Inside this Volume of the IIATEJ

WHS Innovation

2014 Conference

Churchill Fellow-
Alesha Bleakley

Teacher Expertise & Professional Learning

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- Bruce Lewis
- Dean Maddock
- Sollya Richardson
- Ruth Thompson

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.
Welcome to the first IIATE Journal of 2015. Inside this issue are some interesting discussions with members of our TechEd community. My editorial this issue is to introduce the theme of ‘teacher expertise’.

Teacher Expertise

Often ESNET (Engineering Studies Network) commentary resonates around a contemporary concern regarding teacher training and expertise as our recent graduates take the reins from those retiring from face-to-face teaching (NB> I deliberately stated face-to-face as we have many members who are retired, yet are active contributors to the TechEd community). I often ponder the question, where is Technology Education headed as the curriculum has evolved over time? And in this internal dialogue, I contemplate my limited knowledge and experience and analyse the new knowledge and skills I need to continue to make my teaching relevant. To ‘fill in the gaps’ of my own expertise, I seem to be continuously reading, watching videos, and I find myself sifting through the discussion threads on ESNET, or surfing the web. I also relish the opportunities where I can learn from the informal conversations held over a coffee or a few cleansing ales as I converse with those either more experienced, or those in my classes who are bringing new perspectives and skill-sets to TechEd. The main purpose of this quest is to seek advice from those who may have ‘blazed the trail’ before me, learning from them and avoiding their mistakes.

In education, the required knowledge, skills and understanding are just one piece of the puzzle, as the essential content knowledge needs to be complemented by our understandings and skills delivering this content to teenagers in an educational setting that is going to maximise student learning- pedagogical knowledge. In 1986, Lee Shulman labelled this interplay as Pedagogical Content Knowledge (PCK). We often may just label this as good teaching, but likened to an episode of ‘Welcome back, Kotter’, we watch the experts in our field, craft fantastic lessons with the wiliest bunch of students, and somehow still achieve remarkable results (for those students). Yes, this is where pedagogy can be defined as an art!

As Technology evolves, so will our curriculum.

Unfortunately, what I have witnessed over the years, is a vast amount of knowledge and experience sign out of ESNET as seasoned educators take their well-earned retirement. I recall a conversation with Gary Lyon (Coffs Harbour High School) who had suggested that all teachers in their last year of teaching work with mentor teachers who are new to the profession (I hope I got this right Gary?). By no means is this sour grapes as retirement is hard-earned, but the point I am making is that it is regrettable to see the education industry allow experienced TechEd teachers who could have spent four decades honing their skills teaching, pack the caravan and
drive off leaving recent graduates the challenge of making the same mistakes as they fumble their way through PCK.

Demonstrated in John Hattie’s research on ‘Visible Learning’ in 2009, is his ‘effect size’ charts that rank more effectiveness of educational outcomes. In his research, he discovered that the development of new teacher’s content knowledge and teacher training is less effective to student outcomes compared to development of teachers ability to teach what may be considered as ‘best practice’.

As teachers, we are required to deliver ‘specific content’ and to assess student understanding of this content using various methods. The content we deliver is mandated by the syllabus documents we teach from, but as discussed later on in this editorial, this is only one part of the curriculum. This is where the development of teacher expertise is important. In acknowledgement of the diverse nature of our ‘Learning Area’ or discipline, what could be considered as adequate graduate teacher knowledge and skills in our discipline is arguably unobtainable in teacher education programs (Darling-Hammond et al, 2005). See the article by Sollya Richardson p. 25.

Realistically, teacher education programs can only provide ‘foundational’ knowledge at best. An example of this is the scope of the NSW Board of Studies 7-10 Industrial Technology syllabus which covers eleven different focus areas. The beauty of such a wide scope is that it caters for the diverse interests of students, and possibly those interests common to their communities, however the reality is that teacher expertise, students numbers and the ‘set-up’ of the school workshop’s plant and equipment may sadly narrow this scope dramatically.

Focus areas from the NSW Board of Studies Industrial Technology 7-10 syllabus (2003), page 15.

- Automotive
- Building & Construction
- Ceramics
- Electronics
- Engineering
- Farm Maintenance
- Leather
- Metal
- Multimedia/Photography
- Polymers
- Timber

So what is the answer? Acknowledging that teacher training is only the beginning of a teacher’s professional learning, an article edited by Darling-Hammond et al. in 2005, suggested that teacher education should seek to develop the expectation and strategies that will enable teachers to become effective lifelong learners. In support of this concept, the focus on professional learning aligns with the Australian Institute for Teaching and School Leadership (AITSL) who established teaching professional standards to promote excellence in teaching to maximise student achievement. The 2012 AITSL ‘Australian Charter for the Professional Learning of Teachers and School Leaders (the Charter)’, states that professional learning should display the characteristics of being Relevant, Collaborative and Future Focused!

“To successfully prepare effective teachers, teacher education should lay a foundation for lifelong learning.”

(Darling-Hammond et al, 2005 p. 359)
To focus on just the collaborative characteristics of professional learning, Technology Educators must seize the opportunity to develop professional learning networks or communities to ‘fill the gaps’ that may exist in their content and pedagogical knowledge. To develop teacher expertise and maximise student achievement, communities of technology educators in a mentoring capacity need to collaborate. I am not saying that this doesn’t exist, as the IIATE is an excellent example of support through collaboration, but in a dynamic and ever-changing curriculum, backed by research into the importance of teacher professional learning, the nature of Technology is that it will continue to change! As a result it is important to be cognisant that due to the ‘point-in-time’ nature of our teacher education, we need to acknowledge that as technology evolves, so will our curriculum, and therefore, we need to undertake professional learning to become familiar with a new curriculum.

I apologise to those who have been actively mentoring staff, as I am attempting to communicate with those who have an opportunity to ‘make a difference’. In doing this I say to those ‘short timers’, who are rapidly approaching retirement, to leave your legacy on the next generation of TechEd teacher before the door hits you on the backside on your way out! Make an argument for Principals to allocate time for you to impart your knowledge and wisdom on those who will be taking the baton from you.

The responsibility doesn’t stop there as recent graduates or inexperienced teachers (could be experienced, but inexperienced in teaching a particular subject) also have an opportunity to make mentoring symbiotic so that there is a mutual benefit for both experienced and inexperienced teachers to invert the roles of the mentor and the mentee.

Expanding on the work of Shulman’s PCK was Koehler and Mishra in 2009. Their research seemed a natural progression as the diffusion of technology into everyday teaching practice called for Technological Knowledge to be added to PCK to create a framework called Technological Pedagogical Content Knowledge (TPCK) or TPACK. Noting that there is a distinct difference between ‘Technological Knowledge’ and a knowledge of Technologies in a TechEd context, the development of the TPACK framework is still very appropriate to TechEd teachers as we incorporate technology into our teaching every day. An example of this is the pedagogy we use when demonstrating to students how to extrude a shape in Creo, or to troubleshoot a problem encountered when a 3D print doesn’t turn out as expected. These are opportunities for the inexperienced teachers to become the mentor, assisting experienced teachers in embedding technologies that may be considered emerging or recently emerged into their lessons.

Sourced from: http://tpack.org
Further reading


Curriculum

Related to the theme of teacher expertise is the evolution and importance of curriculum in our teaching and learning as we need to understand it in order to teach it (Shulman, 1986). To make the connection between curriculum and teacher expertise, this issue will contain an article on our 2014 Churchill Fellow, Alesha Bleakley. In a win for the TechEd community, Alesha was a successful candidate for the Fellowship program, and this has resulted in her having the ‘ultimate’ professional learning opportunity in developing her own expertise of Technology Education internationally. The article on Alesha will touch on the notion of curriculum, and how it has influenced the specific teaching and learning activities that occur in classrooms across the world. As a result, the rest of this editorial will discuss the concept of curriculum, seeking to explain how a syllabus is just one component, and how curriculum is a dynamic concept influenced by the teacher and other ‘commonplaces’. This is the nexus between curriculum and teacher expertise, and how one influences the other as expert teachers find opportunities to ‘value-add’ to any subject.

