretation of the INPUT data and this interpretation may be manifested as information on an OUTPUT device, such as a screen, laser printer or 3D printer. From the point of view of everyday users, the actual inner workings of most devices are not clearly understood/ or too complex. As a result the processing part of a system could be considered a ‘black box’ system. A definition of a black box system is, “a usually complicated electronic device whose internal mechanism is usually hidden from or mysterious to the user” (Black Box, n.d.).

Regarding the outputs in a system, like the inputs, these could be considered as software outputs like a calculation, or physical outputs like words on a screen or sound through speakers (Techterms, 2008). As I progress through the list of content that ‘students learn about’, I become aware of the mechatronic devices, sensors, actuators such as motors, switches, lights. Having taught Stage 5 electronics for many years, I was accustomed to working with both INPUT and OUTPUT devices such as motors and switches, but mechatronics was a term I was not completely familiar with.

A quick google search has suggested that there is yet to be a universally agreed upon definition of what mechatronics is, however Rzevski (2014) provides a definition of “an engineering discipline concerned with the integration of mechanical, electronic, computer software and other technologies” (p. 20). A much broader definition by the association Engineers Australia develops this further stating that, “Mechatronic engineering is the engineering discipline concerned with the research, design, implementation and maintenance of intelligent engineered products and processes enabled by the integration of mechanical, electronic, computer, and software engineering technologies” (Engineers Australia, n.d.)
As a result of my brief research into a definition of mechatronics, I have determined that this stated interplay between the other disciplines in mechatronics is not new (term being first patented in 1971 http://www.mechatronic.me n.d), and certainly isn’t all about robotics. Most of us use mechatronic items every day.

To name a few common mechatronic devices, some of these include:

- Washing Machines
- CNC machinery
- ATMs
- 3D printers
- Elevators
- Cooking controls
- Photocopy machines
- Drones
- Sewing machines
- Air conditioning thermostats.

![Figure 7. PLC in a system (abir97 n.d)](image)

To address the final dot point in the Materials/ Inputs section of the syllabus, the Technology(Mandatory) syllabus (2003) states that students will learn about “programmable logic controllers (PLCs) and associated hardware” (p. 28).

Again, to find out what a PLC was, I referred to the internet for a quick search. I was pleased to find a simple definition stating that, “A PLC is an industrial computer control system that continuously monitors the state of input devices and makes decisions based upon a custom program to control the state of output devices” (AMCI, n.d.). Realistically, this meant that a PLC was itself an IPO system, and the programmable aspects to it is the software that instructs the PLC to perform a particular way based on the input data received.
This programming feature, immediately reminded me of my experiences in working with a LEGO Mindstorms brick in years gone by. I firstly want to openly state that I have no preferences at this stage for any particular brand, and I am not ‘plugging’ LEGO. In the past I have had a little experience with programming using the LEGO Mindstorms kits with the RCX programmable brick, not knowing it was a PLC. Since my first exposure to it, I haven’t had access to the newest LEGO EV3 programmable brick so I cannot comment on how that particular version is, but did find the RCX quite easy to use and suited my needs.

From the perspective of a complete novice, self-directing my professional learning, I remember that at the time, I needed to design and develop appropriate learning activities to enhance student knowledge of control technologies without any experience in it myself! As a result, I undertook a crash course in control technologies that consisted of placing batteries into the RCX brick and turning it on to discover that nothing happened.

The typical blokes approach of not reading the instructions, backfired, then I realised there may be some benefit to reading them. I discovered that the bricks needed to be programmed first! The program is designed and simulated on the computer, then transferred over to the brick. Doh!

**How and where can I access the information?**

Until this point, I have been relying on what I already know (A) and a few quick searches of definitions on the internet (B) to determine what I already know, and to efficiently engage in some PL where I consider the internet to be an appropriate resource.
Professional Learning Communities (PLCs)

As a technology education teacher with little experience and knowledge in control technologies, I will seek to build a Professional Learning Community (PLC) of colleagues who I know to have had some experience with control technologies in an effort to develop my subject knowledge.

With this in mind I also note that a PLC is not necessarily a stable entity, as the people within my PLC may change, shrinking or extending to suit my perceived needs. As a first step, I am going to choose people who are the exemplars of where I wish to be in terms of my own knowledge.

As a result, my initial PLC will consist of TechEd teachers who have had some experience with teaching control technologies in school settings. These teachers not only possess a greater knowledge of control technologies, but understand the nuances of teaching this in the classroom.

