An ABC of computational thinking and digital technologies

Professor Tim Bell, *University of Canterbury*

The new Digital Technologies curriculum sounds like it would be mainly about devices, but in fact it is more about people; devices aren't an end in themselves, but a means for helping people to achieve their goals. In addition, teachers might be concerned that the technology is too fast-changing to keep up with, and uses jargon that may become outdated quickly. This talk will look at the connection between the digital devices and people, including some key ideas and terminology foundational to digital systems, and reflections on helping teachers get up to speed with the curriculum. This will include exploring the lasting ideas that underpin the curriculum, illustrating them with examples from the Computer Science Unplugged approach.

Power up your PLN

Brett Salakas, *MLC School*
Zeina Chalich, *#aussieED*

In this interactive and informative keynote session Zeina and Brett will guide you through the world of an online PLN. Become informed as they analyse the success of online case-studies with social media, become acquainted with terms, techniques and strategies that boost the effectiveness of online interaction and collaboration. Expand your PLN by engaging with others in the ACCE online challenge that they have planned for you!

Planning an action research project to facilitate implementation of Digital Technologies

Julie King, *Australian Curriculum, Assessment and Reporting Authority*
Simon Collier, *Australian Curriculum, Assessment and Reporting Authority*

The Australian Curriculum, Assessment and Reporting Authority (ACARA) has been contracted to manage the National Innovation and Science Agenda project known as Digital Technologies in focus: Supporting implementation of Digital Technologies. The project focuses on supporting school leadership to plan for implementation of the curriculum in their school, and then providing professional learning for teachers. To facilitate implementation an action research approach has been adopted. Each school considers their situation and develops a proposal that best meets the needs of their school.

The project framework is based on the key ideas of the Australian Curriculum: Technologies and the Technological Pedagogical Content Knowledge (TPACK) model will explore how their school might use an action research approach to facilitate implementation of Digital Technologies for their situation.

Digital Technologies in 30 minutes or less

Australian Computing Academy

Come away with an understanding of the fundamentals of the Australian Curriculum: Digital Technologies. Understand how it was written and how to unpack the key concepts for your students. Leave with a list of free resources mapped to the curriculum.

Assessment of Digital Technologies

Australian Computing Academy

What does achievement look like at each level?

You understand the requirements of the Australian Curriculum: Digital Technologies but how do you effectively design assessment and conduct the assessment to evaluate the efficacy of the learning and the achievement levels of the students? A conversation referencing case studies.

Leading Digital Technologies professional learning and development

Katrina Falkner, *Computer Science Education Research Group, The University of Adelaide*
Rebecca Vivian, *Computer Science Education Research Group, The University of Adelaide*

Professional learning and development of staff is critical to successful curriculum reform, particularly for a new subject area. As schools across Australia plan and launch implementation of the Digital Technologies Curriculum, leadership in schools are seeking effective ways to support and upskill their staff that meet their particular needs and contexts. This workshop is designed to support school leadership to design and plan a contextualised, whole-school approach to upskilling staff in the Digital Technologies Curriculum, based on insights from research, case study examples and freely available resources.

References

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Cognitive and non-cognitive skills acquired through two collaborative e-learning projects

A/Prof Bruce Lander, *Matsuyama University*
A/Prof Eiji Takeda, *Matsuyama University*

Computers, music players, smartphones or tablets, youngsters of today seem to always be multi-tasking with one or more of these at the same time. Whether we like this or not, this is something that will only escalate with time. There is no doubt that this trend is having a huge impact on education (Martin et al, 2011). Up to now many students would probably not associate their mobile devices, at least in the Japanese context, with learning. However, if technology can be introduced to promote collaborative learning there is a far greater potential for autonomous learning to occur outside the classroom.

This paper presentation will introduce two projects that differ slightly in the way technology has been used to advocate autonomous and collaborative learning. The first project involves a collaborative e-learning exchange project between high school students in Japan and Australia sponsored by the Australia-Japan Foundation. Whereas the other project involves Japanese economics university students and how they have used ICT tools to communicate and learn collaboratively amongst themselves.