To discuss curriculum and where teacher expertise fits in, I will refer to the work of Shirley Grundy (1998) who not only writes about curriculum as an object, but an action. To entertain the concept of curriculum as an action, Grundy was influenced by the work of Joseph Schwab (1969) and his four commonplaces that determine curriculum. Grundy recognised the dynamic interplay between these elements:

> “Those who can, do. Those who understand, teach.”
> (Shulman, 1986 p. 14)
**Schwab’s four commonplaces of curriculum.**

It has been recognised that the quality of the teaching directly related to the achievement of educational outcomes (Ladwig et al, 2007), and the combination of these four elements that will ultimately determine what, where, how, and who we teach that determines the curriculum. Though labelled differently, these combination of elements, are found to significantly determine the quality of education. Aiming to improve the quality of education through the development of the teacher, relevant state Education Authorities have embedded these elements within their pedagogical frameworks such as the QLD Productive Pedagogies, and the NSW Quality Teaching Framework (2003).

To keep the discussion light, I have used the metaphor of baking a cake, placing it in a Food Tech context when discussing Grundy’s pedagogical view of curriculum, and branched into other technology areas where relevant. To elaborate on the link between cake baking and curriculum, let us consider the self-raising flour as the subject matter, the chocolate, cocoa powder, vanilla and sugar as the teacher, the eggs, milk and butter as the students, and finally, the oven and equipment used to make the cake as the environment or milieu.

**To explain the relevance of the cake metaphor, the four elements will influence the final result as follows:**

**The learning environment**

Let’s assume that we all know the impact that an oven that can maintain a consistent – and accurate temperature, and a well-greased cake tin will enable the cake to rise to it’s fullest potential. The importance of the environment is similar in teaching as we develop learning environments to enable our students. Expert teachers provide safe environments where students can develop knowledge and offer activities to build on this, challenge and test their knowledge, and apply it to new contexts to deepen their understanding.
In another TechEd context, the simple practical demonstration takes the information off the page, and places it in a contextual environment that caters for the visual and tactile learners. In this setting, technical terms and procedural knowledge are used in a situation for our students to observe, and remember before practising themselves. So in linking this to the role of the environment in curriculum, how would your pedagogical approach in teaching the characteristics of thermoplastic polymers differ from being timetabled in a workshop (with a strip heater) to that undertaken in a generic classroom? This is Grundy’s pedagogical view of curriculum, and an example of how it can diversify as an action!

Subject Matter
The self-raising flour is a stable ingredient, we know it to provide the texture and the structure to the cake. It's elasticity is dependent on its interaction with the other ingredients as it forms gluten. Much like our syllabus documents -the subject matter, which provides structure for us to design and sequence our classroom (workshop) activities. The more descriptive the syllabus, the more structure it contains.

In another technology context, If I was given a year 10 Industrial Technology – Metal class to teach, the content, both theoretical activities and assessment may be determined by how descriptive the syllabus documents are – we will call this the subject matter. In NSW, our syllabus documents are quite descriptive as they guide us, but also allow for some flexibility, for example: In the context of studying Metal Fabrication -Specialised Module 3, a Year 10 Metal student will learn about, “industrial manufacturing techniques in metal fabrication including the application of computer-aided manufacture (CAM)” (p. 102). This is good because it is important for our students to learn about contemporary manufacturing processes, however when it comes to what the student will demonstrate, they are required to, “compare and contrast industrial processes with those undertaken in the classroom”. In this case the syllabus does not require students to use CAM to manufacture projects, why? I am not seeking to explain all of the decisions made during syllabus development, however it would be safe to assume that currently not all schools have CAM facilities. Therefore to explicitly state this in a syllabus document would exclude some schools from offering Metal Fabrication -Specialised Module 3. This is the flexibility, or ‘wiggle room’ mentioned previously.

Students
Without any tongue in cheek references to being a good or bad egg, I have likened the fresh ingredients to the students. These items are dependent on the environment they have come from, free-range or caged, there is a difference in taste. Our students may have a background that was stimulating, where they were encouraged and deep knowledge was nurtured. They may possess the attributes of a leader, a problem solver, or be wonderfully enthusiastic. These students have a lot to contribute to our classes.

Teachers
Last but not least are the teachers. The ‘sweeteners’ that value add to the cake mix, it is the expertise of the teacher that value adds to the learning of the student. In creating and maintaining a learning quality environment expert teachers know how to manage the learners, and have a deeper understanding of the content that facilitates the transfer of knowledge.
When it comes to metalworking, I can get by, but I still have a lot to learn from others. In my own teacher training I consider myself lucky to be taught by Barry Webster (in his amazingly clean, white dustcoat) and past Head Teachers throughout my teaching career. I am mentioning this because if I was to compare the projects and my approach to solving practical problems against a legendary metalwork teacher like Gerald Harding (formally of Bellingen High), the teaching and learning activities my students would undertake would vary greatly.


Additional reading


- Lee Shulman’s 1986 journal article: http://math.k-state.edu/~bennett/onlinehw/qcenter/shulmanpck86.pdf

Dave Ellis

Editor
Welcome to a new year at school. I hope your holiday was a time for relaxation and reflection of 2014 past and consideration of 2015 coming.

I need at this point to thank our immediate past President John Perdriau, for his leadership over his tenure. Under his presidency the IIATE grew from a small group to an organisation with a large membership, represented by most schools in the state. His inimitable meetings style will surely be missed as well as his enthusiasm for the continued development of curriculum. I wish him a long and enjoyable retirement.

The end of 2014, saw the annual conference combined with the 8th bi-annual Technology Education Research Conference (TERC) and the first DATTA Australia conference. This was a great success with well over 300 conferees (international, national and local) able to attend sessions ranging from the latest research on assessment to teaching approaches using Biomimicry to hands on skill development activities. Keynote speaker, Richard Kimbell’s discussion on comparative assessment stimulated a great deal of discussion not only for its research based approach but also for its pragmatism and applicability to the classroom.

Conferees were also able to investigate new equipment and resources by attending the industry exhibition. I extend my sincere thanks to the organizers of the conference for all their hard work.

2014 Teacher Excellence Awards

I would like to congratulate the recipients of the 2014 Teacher Excellence Awards, Scott Sleap, David de Bruyn and Matthew Scott along with Alesha Bleakley, recipient of The Northern Districts Education Centre (Sydney) Churchill Fellowship, 2014. These four teachers are forward thinking, hardworking and creative technology (STEM) educators and well deserve the accolades awarded to them.

Top left to bottom right: Scott Sleap, David de Bruyn, Matt Scott and Alesha Bleakley.
STEM as you know is an acronym for science, technology, engineering and mathematics. It is used to refer to “the interdisciplinary pedagogy where technological/engineering design-based learning approaches are integrated with concepts of science and/or mathematics education” (Sanders, M (2012) Integrative STEM Education as “Best Practice,” International Technology Education Research Conference, Queensland, Australia).

STEM is a major driver of innovation and productivity in modern, information-based economies. A ‘STEM literate’ person is someone in the knowledge-based economy who has the ability to understand and accept changes driven by the new technology, work with others across geographic and cultural borders, anticipate the multifaceted impacts of their actions, communicate complex ideas effectively to a variety of audiences, and make informed decisions, devise creative solutions and create new products and processes.

There is a strong connection between these ‘pure sciences’ and technology. Technology is the outcome of creative and critical thinking and it has played a major role in changing the way people live over time. Since the industrial revolution, advances in the STEM disciplines have driven exponential technological innovation and economic productivity.