Based on my own knowledge and recommendations, I have chosen these teachers to assist me in this area:

- Matt Scott - The Canobolas Rural Technology High School, Orange
- Aaron Hinchcliffe - Kempsey High School

Outside of education I have also contacted a friend- Ian Power, who works in IT and has considerable experience in computer programming. I consider this man to be an expert in an industry that uses control technologies, and for the purposes of this article will refer to him as a Key Informant. Ian will not only inform me about the software (programming) side of control technologies, but will help me to filter the appropriateness of the information I gain.
Questions for my PLC

At this point in time, my motivation is to try to determine if I am on the right track with people whom I have identified as leaders in this area of embedding control technologies in education. As a result, I intend on asking them some simple questions that will help to formulate my own understanding. This strategy is different from just ‘Googling’ control technologies as it places the content in a classroom context and helps me to filter what is effective at the same time. So to avoid making ‘rookie’ mistakes, one could say that my engagement with my PLC is to “stand on the shoulders of giants”.

‘What do you consider to be control technologies, and what inspired you to learn more about it?’

Matt Scott: The Canobolas Rural Technology High School, Orange - I’ve always been keen on technology, and my interest in 3D printing lead me to read on Twitter about how the Raspberry Pi microcomputer was developed as an education tool for computing science in the UK, and how technology use in schools seems to have moved away from hardware to software - notably web design, and the use of applications. The ability to combine coding skills with controlling elements of hardware for both input and output give us great potential to move back into the more traditional computing science areas.

Student engagement has also been another motivating factor for me. Controlling a sprite on a computer screen with code is one thing, but controlling LEDs a student has soldered together on a board or controlling the same computer screen sprite with an arcade joystick is by far more motivating for my students.

Aaron Hinchcliffe: Kempsey High School - Control technologies are a form of foundational engineering principles, and disciplines, that incorporate the manipulation and sequential movement of mechatronic devices such as sensors, motors and microcontrollers. To achieve these movements or actions, a user first needs to program the relevant hardware or device through the use of algorithms, scripts and computational programming.

I became inspired to learn about control technologies after attending a Raspberry Pi professional development course with my wife at MACICT. The course itself was excellent, and provided a great introduction on the potential of the Raspberry Pi in educational settings. After doing some research around the web, we came across an abundance of projects that could be suited for senior high school students. The best of these being a retro style 80’s arcade Multiple Arcade Machine Emulator (MAME). Ahh! 1942. From the pinball machine to a computer screen, for those 80s children, many-an-hour (and 20c coin) was spent trying to master games like this, ‘Frogger’, and ‘Galaga’ to name a few.
What are you using, and how is this being used to teach control tech at your school?

Matt Scott - In Year 11 Design and Technology, students design, make and evaluate a USB powered LED lamp from a repurposed item, sourced from our local council waste recovery centre. Usually students use a simple electronic circuit kit to power their lamp. This year students have been taught how to run their lamp from a Arduino board (virtually using Autodesk 123D Circuits, and physically using an Intel Galileo) and Arduino code to control their lamp LED. Students then have an extension option to explore controlling their lamp with either a light dependent resistor, motion or sound sensor. Some will work on developing the code themselves, others will use their D&T information research skills to locate and modify existing code from online tutorials. With modification, this unit idea could easily be reworked for use in Stages 4 and 5 where a control systems task is required.

My favourite resources for inspiration and project ideas are Adafruit and Intel® Galileo University

Aaron Hinchcliffe – In 2014, Year 10 Design and Technology students were given the task to build six retro arcade machines for our school. The 12 students were required to collaborate in pairs and design, construct and document the entire process from beginning to end. The outcomes at the end were holistic, multifaceted and students learned to and about:

Building the shell of the machine from timber, soldering speaker wires to an amp, installing an operating system and other open source software applications onto the Pi, wiring up joysticks to a USB encoder, use Python to code basic functions and run how R.O.M files through an emulator.

Constructing these arcade machines was fun and really engaging for both the students and myself, although there were a few problems to solve and overcome. The hardest of these issues to solve was connecting the Raspberry Pi directly to the Internet through the DEC’s proxy server. After weeks of researching through avenues such as the web and online forums (ESNET) and still having very limited amounts luck, I found the answer to be right in front of me. A few days later, a young student who is extremely savvy with technology particularly programming languages such as JavaScript and Python, came to me to say he had purchased a Raspberry Pi. Not even a week later he had successfully built an application (which he called Pi-Proxy) in Python that can be installed onto the Pi. After adding the proxy server and user details into Pi-Proxy, the Raspberry Pi now connects directly to the Internet without any issues whatsoever. The kid is a genius and he has achieved something that no other teacher or student that I know of could do. And he did it using a $40 piece of open source technology.