The theoretical framework which this study is based around includes Kolb's "Experiential Learning" (1984), Gibbs's "Reflective Cycle" (1988) and Ash & Clayton's "Reflective Framework" (2005) which stress the importance of "reflection" in student learning. According to Kolb and Gibbs, "reflection" about learning is indispensable for students in terms of raising and maintaining motivation to learn.

Regarding the first project, students in Japan learning English, created 5 sets of multimodal digital stories introducing local and national cultural elements while their Australian counterparts did the same, but in Japanese. All digital stories were exchanged every 2 months over the course of one academic year. Students in Australia provided feedback online in English, whereas students in Japan did the same, but in Japanese. Student created eBooks were made with various forms of iPad apps including Comic Life, iMovie, PuppetPals, Tellagami and Book Creator for iPad. The second project however involves students from the department of economics at a medium sized private university in Western Japan and how they used ICT to collaborate and learn towards joint goals. Through the use of these edu-tech tools this paper will highlight the value of ICT usage in the context of foreign language education and students in the department of economics in recent times. It was discovered that not only digital literacies but also various cognitive and non-cognitive skills like teamwork discussion skills developed in the process.

Pedagogical practices of K-12 online global collaborative educators

Dr Julie Lindsay, *University of Southern Queensland*

The practice of online global collaboration in the K-12 classroom is emerging as a catalyst for multi-modal literacy, global competency and intercultural understanding. Implementation within a school context continues to be limited, however, to those educators who have access to a wider range of digital resources and willingness to take on 'outlier' tendencies. Online global collaboration broadly refers to geographically dispersed educators, classrooms, and other learning environments that use online technologies to learn with others beyond their immediate environment. This paper presents some preliminary findings from an investigation into educators' pedagogical approaches influenced by online global collaborative learning. It also shares the emerging pedagogical practice of Online Global Collaborative Learning (OGCL) in support of a broader concept of an online global collaborative learning framework and discusses implications for K-12 education.

Early childhood educators' attitudes towards use of digital technology in young children's learning

Dr Leigh Disney, *RMIT University*

Early childhood educators' attitudes towards the use of digital technology in young children's learning in child care centres were investigated in this paper. Twenty early childhood educators in three child care centres participated in a survey to show their attitudes towards the use of digital technologies in educational centres in child care centres. Main findings include a) some media devices such as television, DVD player, computer, Internet and Smartboard were provided in child care centres; b) educators thought the use of digital technology could be used to teach literacy, numeracy, science, art and physical education, and c) educators agreed the use of digital technology could be used within children's five domains of development, which include cognitive development, gross motor skills development, fine motor skills development, language development, and social development. The impact of early childhood educators' attitudes to digital technology in early childhood settings will be investigated further. This paper will be useful for early childhood educators and parents of young children in understanding the use of digital technology in early childhood educational settings.

The ImpaCT of global classrooms

Anne Mirtschin, *Hawkesdale P12 College*

In an interconnected world, it's more important than ever that students become global citizens. This session will demonstrate how how to create connected global classrooms with the innovative use of technology and the high ImpaCT that this has on their learning.

By creating making the world their classroom, students are empowered to become globally aware learners, helping to transform how they see, interact, and understand the world beyond their classroom and local community. By integrating these connections and projects into the curriculum, students' learning can be enriched in ways never thought possible.

Synchronous and asynchronous connections allow students to collaborate, connect, communicate and problem solve with others across the globe, enabling them to develop understanding, compassion, inter-cultural empathy and build relationships with each other and indeed change lives, both locally and globally. This is in keeping with the ISTE Student Standard – Student as Global Collaborator - *Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.*

By attending this session, participants will explore and gain "hands on experience" in the following:

- hear inspiring and amazing classroom stories of collaborative global classrooms
- explore online tools for communication, connection and collaboration both synchronously and asynchronously. These tools are free, cross platform, cross device and accessible to the majority of classes across the world. Some are proven tools over time and some are the latest trending tools
- Learn how to get started
- Where to find global projects – both simple and complex
- Discuss tips for success
- Explore the challenges of collaborating globally
- How to overcome the challenges including the challenges of cultural and religious differences, language barriers, accents, time zones and more
- Understand the need for and the power of developing a personal learning network
- How to develop a professional learning network and learning communities to join

An online resource document will be shared with participants, so that they can access tutorials, websites, presentations, etc. for further research after the conference.