The hallmark of STEM in the classroom context is the application of science, technology, engineering, and mathematics in an integrated manner to make real-world connections and solve problems collaboratively. In NSW, this approach is nurtured in students from the outset of their school education, specifically with the K-6 Science and Technology syllabus. At the secondary level, there is a wide range of courses which enable authentic STEM educational outcomes.

In 2014, Peter and I attended the International Technology and Engineering Educators Association (ITEEA) conference in Orlando. This is the 6th such conference we have attended, from 2006 - 2014. Over this period of time we have listened to much discussion about the effect of STEM education on the technology learning area in the international forum. In general terms, the T and E disappeared very quickly from the dialogue surrounding STEM education and it took technology education teachers a considerable amount of time and energy to bring the T and E back into the mix.

Over the past year I have become increasingly concerned that the language of STEM in the NSW dialogue is reflecting that of the USA that is the T and E are becoming subsumed by Science and Maths with technology consisting of the use of ICT’s in the science and maths classroom. In order to redress this imbalance in the discussion surrounding STEM education, we should be talking loudly about our subject area and how we have, for many decades, integrated science and maths concepts into our technology and engineering subjects. We are the original STEM teachers and should take every opportunity to remind our colleagues in other faculties, our parent body and our local community of this fact.... and to support our colleagues in their endeavours to make Science and Mathematics teaching more engaging.
Finally, to the Australian Curriculum

The current status of the ACARA Australian Curriculum: Technologies is that it remains unendorsed by the ministers of education, both nationally and in states and territories. The review of the Australian Curriculum put in place by federal minister Pyne has resulted in some further clarification of the Australian Curriculum being needed. NSW BOSTES has no further plans at this time to implement any more than the current work in English, mathematics, science, history and geography in various stages from year 1 to year 12. HSC courses in English, mathematics, science and history are in the early stages of review and new syllabus development.

Technology teachers in NSW are to continue to teach all of the existing syllabuses, engaging new technologies and materials and tools and techniques that continue to meet existing syllabus outcomes.

I wish you a successful and enjoyable 2015.

Ruth Thompson
President (IIATE)
Head Teacher (Industrial, Engineering and Information)
Northern Districts Education Centre (Sydney) Churchill Fellow, 1998

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Hi Bruce, I wish to interview you about your journey in the realisation on one of your innovations - your WHS product OnGuard. Also for the purposes of highlighting your innovation process, I will enlarge particular terms for our readers.

As someone who has subscribed to and used OnGuard for many years now, I have seen the product evolve and improve over time. The purpose of this article is to provide others with some insight into how you got started, maybe some of your highs and the low points, as well as some advice for our readership who may be floundering at the beginning stages of product development.

Bruce, you are an experienced Technology Education teacher (trained in Industrial Arts) who has worked in both State Departmental and Catholic systems. Can you describe the situation, or the time when ideas about OnGuard first started coming to mind?

I have always had a firm belief that students in my care must be instructed well when it comes to safety. As far back as 1982 I was preparing safety booklets for my metalwork and automotive classes. I was teaching at Shalvey High School in Mt Druitt and literacy was a huge focus of the Disadvantaged Schools Program in the Met-West region at that time.

In 1998 I was teaching in a small country school, and the Principal appointed a new member to my faculty. The teacher had no previous experience teaching in technology workshops, so I called the regional head office, NSW DET in Sydney and NSW WorkCover. I needed to know what my responsibilities were, and where I stood in the event of a student...
getting seriously hurt. My research indicated that I in fact, had a ‘duty’ to make sure I did everything I could to eliminate any ‘foreseeable risk’. (BTW - this is where experience working in workshop environments equips the experienced TechEd teacher)

I documented my findings and then I started to produce my faculty policies and procedures – in essence to protect myself from any possible legal issues if a student was injured. Then I created safety training resources for students to back up my policies and procedures. My aim - student safety training was to be consistent across all classes and independent of the workshop teacher!

Apart from your independent research, how did you come to the realisation that this was something that may be a product that others could benefit from?

My partner Deborah Jones commented one night on what was I working on? She asked why I wasn’t utilising resources found in the library. I advised her that there were no such resources. She suggested that perhaps other TAS coordinators would be interested in such a resource and even consider buying them. It was 1999 and I was about to attend a TAS teacher conference. This seemed a great opportunity for me to present my resources and gauge if there was any interest. So I took along a print copy of my new faculty policies, procedures and safety resources.

In terms of market research, I showed my ‘stuff’ to the group during one of our evening ‘bonding’ sessions. After a few beers and a port or two (just a few Bruce? - Dave), everyone liked what I had produced and several asked: “How much do you want for a copy for this stuff?” My hard work it seemed could indeed transform into a saleable product! OnGuard was born.

In the meantime Deborah researched mailing list companies to determine ways to communicate our marketing message.

The ‘product’ needed a name. It was originally called ‘TechSAFE’ – OH&S Guide for Head Teachers. It was a partnership with my partner Deborah Jones. Deborah worked as a financial planner and had an established home office with staff. We called the new business - ITE Services. Having this office backup was critical in establishing the business – staff, phones, fax machine, internet, photocopier, post box etc. We initially sold ‘TechSAFE’ – OH&S Guide on CD. The ‘OnGuard’ section in the ‘TechSafe’ Guide included over 60 blackline safety tests for TechEd.
machines and powertools. Teachers started calling the TechSAFE CD, the ‘OnGuard’ Safety CD – because all they really wanted was the safety tests, so we eventually changed our name. In 2008 we created the company ‘OnGuard Safety Training Pty Ltd’. Some sixteen years on, the current ‘OnGuard’ range of products looks nothing like the original.

Bruce I am trying to get an idea of what expertise you possessed at the time to help you realise this innovation. If we were to try to unpack some of this, what experience did you have, and what were the gaps in your knowledge and skills. I am assuming you have built on these along the way in realising OnGuard?

I have always been computer savvy. My dad had a Tandy TRS 80 business when I was at Sydney Teacher’s college, and I helped him set up. I have been a faculty Head Teacher from the age of 30, and in that time I was proactive in my use of computers - starting with an Apple Ile in 1987, progressing to PC laptops (1990), the BBC Acorns (1994), then Apple Macs and PCs through to 2007. This gave me a good foundation in basic network and computer use. I was also a Curriculum Coordinator, and became quite proficient at using desktop publishing software to develop subject booklets. Then I taught Stage 6 Industrial Technology – Multimedia for a number of years. The new knowledge and skills that I have acquired since 2000 have included: web site design and creation, server technology, MYOB accounting, Copyright and Intellectual Property, business administration, marketing and of course WHS Legislation. My learning curve has been quite steep with regard to learning new software. Some programs include: MYOB accounting suite, TextaLoud, HTML Protect, Camtasia, Acrobat Extended Pro, Corel Draw, MS Expressions and many more.

This certainly seems to also demonstrate the evolution of technology and how your skills and knowledge have also had to adapt over time. This is evidenced by your transition from CDs to the delivery of your products over the internet and now the use of mobile devices. It must be difficult to manage some of the more technical aspects in working with computers. Do you have any help?

Yes. Since 2006 I have had a contract programmer – Adam – who works on OnGuard with me. In 2008 we moved the OnGuard product to a cloud solution, so he looked after all of the server aspects and assisted me with the coding and scripting of all the new features in the program. We have worked closely together recently, on the new ‘Just-In-Time’ Mobile Web, utilising mobile devices and QR Codes. It only took us 7 months from conception to completion. Deborah’s role as our Business Development Manager involves the marketing and administration of the business and dealing with our clerical/accounts office staff on a daily basis. This is great as I don’t have to get involved in this area of the business and I can continue to focus on product design and delivery. We of course have an accountant, a lawyer and an IT guy that looks after our office network.