The Raspberry Pi is extremely versatile and there are a number of ways in which this project could be extended or stripped back for other TAS projects. Stage 4 students can learn to program through Minecraft or build a Gameboy console similar to those designed through Adafruit.com. Stage 5 and 6 students can get into quad copters, Pi Bots, or learn to build console games such as ATARI that can be emulated through the MAME.
Thanks Matt and Aaron. So now in addition to my solidifying knowledge of what control technologies are, I am cognisant of what devices are successfully being used in schools, compatible with school IT systems and am aware of what students seem to enjoy.

Looking ahead in a future article, after I have had opportunities to physically engage in using and manipulating with control technologies, I will revisit my PLC to ask them to validate my learning in terms of accuracy. It is important to ensure that in my autonomous professional learning journey has not gone-off on a tangent. This validation can be classed as ‘Testing the Learning’ found in the graphic below.

The ‘so what’?

As TechEd teachers, what can we take from this article? In undertaking my professional learning journey into Control Tech, at this point it is important to emphasise that the journey has not arrived at any destination, but rather it has reached important milestones in its continuation.

What has been interesting is the explicit visibility of the professional learning process. From a visual perspective, the process has been mapped in the graphic below.

In terms of reflecting on what I have learned, I now have solidified my understanding around the terminology used in the syllabus, I have a basic understanding of what control technologies are and thanks to my PLC possibly how I could implement this is the classroom. I anticipate the next part of the journey incorporating experiential opportunities where I will ‘play’ with the technology to deepen my expertise.

References


LittleBits makes it look easy

How is, or was electronics run at your school? Remember the days of the Dick Smith ‘Funway into Electronics’ kits and the ongoing fault finding sessions to find a bridged ‘veroboard’ track, electrolytic capacitor in backwards, or even a dysfunctional circuit due to the poor conductivity of a frosted solder joint.

Electronics technology has certainly been a contemporary technology for students to engage in for quite some time, but anecdotally speaking, part of the limitations of electronics is the semi-permanency of the assembly process—soldering. Even though students can reach for the solder sucker or braid, removing soldered components isn’t easy! Individual electronic components are soldered in place with the intent of not being removed again.

To work around this, products such as bread boards, and the spring and screw mounting boards (supplied in kits such as Jaycar electronics and Dick Smith) enable students to prototype their circuits prior to picking up the soldering iron. In recent times, software programs that ‘debug’ and test circuit designs assist in the prototyping of circuits virtually.

Arguably, these products, though very effective and beneficial in circuit design are constrained by the users limited understanding of electronics. An odd and obvious statement to make (especially coming from an old electronics teacher), but in my experience in electronics, it is the lack of understanding of both the teacher, and the students that limits the classroom projects to the tried and tested circuit designs found in books and magazines, impeding creativity and innovation. What the result is is that blind innovation, where students can just ‘assemble a heap of components together and see what happens’ is restricted as it is aligned with student understanding of electronics.

I can see many readers out there saying, “yeah der- of course”, but to provide some clarity for my argument, a circuit as simple as a getting an LED to light up can be hampered by issues such as:

- LED wired in the wrong way
- Some short where the current bypasses going through the LED
- Battery connected wrong way (very difficult to do I admit)
- Poor conductivity (possibly due to soldering)
- Resistor too large
- Dead battery
- ‘Blown’ LED

Figure 1. Prototyping on Breadboard

Figure 2. Simple circuit
Enter ‘LittleBits’

A new ‘startup’ company that was founded in 2011 can be considered ‘new’ with an online shop that opened less than a month ago. LittleBits offers a different approach to designing prototypes with electronics where students can select an input device(s) and attach these to output device(s) to see what happens. The beauty of this approach is that using this modularised approach, students can experiment using an experiential approach and relating effect to causal situations.

In mitigating the incorrect assembly of circuit components- making them ‘kid-proof’, the snap-together modularised approach was developed by ‘LittleBits’. This concept uses magnetic electronic modules that snap together in a particular way- the only way.

Figure 4. LittleBits allows users to prototype circuits through snapping ‘bits’ (modules) together without the need for soldering. One of the benefits is that the bits always go together the correct way.

*NB*> Note the text on each bit that informs the user on the name of the components, and the direction they should be snapped together.

The beauty of a product like this is that users can use the bits to prototype their circuits, or to construct a project, then the pieces can be stripped down for the next user. The modules require no soldering or programming (I lie, there is one Arduino module that allows for programming).

In pondering the application of products like LittleBits, one can imagine design projects that integrate the use of 3D printed components, Lego, or Arduino. Under the heading, ‘Who is using LittleBits’, is an example of the application of the product.
Colour-coding the bits (modules)

To enable users to piece together prototypes more efficiently, LittleBits uses a colour-coded system. As an example, the colours can quickly display to users whether the bit is to be used as an input or an output device.