Leading ImpaCT: Past, present and future

Amanda Rablin, *St Peters Lutheran College*
Julia Boulton, *St Peters Lutheran College*

In this 90 minute workshop, participants will be guided through thought provoking discussion regarding the impact of ICT initiatives and contexts of the past and present on learning and teaching. Key areas will include technical initiatives (resources, platforms and devices), contextual impacts (global, government influences, school contexts), and pedagogical and curriculum drivers.The facilitators will share their experiences from a variety of contexts are well as their current workplace. Participants will be encouraged to share their experiences with others in order to determine what is similar and what is unique. The discussion will then look at what future initiatives and competencies may be required and the role technologies and pedagogies could play in learning and teaching.

What do you with a problem like Steven? A Luddites perspective of ICT integration

Steven Bauer, *Emmaus Catholic College*

Tomorrow, we are told, will be a different world.

The BBC (2014, http://www.bbc.com/future/story/20130102-tomorrows-world) bet that by 2020 most humans will be permanently wearing devices that will record all conversations… by 2025 you will be able to upload the contents of your brain to a computer… and by 2035 you will be able to log onto IT systems from your brain. While some of the BBC's other predictions made have come true, the question arises, how will this leap in technology affect education, and where does the luddite sit in the future of education?

This presentation will explore the need for the old ways and the new ways to come together in harmony in order to provide the best learning experiences possible for the students under our care. This talk will bring a clash of cultures together to show that while the old needs to adapt to the new ideologies of tomorrow, future practise cannot discard our past otherwise a gap will form that no amount of putty will fill.

3D design and printing in the primary classroom

Kim Martin, *Star of the Sea School*

3D Designing offers primary teachers unique opportunities for hands-on, project-based, STEAM-themed teaching and learning. Learning by creating in 3D enables students to develop design thinking skills critical thinking skills. The objective of this workshop is to show primary school teachers how easy it is for their students to start designing in 3D in minutes, share some of the reasons they should be using these tools and examples of ways I have integrated 3D Design and printing into my teaching in a primary school classroom.

Systems thinking – Going around in circles

Paula Christophersen, *Digital Learning and Teaching Victoria*

This workshop focuses on systems thinking—its meaning and role in the Australian Digital Technologies Curriculum.

The session is suitable for teachers of Foundation to Year 10 as the unplugged activities will be aligned to the different bands of learning. No or limited prior knowledge is assumed.

Systems thinking is one of three ways of thinking in the Digital Technologies curriculum and is closely connected to the key concept of interactions and impact. It involves thinking about each component in digital and information systems and how their interrelationships affect the functioning not only of that system (or solution) but other systems. Through unplugged activities, participants will appreciate the importance of thinking in circles rather than in straight lines, a hallmark of systems thinking, and how this approach to problem-solving affects the type of digital solutions we create and their purposes.

Participants will need to be able to work independently as well as in pairs, and will need to be able to create and complete worksheets. As the activities are unplugged, it is not essential for participants to bring along their own digital devices. Internet access is not required for the presenter. It would be preferable for participants to work at tables to foster sharing of ideas and co-jointly complete activities.

Data: The vital ingredient

Paula Christophersen, *Digital Learning and Teaching Victoria*

Data is to a digital information solution as meat is to a savoury pie. You can't create a digital solution unless you input data into a digital system, manipulate or process it following a plan or design in order to create desired output. Similarly, the correct combination and balance of ingredients need to be manipulated using appropriate techniques in order to successfully produce a dish.

Data is integral to every band of learning in the Digital Technologies curriculum. This session explores why it is important for students to understand the features of different types of data and how data can be manipulated, stored, communicated, acquired, protected and represented. Through presentation and small activities, the role of data in this curriculum will be explored, with examples provided for each band of learning.

This session is suitable for teachers of Foundation to Year 10 as the activities will be aligned to the different bands of learning.