A few years back we employed a NSW Sales Representative – Trevor (a retired NSW Industrial Arts Head Teacher, who many of our readers may already know). Trevor and I taught together as ‘first-year-out’ teachers in 1978. Trevor has added considerable depth to the services we offer
to schools in NSW. He conducts workshop safety audits, trains staff in the use of OnGuard ACEProPLUS and provides professional development by conducting ‘currency’ machine training for workshop teachers.

*This journey has been both a lonely and courageous one, with a lot of risk taken on by you. At the end of the day, if you don’t sell your product, you won’t eat! What has been some of the successes that you have enjoyed with the realisation of OnGuard?*

Lonely? Courageous? Risk?
Not really Dave. 😊
Just head down, bum up and mouth shut. When I look back on my teaching career, it offered me heaps of opportunity and experience, but it didn’t matter how hard I worked or the long hours I put in every day, I was really only a ‘soldier ant’. Starting OnGuard and leaving teaching has given me a new and invigorating outlook on my work life.

In terms of success – I know in my heart that OnGuard is helping fellow Industrial Arts (TechEd) teachers all over Australia. Two awards that we have received include:

- **2006 NSCA National Award – Best OH&S Training Program**, and
- **2008 QLD Finalist in the Telstra Small Business Awards**.

OnGuard has had continued growth since we began. The business first started in 2000 and when I was still teaching – it was a hard slog – I worked every weekend and all my holidays on OnGuard. The business grew to the point that in 2008 I resigned from teaching after 30 years and worked full time on OnGuard. The business experienced significant growth due in part to my increased focus. Another significant event was the signing of the Catholic Archdiocese of Sydney in 2012. This signalled an impressive feat – every Catholic diocese in NSW was now using OnGuard.

We currently have about 35% of all high schools in Australia using OnGuard, across all three education systems. Considering our market penetration in WA and SA is minimal, the percentage of schools using OnGuard in the eastern states is closer to 50%!
As you know teachers can be pretty liberal with the copying and situation of other peoples work. How did you go about protecting your innovation, and has there been any times where you have had to remind teachers regarding intellectual property?

YES - constantly. We have been very clear and upfront that our business model changed in 2008 to one of a subscription based licence – much like Foxtel. The more you subscribe to, the higher your subscription.

We know that even when schools cancel their subscription, they continue to use paper copies of our resources. We also know, that they know, they are breaking the law. We are a member of Copyright Agency Limited – an organisation that audits workplaces including schools for copyright usage/infringements. These audits result in a monetary charge for the resources used in schools according to their findings. These charges are passed onto us annually. This is how we know teachers do ignore our copyright notices and pay little regard to our Intellectual Property. We are continually monitoring the situation and Deborah is working closely with our legal team in this regard. It is important that teachers understand, any person charged can face a huge fine and/or a jail sentence. So in summary a copyright breach is just not worth it.

Bruce, unfortunately as we know with WH&S issues, ignorance won’t protect you. I think the culture of ‘borrowing’ and ‘sharing’ work is part of teaching, but when it comes to commercial products, I think all teachers need to be aware of copyright and the implications if they breach it.

Thankfully Dave, we have a huge ‘fan’ base of clients all over Australia, and they tend to inform us of ‘folk’ that are deliberately ignoring Copyright law and using our resources unlicensed. To date a polite and courteous phone call from me usually sorts out the problem. 😊

For those readers out there that may have an idea about developing a future innovation, what are some words of advice that would help them to make that first step and to possibly avoid some of the mistakes that you initially made?

Mistakes? Only one comes to mind. We signed up a business coach for me in 2007. It cost us $6000 and all the guy tried to do really, was sign us up to his telemarketing program – which we knew would not work in schools – because teachers are teaching during work hours and cannot be contacted!
If you have a ‘product or service’ and want to start your own business the following are areas you need to have a good understanding of: –

**The Market**

- Do you understand the needs of the market?
- What is it, can it be identified?
- Do you know your competition?
- What are the potential sales?

**The Product**

- Will potential buyers see value in it?
- Is it competitive in your chosen market? E.g. price, support, ...
- Does it fulfill a need, not a want?
- Is it innovative?
- Does it have a ‘point of difference’?
- How do you stay ahead of the competition?

**Constant client feedback** is very important. Thankfully we do not have a comparative competitor in our market segment (Education) in Australia. Some say this is lucky – but really luck has had nothing to do with it. Before starting out back in 2000, we knew the market (TechEd Education in secondary schools), we knew there was a specific need in this market (safety training resources for students) and we knew how to reach the specific ‘decision makers’ in our market. (TechEd head teachers / faculty leaders).

*Bruce, from personal experience, you have certainly improved the WHS practices that have occurred in the schools I have taught at. Is there anything you wish to plug, or any plans for the future that you wish to let the audience know?*

Thank you Dave. We are constantly getting great client feedback. We know that OnGuard does make a difference in TechEd faculties in schools - it improves WHS culture and it actually has been proven to lessen the number of workshop accidents and near misses in schools using it.

What’s new in 2015? The ‘Just-In-Time’ Mobile Web is a **new product** we have developed utilising QR Codes. It was in response to a **real need**, expressed by TechEd teachers at the 2013 IIATE Conference in Sydney. Our clients needed a simple method of conducting regular machine inspections.
This led to us creating the FREE ‘Just-In-Time’ Mobile Web. TechEduc teachers can now conduct machine inspections, record machine demonstrations and record student machine competency - all on the run – on their phone or tablet. Students can also scan a QR Code to open machine safety training and tests with their mobile device.

Next, we have developed a ‘SUPPORTED LEARNING’ pack for use with students who require one-on-one support with their studies. Every machine training unit for year 7 and year 8 within the Food, Metal, Textiles, Workshop and Wood packs have been revised and simplified. The SOPs include strategies that highlight the learning outcome required and assist the student to satisfactorily complete the necessary knowledge test. Like the ‘Just-In-Time’ Mobile Web, the ‘SUPPORTED LEARNING’ pack is FREE to ACEProPLUS clients. We will continue to improve the OnGuard suite of products as long as our clients want us to. There are also at least a dozen or so new features on my ‘design board’ for 2015.

Definitely watch this space!
Thanks for spending the time discussing your study with us Alesha, for those readers who are not familiar with the Churchill Fellowship, you are the third Technology Education (TechEd) teacher from NSW to receive the fellowship following Anna Bailey in 1991, and our IIATE President Ruth Thompson in 1998. What is the fellowship all about?

I was very fortunate to receive such a prestigious award and I took the opportunity as a great honour and opportunity to further my passion for TechEd in Australia. The Trust was formed with the principal objective of perpetuating and honouring Sir Winston’s memory by the awarding of Memorial Fellowships to be known as ‘Churchill Fellowships’.

The aim of the Trust is to provide an opportunity for Australians to travel overseas to conduct research in their chosen field that is not readily available in Australia. The main aim is the enrichment of the Australian society with the knowledge gained.

Reading between the lines, I picked up on the “enrichment of Australian society” and am well aware, there is no such thing as a ‘free lunch’. You have some outputs that are expected of you as a Churchill Fellow, what is required of you, and what are you hoping to do with the knowledge you have gained?

No it definitely is not a ‘free lunch’ or a holiday per se. As a result of receiving the award you have a high level of accountability to ‘give back’. The expectation by the trust is that you have a positive influence on the Australian society with the knowledge that you acquire. You need to produce a report about your travels that is submitted to the trust within 10 weeks of your return. During the application and interview process you also have to outline how you plan on disseminating the information that you learn. You are expected to carry this plan out as stated.

Examples of ways to disseminate the information gained include; presenting at conferences and in-service days, and being proactive in a volunteer capacity and/or through work-related opportunities with the overall aim of bringing about a positive change as a result of what you have learned – the enrichment of Australian society. My use of contemporary communication
technology enabled me to inform people immediately as I also chose to keep a blog so that people could learn back at home and also around the world whilst I myself was learning.