LittleBits colour-code:

- The blue module is the power source
- Pink modules are the inputs
- Orange modules are used as connecting wires
- Green modules are outputs

Figure 5. Example of the modules from base kit

At $99 for the base kit containing 10 modules, the modules aren’t cheap, but can be reused over and over as a prototyping tool. Presently, LittleBits states that they have almost 70 different modules and a variety of different kits and expansion packs. It appears that they intend to expand on this.

The LittleBits site provides much more information such as lesson plans, the different kits, and the projects.

To access the site, click here: [http://LittleBits.cc/](http://LittleBits.cc/)

For more information on the development of LittleBits and an insight into the founder Ayah Bdeir’s motivation, you can watch the following TED talk:

[https://www.youtube.com/watch?v=YguB-keZ4Tk](https://www.youtube.com/watch?v=YguB-keZ4Tk)

[https://www.youtube.com/watch?v=XNEWQBlPCY](https://www.youtube.com/watch?v=XNEWQBlPCY)
Who is using LittleBits?

An example of the use of LittleBits in primary education is Amnon Carmel from Sydney. Amnon is the founder of TechScience Australia. In addressing the potential shortfall between the curriculum and the reality of primary education, offering after school Science and Technology Programs, as well as Robotics, and ‘Makerspace’ workshops to primary students. Amnon’s business ‘TechScience Australia’ has been using the LittleBits modules to encourage safe innovation and the development of a basic understanding of electronics. Video examples of Amnon’s work can be found in the link below.

http://www.techscience.com.au/#!makerspace/c9cv

The ‘TechScience BitOlympics’ video demonstrated the outcomes from a 1.5 hour workshop.

Figure 6. Gallery of Amnon’s work from the TechScience website.
International Research in Technology Education

Pupils’ Attitudes Towards Technology (PATT) conferences are events where international researchers in technology education come together to disseminate research around given topics. The latest Proceedings from the PATT29 conference in Marseille are found in the link below.

- From the 2015 PATT 29 Conference in Marseille, France

Conference Proceedings:

Plurality and Complementarity of Approaches in Design and Technology Education. Edited by Marjolaine Chatoney. [https://hal.archives-ouvertes.fr/hal-01161553/document](https://hal.archives-ouvertes.fr/hal-01161553/document)
Student Teacher

TIM BARRY – University of Newcastle

Who is the future of technology education? What are their qualifications and skill-sets? This section of the journal provides a snapshot of high performing pre-service teachers to gain a better understanding of their journeys, thoughts and experiences thus far.

Tell us a little about yourself Tim

I grew up in a little town called Forster on the mid-north coast. I always enjoyed Design and Technology and Industrial Technology at school, so after graduating I decided to pursue my interest in design and moved to Sydney to study Industrial design at the Enmore Design Centre, before transferring to the University of Newcastle where I attained my Bachelor’s degree.

Since then I have been floating backwards and forwards between Newcastle and Sydney doing a bit of everything, from overflow design work to working as a barista all while studying and still trying to maintain some sort of social life.

How has your postgraduate degree assisted you in your studies at University of Newcastle?

I came to the Masters course in Newcastle with an undergraduate degree in Industrial Design, so the Master’s degree for me has been more about taking my knowledge of design and adjusting it for use in the classroom. A lot of the skills have been transferable, however there has still been plenty of learning along the way. The Master’s degree has provided me with multiple opportunities to get into a classroom, whether that be for practicum, mentoring, or technology days, where we were taken into schools in our first semester and given the opportunity to teach small groups of students the design process. This has allowed me to put theory into practice and helped build my confidence in the classroom.

It is always great to have people moving from various TechEd related industries into Education, as I see it as a way of validating our content with the workplace. Seeing that you have an Industrial Design background, do you think the design process we teach in Tech(Mandatory) and Design and Technology is true to the profession? If not, are there any ways that we can improve on our practices?

I have found that the design process matches up reasonably well with the one used in industry, I did however have a little disagreement with one of my lecturers in my first semester as to where research belongs in the process. The other Technology Masters student and I were both adamant that research should be done before any idea generation begins. I feel that exploring a concept too early in the process sometimes leads to tunnel vision where the student or designer can’t see past their initial concept.
I can see many of our readers out there nodding their heads Tim. Many a challenge in the classroom is encouraging our students to entertain alternate designs. What we as teachers need to consider is that even though there are defined ‘stages’ of the design process, the sequence of some of these stages is fluid (as we know, evaluation is ongoing, yet often represented as a final stage of the process). In some cases, the act of idea generation is an act of research in problem-solving. The testing of ideas of paper (or the computer), we often evaluate how a design may look in terms of its aesthetic appeal, its proportion and how certain components may interact with another.