The CSER program and hands on workshop

Suzanne Carter, *University of Adelaide*
Celia Coffa, *University of Adelaide*

This workshop will introduce a free online course for all teachers that will define computational thinking and introduce digital systems and visual coding. Participants in this course will sign up for the online course. The presenter will demonstrate how to implement this in your school and introduce supplementary materials for teachers that can be used in a school environment to support the course. This workshop is suitable for leaders wanting to upskill their staff in digital technologies. This workshop will assist all teachers and leaders to navigate the vocabulary and new skills in digital technologies curriculum, digital systems and visual coding. This workshop will also provide a starting point and a tool that can be implemented immediately.

Micro:Bits hands-on workshop

Toni Falusi, *University of Adelaide*

This workshop will explore Microbits in the context of the primary and secondary classroom. This course will be conducted by one of the University of Adelaide CSER Project Officers. The Microbit is a powerful tool that can be used from Year 3 to Year 10. This workshop will introduce parts of a Microbit and investigate activating lights and using the buttons as controls. It will demonstrate how to save and download a program to the Microbit. There will also be a simple project to learn to use the Microbit in a classroom. Tips and tricks for using Microbits and locating project ideas will also be discussed.

CS + X in Careers with STEM

Heather Catchpole, *Careers with STEM*

Careers that require skills and knowledge in Digital Technologies are expected to account for 92% of jobs by 2030. Many of these careers will be new, and much of the skills will be utilised outside of traditional digital careers and in fields as diverse as architecture and agriculture. In 2014, Google and publishing company Refraction media launched a multi-platform communication strategy based on the narrative of Computer Science (CS) + X - where X is a student's passion, skill or another field. This presentation looks at how CS + X is utilised in tertiary and secondary education, the application to career and study pathways and how digital technologies can be combined with cross curricular priorities to create an engaging tool for student learning.

Code Like a Girl presents 'Teaching with ImpaCT'

Anna Hayes, *Code Like a Girl*

Women account for less than 24% of the IT workforce in Australia and only 1 in 10 enrolments to Australian Universities for IT based degrees are girls. How then, can we as educators claim the we are delivering High Impact Teaching in the field of digital technologies? Although there is a large focus on overlaying the digital technologies curriculum over the more traditional teaching streams, to support students' learning, problem-solving, critical-thinking, creativity and collaboration abilities; it would seem that the current methods are ignoring the huge gap and the gender bias currently in the industry.

By 2020, Australia is predicted to need 700,000 skilled ICT workers to meet demand. Roles suggested to be most impacted by automation and machine learning, are also those that have highest proportion of female workers. We would like to provide attendees with some real-life anecdotes about what it is like for women in this industry and consequently what it could be like for the girls we are educating if we don't make a change.

Code Like a Girl is an award-winning Melbourne-born social enterprise driving change in the tech community; inspiring new generations of girls to acquire coding as a skill through workshops and events. We would like to give attendees some insight into how we engage young girls in Computer Science and how we keep them coming back. We want to share our proven model for success in this area including:
- The importance of providing girls with inspirational female role models
- Not only teach girls computational thinking and coding skills but we put a great emphasis on empowering young girls to feel confident in the area of technology
- Providing and encouraging opportunities to collaborate with like-minded girls
- Inclusion of both 'online' and 'offline' activities to encourage resilience and problem solving

We would also like to invite attendees to try out some of the activities which we have found to be most well received by students in our workshops.

Digital systems hands-on inside a computer's brain

Dr Karsten Schulz, *Digital Technologies Institute*

In this session, we get to know Digital Systems and binary data with a hands-on approach. We explore the interrelationship between software and hardware. We start by making our own binary data, translate it into decimal numbers, perform binary addition, subtraction, and data storage. We'll then use binary data to program a simple computer and learn how binary data becomes computer code. The approach is fun, interactive, tactile, with many experiments. Participants will grow their understanding of the binary number system and the internal working of computers through experimentation. ACTDIK001, ACTDIK002, ACTDIK007, ACTDIK008, ACTDIK014, ACTDIK015, ACTDIK024, ACTDIK034, ACTDIK035

Multi camera editing with Premiere Pro

Chris Woldhuis

Sometimes just one camera angle isn't enough. A simple interview can take multiple angles, but normally takes LOTS of editing. Premiere Pro has a feature that allows you to take the video from multiple cameras (up to 16) and easily edit them into a final video. This session will give an introduction and an example of editing with multiple cameras.