Now that we have learned a little about the fellowship and your obligations, let us delve more into your research topic of “the dichotomy in technology education of the future, the role of hand skills and the role of CAD/CAM technology in the production of designed solutions - USA, UK, Netherlands, Switzerland, Germany, Finland”. There is plenty of software solutions - many free now, that enable us to come up with design solutions. Given that CAD/CAM technologies are becoming more affordable today or within reach of schools, in your opinion, is there a place for hand skills in TechEd, and how are other countries addressing this?

A large part of my study was to weigh up this challenging question. I spent much time deliberating the pros and cons. There is a necessity for both. In the countries such as Finland there is a strong tradition of craft education, as a result there is a wide gap between the design and production processes that are taught in the schools, compared to the processes undertaken using advanced manufacturing technologies. In countries such as the United States, there is a big push for the use of CAD/CAM in the classroom as it is considered a ‘cheaper’ and ‘cleaner’ alternative, yet I discovered that the students struggle to identify the difference between a nail and a screw, as this is not a requirement of their curriculum.

This is concerning as people need to be able to evaluate and use ‘appropriate technology’. As an example, how would you know how to hang a picture on the wall if you cannot evaluate the situation, then decide whether a nail or screw would suffice, or whether it is a hollow wall where an anchor would be more appropriate? The focus of study was to determine if the dichotomy in Technology Education of the future is a problem. Based on the research conducted, I concluded that the dichotomy is not a problem. The problem is that in order for students to have the skills to solve problems of their generation there needs be more of a focus on advanced manufacturing and control systems in our current Technology Education curricula and teacher training. There is still a need for traditional technologies and hand skills to complement the new generation of advanced manufacturing and techniques. It is important that there is an appropriate balance of both.

In addition to this I discovered that every country had a deficit of engineers (which we hear often). For these engineers to have a critical understanding of material properties and characteristics, they should engage in traditional skills that develop this deeper understanding as well as the ability to utilise CAD/CAM technology. This philosophy of providing learning opportunities through ‘doing’ reflects the work of Dewey and Kolb in what can be coined as ‘experiential’ or learning through experience which is predominately how Technology Education students engage in the curriculum.
Your comment regarding the curriculum in the United States is very important. There is a lot of consideration that goes into developing a curriculum document. For example, in the current NSW Technology Mandatory syllabus on page 34, Students learn to: “select and correctly use appropriate hand and machine tools for a design project”. Given this, what is the role of curriculum in creating this dichotomy?

One of my major focuses during my trip was to look at the curriculum in each country and area that I went to. Fortunately most of them had just been reviewed before my arrival. I spoke to many people involved in curriculum development, and as a result I think that the curriculum is a significant factor that ‘creates’ this dichotomy. When it comes to the efficiency and accuracy in design and production, CAD/CAM is the now and is the future. It is not a fad or something that is going to go away. In future reviews of the Australian Curriculum as well as the syllabi developed by the individual States and Territories, this may be something that needs to be looked at in terms of providing support for professional learning and embedding this in teacher training. This way teachers will become more confident in both using and teaching these technologies making learning more effective, and provide the skills required by students to solve the problems in their future.

In your travels around the globe, are there any examples where some countries are moving away from an emphasis on the development of hand skills?

Yes! It was common in many of the schools that I visited in the USA not to have workshops. These rooms were commonly referred to as a ‘dirty lab’ if they did exist. This was unique to the USA. When I asked how they still managed to address curriculum outcomes their response would...
generally be that they use CAD to model virtual projects. These projects would commonly be modelled with card and felt afterwards. There were also some similarities here in Germany, where most schools are not equipped with workshop facilities, and the non-descript nature of the German curriculum caters for this.

In contrast to what appears to be the situation in Germany and the USA, is the approach to TechEd taken by Finland. In what appears to be constrained by history, they offer more traditional subject called Craft (remember that?).

Some schools in England also had a major focus on CAD/CAM in the classroom. The unique thing about England is that teachers and students are held highly accountable with external assessments that moderate against internal results through the submission of student examples to an exam board. As a result of this and the subject marking criteria, student projects tend to demonstrate the use of traditional tools and processes as well as the use of CAD/CAM for the final design solution. I think this is a good balance as students can appreciate the behaviour of materials as well as the contemporary manufacturing processes. This is what appears to be lacking in TechEd in the other countries mentioned above. The only thing I struggled with was that in order to get into the top achievement bands students have to demonstrate the use of CAD/CAM production techniques. In terms of equity across schools, student success in this case would be greatly determined by the facilities of the schools as the expertise of the teacher or the staffing of technicians to free up teachers to focus on what is important - teaching.

Display of numerous household items highlighting a variation in design approaches.
Given you have now viewed numerous examples of technology education around the world, Could you elaborate on any countries (or even schools) who you would consider as ‘lighthouse’ exemplars of good TechEd in practice?

Realistically, all of the schools I visited demonstrated ‘best practice’ in TechEd in one element or another. I am a firm believer that there is no such thing as perfect practice because there are always things to improve on. Though saying this, I did witness some teachers are doing some fantastic things. Examples of this include:

Mr Phil Cotton (England) is having great success with the use of CAD/CAM in the classroom. He documents his success on his website which can be viewed at http://philipcotton.com/

In America there is a major focus on STEM education. The Ellis School with Dr Lisa Palmieri is fantastic focusing on holistic STEM education within their school. You can follow Lisa on Twitter: @Learn21Tech. This is an example of how the STEM pedagogical approach was meant to be implemented. Also from the South Fayette Township School District in the USA was some recognition of excellence by Aileen Owens who is one of the STEM leaders in the school. More information on this can be viewed at http://awards.edsurge.com/winners/administrator-trailblazer/

Thank you for your information on your project and the international insight that this article has given us Alesha. I hope that in the future your input regarding STEM pedagogy, teacher professional learning and TechEd curriculum will become the basis for future journal articles.

Please keep an eye out for Alesha’s report, I’m sure it will be an interesting read.
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Technology Education: Learning for Life

2014 was the ‘perfect storm’ for Technology Education conferences as there was an amalgamation of our annual IIATE Conference (DATTA NSW), the 2nd DATTA National Conference, and the 8th Biennial International Technology Education Research Conference (TERC).

Sollya Richardson, fourth Year TechEd student (Griffith University), and the INTAD (DATTA Qld) State Executive – Secretary has kindly produced a few articles that report on the conference and particular sessions. Please read her report below:

Technology Education Research: highlights from the 2014 National Technology Conference.
by Sollya Richardson.

One of the delights of the 2014 National Technology Conference was that attendees could move freely between the IIATE sessions presented predominately by NSW Technology Teachers, and the sessions presented as part of the 8th Biennial International Conference on Technology Education Research. Through the latter, attendees glimpsed the scope of technology education research within Australia and around the world. Presenters attended the conference from Australia, Japan, Sweden, New Zealand, the USA and UK, and here is a brief summary of just a few:
Challenging technological identities in contemporary technology teacher education

John Barlow and Belinda von Mengersen; Australian Catholic University.

Students undertaking the ACU’s Technology Teacher course were asked to design and make a wearable felt protection device; an e-textiles project that incorporated a personal alarm. This required students to work with electronic components, e-textile materials and laser cut commercial or handmade felt, and included CAD drawing preparation as well as hand stitching.

The task was intended to challenge the pre-service teachers’ technological identity, but was also found to challenge the identities of the staff delivering the sessions. The authors noted that many students did not achieve the desired broader contextual understanding of technology, instead they tended to compartmentalise the project.