“It don’t think outside of the box; I think of what I could make using the box”

Unknown

It is always good practice to reflect on what ‘effective teaching’ is. Once we can recognise it, we can adjust our pedagogy to replicate it. Tim, over the years as a product of the education system, you have observed effective teaching, and now have an idea of what effective teaching is. In your opinion, what makes an effective teacher?

I don’t feel there is a one size fits all approach to being an effective teacher, as what works for some, may not necessarily work for others. Personally I believe an effective teacher, above all else, needs to be flexible, passionate and available.

All good characteristics Tim! At Forster there must have been some influential TechEd teachers that demonstrated these characteristics for you to want to become a teacher. Who were these teachers, and how did they inspire you?

I had both Tony Morell and Greg Glanville for Industrial Technology and Design and Technology throughout school. I was lucky enough to be part of the first year group to go through the senior years at the then new senior campus in Tuncurry, which meant we had a brand new workshop full of toys at our disposal. The entire campus had a focus on creating an adult learning environment, and both Tony and Greg embraced this philosophy always making me feel welcome in the workshops and donating their own time to help students with their projects.

This issue of the journal has an article relating to the professional learning of control technologies. As a beginning teacher, it is acknowledged that you will not possess all of the knowledge and skills you require to teach effectively. The mind-set of a successful teacher is one who subscribes to a life-long approach to professional knowledge. How are you intending on bridging some of those ‘gaps’ in your teacher preparation?

From my experiences on practicum, there is a wealth of knowledge in most Technology staffrooms, so where possible, I will draw on the experience and expertise of my peers. If or when these teachers get sick of me asking questions, I can always retreat to the World Wide Web where online communities such as ESNET are full of people who are more than happy to share their knowledge and experiences.

It has been demonstrated that collaborative approaches to Professional Learning are very effective. The terms Professional Learning Networks (PLNs) and Professional Learning Communities (PLCs) are quite common in educational discourse these days.
Tim, this is your opportunity to promote yourself to any potential employers. What skills, knowledge, and characteristics do you possess that would make you a great asset to any school?

I feel my greatest asset is my undergraduate degree and my passion for design. Having studied and worked in the industry, I have developed strong ICT skills and am well versed in the use of multiple CAD programs such as Solidworks, Creo and Rhino 3D, and I feel my real world experience with design projects, portfolios and project management would be a great asset to any school. I have had the opportunity to work with some well-respected design firms in Sydney where I worked on packaging designs for Aldi through to design projects for the Government.

Finally, given the opportunity to play around in your workshop, what would we find you doing?

I have been blown away by some of the technology and tools available in the different workshops I have had the privilege of visiting. Given free-reign, I don’t think I would know where to start. Vacuum forming, 3D printing and a metal workshop sounds like the perfect recipe for some custom motorbike parts.

Thanks for your time Tim, it has been great learning a little more about you. Good luck with your remaining studies.
The Storeroom

In the Storeroom you will find a small number of resources available to IIATE members

**Suppliers and Text Resources**

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**Paul Copeland texts**

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Email Richard Paine: ad2000book@bigpond.com

**Web Resources**


NSW BOS Website- Sydney Harbour Bridge

Working with phone projects?

- Aluminium [CNC iPhone case](#)
- Wooden smart phone case
- Veneered smart phone case
- Timber veneer iPhone case

**Events**

- **2015 IIATE Annual Conference**
  
  STEM: Changing Focus – 15-17th of October,
  
  Sydney Masonic Centre

- **Term 4 IIATE Council Meeting, 31st of October,**
  Cherrybrook Technology High School

  All members are welcome to attend. If you have an item that you would like added to the agenda and you are able to attend and discuss the item please contact Grant ‘off-list’ ([grant.byrne@det.nsw.edu.au](mailto:grant.byrne@det.nsw.edu.au)) to discuss this. Please rsvp by the 14th of July to [grant.byrne@det.nsw.edu.au](mailto:grant.byrne@det.nsw.edu.au) for catering purposes.

**Technology Education Associations - Australia**

IIATE NSW  IIATE Blog page

INTAD QLD (This will change to DATTA QLD)

DATTA – Australia (includes links to all State Technology Education Associations)

**International Technology Education Associations**

DATA – UK  ITEEA – USA  TENZ- NZ

**Related Associations**

The Warren Centre

Re-Engineering Australia Foundation