Image courtesy of conference presentation

With the Technologies learning area as a challenging and evolving discipline, there is a need to expose technology teachers to the broad range of the material specialisations it encompasses. Barlow and von Mengersen question how they can nurture students "favourite" material specialisation while concurrently developing an appreciation in them of the broader base of the technology learning area. They urged the need for professional development for educators in design and technology, to foster and encourage more innovative and cross-disciplinary activity.
The dialogic journal: documenting the inner drama of creative processing

Ann McGlashan; University of Auckland, New Zealand

Referring to what people in art circles might call a visual diary or ideas book, McGlashan gave examples of what she calls the dialogic journal for capturing and developing design processes. Dialogic, pertaining to conversation, and journal, a record of daily events. With different people using different practices and a myriad of ways of design processing, McGlashan suggests that the journal can be an excellent means of explicitly teaching and modelling being creative for our students.

McGlashan shared that she likes to use a lateral thinking activity as a settling strategy for her students in advance of an ideation lesson, and states that visual communication must inform technology and design. She highlighted differences in student outcomes between those that know their developmental journal work is going to be assessed and those that are using it for the intended purpose. The session concluded with an engaging discussion on the importance of hand sketching, and curriculum and industry drivers of learning objectives.
Analysing the Australian obesity epidemic's role in the "Design and Technologies" national curriculum

Deborah Trevallion & Donna Owen; University of Newcastle

Citing research that Australian students do not currently have the knowledge and skill to achieve optimum diets, Trevallion and Owen have examined the importance food has been given within the Australian Curriculum. There is a new demand for students to problem solve, and in food technologies this translates to having students generate menus or meal ideas for particular requirements rather than having the whole class follow a provided recipe.

Trevallion and Owen describe food literacy as the basis of our health, offering a projection that by 2025, 80% of adults and more than one third of Australian children will be obese. These statistics highlight the importance of teaching food literacy to all young Australians, empowering them to become agents of change. Evidence from Stephanie Alexander’s kitchen garden program in Victoria demonstrated children's willingness to try new foods, along with increased in student knowledge, confidence and skills in cooking and gardening. The program was also considered effective at engaging 'non-academic learners' and children with challenging behaviours.

This was a presentation was rich in resources shared via QR codes. It also highlighted their value in education for directing students to particular web content, one can simply use a QR code generator.

Stephanie Alexander's 'Kitchen Garden Program' webpage
Females in technology; on the other side of the glass

Vicki Knopke; Griffith University doctoral candidate

Knopke presented details of an ethnographic case study she has undertaken regarding females in technology, and how we can avoid them being marginalised and encourage the valuing of girls’. She discussed student and teacher gender dynamics at various locations investigated, secondary schools in south east Queensland.

Knopke discussed the impact of teacher blindness regarding gender differences and use of language that can inhibit female inclusion. Through her observations, recordings and interviews Knopke grouped together findings relating to the notion of families and school, the institutions within which females function, knowing & reasoning, the power of one's mind and women's self-concepts. She offered preliminary findings that acknowledge clear differences between female and male students saying that teaching and learning practices need to differentiate for gender but not promote separation.

Knopke encourages educators to revisit the notion of values, student intrinsic and extrinsic motivators, and the value of projects undertaken; highlighting that she had observed 'bright' girls being encouraged out of studies in technology, and that some projects failed to be relevant to students undertaking them. Meanwhile, she found that female students ability to plan, manage and organised their projects often meant that they surpassed their male counterparts despite starting technology courses with a perceived lack of skills.

The study focused on examining each site through 7 'lenses':

1. Learning ecology
2. What makes a difference to the girls?
3. Language
4. Motivation
5. Role modelling and peer support
6. Socio cultural influence on learning
7. Learning environment and value
Effects of pre-engineering experiences on design cognition in high school students

Dr John Wells of Virginia Polytechnic Institute & State University, U.S.A.

John presented research on behalf of a team comprised of Mathew Lammi, Michael Grubbs, John Gero, Marie Paretti, Christopher Williams and himself.

This presentation explored whether formal pre-engineering experiences affect the cognition processes of high school students and reflects the first year of data from a two year longitudinal study. The team went to great lengths in this research, which involved paired students being presented with a design challenge. Participants were asked to verbalise their thought processes whilst working to solve the problem, and were videoed doing so. The videos were transcribed, with the dialogue broken down into individual utterances that were coded according to an aspect of design processing; formulation, synthesis, analysis, evaluation, documentation and reformulation. Utterances were time mapped to provided references, and coding was completed by two individuals who met later to compare, justify and discuss the codes they had assigned. Final codes were then compared between the experimental and control groups for statistical analysis.

The pre-engineering experience undertaken was a Project Lead the Way course, Introduction to Engineering Design. With engineering design being embraced as part of the core learning for integrative STEM education, it seems essential to understand the effects of these experiences have on design practices. Unfortunately, the data thus far reveals a lack of difference between the design processes of students with and without formal engineering experiences. Despite this, the team continues the analysis of the second year data from the study, and still anticipate some degree of difference in design cognition to become evident.

Presently: The data thus far reveals a lack of difference between the design processes of students with and without formal engineering experiences.
Talking about the future: What makes secondary-school students choose or avoid a technology career?

Jan Grenholm and Edvard Nordlander; University of Gävle, Sweden

Swedish researcher Jan Grenholm presented research undertaken by Edvard Nordlander and himself. The paper based surveys were distributed through seven schools in Sweden regarding technology as a subject choice and career. The survey revealed rich data including a perceived lack of student knowledge regarding the possibility of future studies in technology. Students don’t believe that parental assistance plays a role in achieving good results a school, while teachers’ pedagogical skill does. The results also indicated that fathers have a strong influence on deciding whether a female students would choose to study technology, and that boys find technology more fun and less hard work than girls do.

Statistics presented by Jan Grenholm of student responses to a survey on technology studies

Fathers have a strong influence on deciding whether a female students would choose to study Technology

Within the Swedish educational system, students tend to make critical choices regarding future careers in their early teens, and as they move from compulsory to upper secondary study. They choose academic or vocational programs including design and technology. Student attitudes to courses have been found to be strongly influenced by teachers, parents and classmates. Interestingly, the Sweden’s technology syllabus emphasises that a main task of the subject is to promote teaching and learning which generates interest in the subject. Sweden and the rest of the industrialised world share a problem of declining interest amongst young people in STEM subjects and increasing demand for manpower in these sectors.
Adaptive comparative judgement: a holistic approach to assessment. By Sollya Richardson

Richard Kimbell is Emeritus Professor of Technology Education at Goldsmiths University of London, and was the keynote speaker at the 2014 National Technology Education Conference.

In Professor Kimbell’s keynote address, he spoke about the conflicting interests in assessing learner performance; national standards and requirement for reliability versus the local cultural practices, pedagogy and individuality. He highlighted the progressive atomisation of assessment, in England students are now assessed against 150 statements of attainment, and how this is at odds with his own research in holistic assessment practices.

To introduce his research he asked three audience members to guess the weight of two rods, and write their guesses down on post it notes. All the answers were different, and they were all wrong. He then asked the same three people to step up the front and hold the two rods, one in each hand, and guess which was heavier. This time all three agreed and they were all correct. To assess using numbers on an absolute scale is very difficult, with judgements against criteria being personalised and value laden. However, comparative

He is pictured here with INTAD Qld president Mark McMullin (right) and Treasurer James Lansbury (left).

Professor Kimbell taking questions from the audience at the 2014 National Technology Education Conference
judgement is reliable and very easy. In short, Professor Kimbell explains that schools use a difficult and unreliable method of assessment.

Kimbell partnered with software developer TAG Developments to create a digital system of compiling student portfolios that collates student responses in a variety of formats; text, images, audio and video recordings. The software includes built in capture tools, such as a drawing tool, and allows for additional file types to be uploaded. The software captures the creative process and shows a sequence of activities (their design process) through storyboard thumbnails, any of which can be zoomed in on. Students can reflect on their activities as they go, rather than leaving it until the end, and formative feedback can be left for students at any stage in written or audio format. The software’s comparative judgement engine manages the assessment process. Portfolios are presented to assessors two at a time for an easy comparative and holistic judgement; which portfolio is better? Using sorting networks, different combinations of portfolios are presented to different assessors until they have been ranked in order of performance.

Not only does the software manage assessment of students, it also develops profiles of assessors based on their ‘consensuality’ or misfit. Assessors can then deliberate over discrepancies or be eliminated from the process. The findings in sample research presented had a reliability coefficient of 0.95 or greater. The research reveals that marking via holistic judgements allows for
professional judgements, speed, fairness, professionalism, and collaboration with the added benefit of minimising the judge’s subjective bias through this process.

Kimbell asked teachers whether they would prefer to make holistic judgements or mark according to criteria, and 100% chose holistic judgments over marking, although 8% said they would like to use both holistic judgments and marking criteria in conjunction with each other.

Kimbell extended his research to allow the students to become the assessors. He found that students were able to see a variety of responses and make adaptations to their own. It promoted discussions regarding what is good within the portfolios. I asked him how this affected student performance, as it is generally regarded that criterion based assessment is better than normative comparison, which can affect student motivation and collegiality. He responded that he had found the process to increase student motivation, as students were not necessarily being compared to others in their own classroom, only occasionally would they recognise a portfolio presented during assessment. He said students who are allowed to assess and feedback on work come to have a better understanding of the process, increased motivation and enjoy the comprehensive feedback.

Portfolio compilation has long been used as a means of assessment in early years learning, and is at the very heart of design folio assessment. The use of ongoing portfolio compilation can reduce the need for externalised high stakes testing. Coursework is generally seen as problematic, with stakeholders wondering whether the work is the students own, however with software that shows the learning journey, stakeholders can be reassured that it is. Professor Kimbell's more recent work continues to look at how understandings from Design & Technology can be moved to assessment in other curriculum areas.

‘LiveAssess’ software for managing digital portfolios was developed TAG Developments. Find out more at http://www.maps-ict.com/content/liveassess
Biomimicry: Innovation inspired by nature
by Sollya Richardson.

One of the most delightful sessions I attended at the 2014 National Technology Education Conference was enthusiastically presented by Pittwater High School (NSW) teacher Kathryn Mamone.

A fan of Edmodo (an online social learning community for teachers, students and parents), she shared a variety of resources from her presentation with attendees electronically through a virtual classroom.

Quoting Einstein who said we need to change our thinking in order to solve our problems, she introduced the concept of Biomimicry. Biomimicry, which is sometimes also called Biodesign (although this can refer more specifically to incorporating living organisms in design, not just taking inspiration from them), is about investigating nature to find solutions to problems. Our natural world is the ultimate in good design; filtering water, creating shelters, storing and converting energy, aerodynamics, exponential growth, zero waste and more.

Biomimicry can be defined in three main ways; Nature as a model: we take inspiration from the natural world, nature as a measure: evolution demonstrates what works and we can compare our designs to those found in nature, and nature as a mentor: rather than look at what we can extract from nature, we look at what we can learn from it (Benyus, 1997).

Examples of Biomimicry include:

- Shark skin imitating paint applied to ships and aeroplanes creating a textured surface that reduces drag and improves fuel efficiency, also making them resistant to temperature variation and intense UV radiation.
- A kingfisher shaped beak was developed for Japan’s ultra-fast train eliminating a problem it had with a frighteningly loud ‘boom’ created on exiting tunnels and incidentally increasing fuel efficiency by 20%.
- A flexible bionic arm has been created based on the structure of an elephant’s trunk, giving it a wider range of movements than previously available.
- Bat sonar navigation has been used to develop a cane to assist the blind to ‘see’ obstacles in their path.
- A robot that can climb vertical glass has been created using directional adhesion principles borrowed from the toes of geckos, an improvement on previous suction technology.
• Research into deer antlers is feeding the development of incredibly strong and durable industrial materials.
• Given that webbing from a spider is so strong, one company tried to mix spider DNA with goats to "milk" web from them - before being shut down for ethical reasons! If they had succeeded in making web as thick as a human thumb it could have supported the weight of a Boeing 747!

Kathryn Mamone's interactive presentation included playing a getting-to-know-you game where the audience organised themselves into groups of three by matching together 1. Descriptors of problems with 2. Inspiration from nature and 3. A design solution to the problem based on the inspiration. It was an engaging teaching strategy that got the audience moving and mingling.

Steve Jobs is quoted as saying that "the biggest innovations of the twenty-first century will be the intersection of biology and technology" calling it "the beginning of a new era". Benyus writes that "evolution itself is believed to have occurred in fits and starts, plateauing for millions of years and then leaping to a whole new level of creativity after crisis" (page 5). Not only do the principles of biomimicry fit in beautifully with the cross-curricular principle of sustainability, it is an optimistic concept that gives hope that humanity can overcome the problems of industrialisation by taking a leaf out of the natural world.

Further Biomimicry resources for educators:
• Biomimicry: Innovation Inspired by Nature (book) by Janine M. Benyus
• Slideshare.net has many relevant presentations in various Design & Technology fields - just search for Biomimicry
• Complete an online course at Biomimicry.net - 'Fundamentals of biomimicry for formal and informal youth educators' or 'Introduction to biomimicry foundational course' (fees apply)
• Explore or search keywords for animals, processes and products at asknature.org
• Familiarise yourself with the Biomimicry Taxonomy for a novel way to approach your next innovation challenge
• or look up a couple of the many TED talks on biomimicry

Kate’s work is located on the IIATE site: http://www.iiate.asn.au/resources/resource/tanxt9u3cq/
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Government Publications

AITSL
This Charter contains some good information about developing a professional learning culture. When was the last time you invited colleagues to comment on/ or provide advice to you about your pedagogy?

Australian Government, Department of Education and Training:
This review examined 217 centres in an effort to improve the use of TTCs.

Australian Government, Department of Education and Training:
Students First- Restoring the focus on STEM in schools initiative
The Federal Government has committed $12 million to the $5 million for the Primary Connections and Science by Doing programmes.

Interesting Research

John Hattie’s Visible Learning
This is the research I discussed in the Editorial regarding impact on student achievement and how a focus on teaching ‘best practice’ may result in better educational outcomes, rather than a focus on your content knowledge.
Talking to pre-service teachers enables our readers to learn a little about who is going to be teaching in the future.

Hi Dean, many of us in the profession can fondly recall an influential teacher who has shaped them. Can you elaborate on any tech.ed teachers who inspired you at school?

I was fortunate enough to be taught by Les Miller at Asquith Boys High School in the 1980s. He had a reputation for being a tough teacher and as little year 7s we did fear him, however, most students (I included) developed a deep respect for Mr Miller and as we progressed through the years came to experience Les as the wonderful person that he was. I think he played an important positive role in the growth and development of many young men. On Thursday nights, the Stage 6 students and many of the IA staff would stay back late and work on their projects. I remember a couple of beautiful western red cedar Guillemot kayaks were made at that time. I bumped into him at the Working with Wood Show many years later and we had a great conversation. He was a real encouragement to me as a woodworker and as a beginning teacher. I shed a tear when he passed in 2005.

You are certainly not the ‘Lone Ranger’ there Dean. Les certainly was inspiration to many, but you could have pursued a trade if woodworking was your passion. I am interested in unpacking your reasons to become a teacher. Dean can you please tell us about your background, and why you chose to become a technology education teacher?

After I left school, I studied Land Economics at University and eventually bought a Property Management Company. For 17 years I built my company up until selling it a few years ago. Over that time, I worked closely with builders, electricians, plumbers etc. on a daily basis. I learned a lot about the various trades, their skills and abilities and the challenges they face. Much of what they do involves complex problem solving and requires good communication skills. Way back in the early 90s when I was just starting out in business, I was asked to do some casual lecturing in Property Management at UTS, which I enjoyed immensely and I suppose it sowed a seed. Eventually I decided that before I turned 40 I would sell my business and retrain into teaching; a planned mid-life crisis! As for technology education, it was a natural fit. Apart from the practical experience of the workplace, I am a keen woodworker and have a fairly well equipped workshop.
(which I built myself) at home. More generally, I like to tinker and I would rather learn new skills so that I can fix my own lawnmower than pay someone else to do it. When we needed a new kitchen, I built it. If the computer breaks down, I fix it (or at least try).

I feel that Technology Education is a key area for developing the skills and abilities needed to truly be a clever country. It is almost uniquely within the scope of Technology Education to develop skills and offer experiences for young people to become effective innovators. Technology Education is the context in which learning can be cemented from other curriculum areas, such as maths and science, especially for kinesthetic and visual learners.

Very true Dean. Much of the research and efforts to improve teaching and learning outcomes can be encapsulated in such words or terms as; ‘significance’, ‘relevance’, ‘Higher-order thinking’ and the quality of the ‘learning environment’. The problem solving skills that we develop in our students enables them to ‘join the dots’ in their development of new knowledge. This is recognised in both the NSW Quality Teaching and the Qld Productive Pedagogies frameworks.

Since you started your study at SCU, what has been the most surprising insight into your future profession?

I have a couple of reflections. Firstly, I have been impressed with the quality of the cohort. Most students at SCU are mature age (although not as “mature” as me) and bring with them a wide range of life and practical experiences and many are from a trade background. Technology Education is a much broader area than I realised; we could be teaching thread cutting on the metal lathe one lesson and animation or video editing the next. It is quite a challenge to be more than a ‘jack of all trades’. Perhaps related to this point, I am also surprised at the lack of people willing to take on the challenge of becoming a Technology educator. I think it is a really interesting and dynamic area of education which may struggle over the next few years as the baby boomers retire.

The diversity in our curriculum is enormous, and that is how you find plenty of teachers specialising in areas that they may have an aptitude for. But the point I wish to make here is that the diversity in our curriculum also requires us to develop professional learning networks in our life-long learning. ESNET is an excellent example of colleagues assisting one another.

It is commendable that you attended the 2014 IIATE conference late last year. What did you take away from that experience?

Collaboration is critical! The IIATE conference is an important opportunity to meet colleagues from other schools, other states and other countries. As I am doing further academic research in the field of technology education, I focussed on the Technology Education Research strand last year (TERC) and met some fantastic people. I was particularly impressed with the work of John Wells at Virginia Tech in the USA and Scott Sleap at Maitland Grossman High School in the Hunter Valley. Both are doing work in the area of Integrative Technology Education, an area that I am interested in. Perhaps I can talk more about that at another time? (Love to hear more when you are ready Dean!). As a beginning teacher, the IIATE conference is the perfect environment in which to build relationships, hear about the challenges and issues facing our area of education and have the opportunity to continue to learn from each other.
The editorial article in this issue of the IIATE journal relates to teacher expertise. As a beginning teacher, it is acknowledged that you will not possess all of the knowledge and skills you require to teach effectively. Does this worry you, and how are you intending on bridging some of those ‘gaps’ in your teacher preparation?

I must admit that I am a bit nervous about some of those gaps. Even as a woodworker, there are so many different skills to master. Whenever possible I have participated in “Hands on Technology” weekends put on by IIATE. They offer very generous discounts for student teachers as well as the CREO training, (I think I will do a refresher this year). Fortunately, I have a natural interest in a wide range of technologies and always have a few different projects on the go. As I mentioned before, I have a well equipped wood workshop at home, but also have a clean area for electronics and computer work. I have been working for some time on a programmable robotic arm as I am trying to improve my programming skills and am about to start building a “hackable” 3D printer. I have also been able to work with a local school through the generosity of Rob Moor. I recently built them a mobile clamp trolley for their Trade Training Centre, which was a great opportunity for me to maintain my welding skills. The key is to be open to opportunities to continually learn and, in any case, it’s good for the brain.

I notice that you reside in the blue mountains, have you had any opportunities to network with the teachers in your local area?

Yes – Wayne Parker, when he was at Blaxland High, has given me some of his time and helpful advice. As I mentioned above, Rob Moor at Wycliffe Christian School has been very supportive, allowing me access to his workshops and the ability to gain practical experiences in machinery maintenance, tool sharpening etc. I have also been able to talk to various classes from time to time, and this year he has invited me to be involved with a Stage 4 electronics/programming class where we are going to try to solve real world problems through the use of programmable electronics.

"The hand is the cutting edge of the mind"
Jacob Bronowski

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

As it is a break from uni at the moment, I can indulge in a bit of workshop time. I am currently working on a small dining table; Australian cedar top with turned redgum legs and a kauri pine apron, all from recycled timbers. As soon as that is finished I will get cracking on my 3D printer build which I do not expect to be easy. I am also about to start building some Japanese shoji screens for my garden. I really consider these projects to be fun and a form of relaxation.

Dean, it has been a great opportunity for our readers to learn a little about the next generation of technology teachers. Knowing you personally I can confirm that you will be a fantastic asset to any school. Many thanks for your time. Check out Dean’s latest article of the 2014 Conference @ http://www.iiate.asn.au/news/reflections-from-2014-conference/
Local News

This issue we have included a report from Steve Delaney about the South Coast IIATE’s activities. Hopefully over future issues, we can get some feedback from other groups around the traps.

SCIIATE

2014 was another big year for South Coast Industrial Artists! Our SCIIATE engagement continued to grow with more and more teachers from across the region attending our quarterly meetings, and an increased number of members actively engaging and sharing in multiple collaborative networks.

2014 saw the inaugural regional F1 in Schools event & pilot program of the Aeronautical Velocity Challenge launched at the University of Wollongong. All things STEM continued to gain traction & ever so steadily it seems as though across our region WE are flying the flag and making a difference.

In addition to the plethora of excitement previously mentioned, public schools across the south coast region from Bulli to Albion Park have collaborated to form CNI (Combined Networks Illawarra) which culminates in a combined school development day once per year with all of our Technology teachers united in an almost ‘festival-like' professional development event.

So what have been some of the highlights?

- The 'Skateboards in Schools are Cool' two day teacher professional learning workshop, run by Marty Naughton and hosted at Warrawong High School was definitely one of them. This saw over 30 teachers from our region (& some welcomed attendees from just outside our borders) engage in practical workshops to gain the confidence & skills to implement skateboard creation to their school curriculum. Upon completion our teachers' skill-set was definitely 'decked out' with a vast array of new techniques and project ideas to inspire their teaching.

- The F1 in Schools regional competition was strongly represented with both Cedars Christian College & Warrawong High School progressing through to the State Finals. The excitement & engagement surrounded this STEM initiative has drawn plenty of attention over the past year with seven schools set to embark on the F1 adventure in 2015. Rumour has it one school is even entering full teams from their Intensive English Centre & Support Units. Stay tuned.
The Aeronautical Velocity Challenge literally blew us away! The pilot run flew without a hitch & the planning committee is extremely excited about the state wide competition this year. With curriculum resource packages accompanying this innovative and reasonably easy to implement STEM initiative we’re hoping to have at least eight schools compete in this year’s event representing the sunny South Coast.

As the year drew to a close a small group of teachers collaborated to draft a South Coast STEM challenges schedule where we plan to further engage our network of schools, teacher in students in more competition based activities, so stay tuned for an update on this one as our year progresses.

Steve Delaney

Related Links

Here are a few websites that may be helpful to IIATE members

- **Technology Education Associations - Australia**
  - IIATE NSW IIATE Blog page
  - 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

- **Events**
  - March 14, 2015. [Hands on Technology Skateboards](#)
  - March 21, 2015. [Creo 2 at Swansea](#)
  - March 26-28th, 2015. [27th ITEEA Conference, Milwaukee (WI)](#)
  - April 6-10, 2015. [29th PATT Conference – Marseille (France)](#)
  - June 12, 2015. [Wood Show Challenge](#)