Cinematic VR and 360˚ video production with Adobe Premiere

Dr Max Schleser, *Swinburne University*

When working with Cinematic VR & 360˚ video production students are exploring new filmmaking forms and production formats. They are working with new 360˚ cameras, new filmmaking techniques and new distribution environments. Today's student filmmakers are working with emerging media and smartphones for media production.

This presentation will share some thoughts and practical tips on pre-production, production and post-production with Adobe Premiere Pro and the free Premiere Clip.

Maximise your feedback with Acrobat

Ross Johnson, *Tuggerah Lakes Secondary College*

Feedback is an essential part of effective teaching. It is also important as part of the digital / paperless Classroom. Adobe Acrobat Pro is the perfect way to provide various types of feedback and this session will show you how to use it in your classroom.

Implementation in the Digital Technologies Curriculum – Covering the curriculum in Stage 2 and 3

Australian Computing Academy

Develop the skills necessary to teach the implementation portion of the Australian Curriculum: Digital Technologies (Years 3-6). Understand the requirements for user input, sequencing, branching as well as iteration and get hands on experience with block based programming activities.

Leading impactful teacher professional development in STEM: Research in NSW public schools

Jane Hunter, *STEM Education Futures Research Centre, University of Technology*

Building teacher capacity and confidence in teaching and learning in Science, Technology, Engineering and Mathematic (STEM) is recognised as a significant challenge for school education systems in Australia. A series of reports by the Office of Chief Scientist states that the situation is urgent. The National Research Council in the United States as well as the Organisation for Economic Co-operation and Development (OECD) also suggest that reform initiatives will require a substantial change in how the STEM disciplines are taught at school and that an equally substantive change is needed in professional development practices in teacher education. In this paper I take up both of these challenges and examine how two mixed methods research projects in eight primary schools that involved action learning using a technology enhanced learning scaffold supported change in STEM teaching and learning in classrooms. Furthermore the research demonstrated a focus on planning well-integrated inquiry-based units of work when supported by an academic partner is a successful approach to teacher professional development in the STEM disciplines and the Arts/Humanities. The paper draws on findings from 37 early, mid and late career teachers who not only collaborated in school-based teams they also increased their content knowledge in multiple subjects and experimented with new pedagogies that disrupted their beliefs about the nature of STEM education in primary schools. After 10 weeks teacher capacity and confidence measured in several rounds of survey responses including two-point document analyses, observations and interviews showed a marked increase in innovative processes and their adoption in STEM. Almost 1000 students aged 7-12 participated in the two studies. The 'hands on' interactive approaches in deeper learning sequences demonstrated a significant shift in their attitudes towards STEM. Students in a support classroom at one of the school's developed more autonomous inquiry skills and abilities in STEM when choice is sustained. Principals participated in interviews and their insights focused on leadership to build a positive STEM culture. This factor was vital to the success of STEM in primary schools while some also recognised that effective cross-disciplinary programming in several content areas remained challenges for many teachers. Findings from these two action research studies were steps towards addressing such concerns. Effective STEM education is a projection towards the future as well as drawing from the past. To be managed and progressed, the teaching of the STEM calls into question how and what learning in primary schooling is prioritised.

Self-Impact and My-Impact: Teacher professional learning through social media

Dr Sarah Prestridge, *Griffith University*

One-shot workshops as part of school based professional development do not suit all teachers and do not leverage teachers to transfer what is presented to their classrooms. When professional development is differentiated and personalised bounded by classroom context, when teachers direct and action their own learning through collaboration, reflection and inquiry, professional learning can occur. Through the use of social networking sites such as Twitter, Facebook, and or resource repositories such as Pinterest and TeachersPayTeachers, teachers are taking action into their own hands to self-learn.

Little is currently known about the process of professional learning using online technologies and how knowledge is considered and actioned in theses spaces. Data drawn for this paper is part of a larger research project examining expert ICT teachers' approaches to their ongoing professional learning and how and if the knowledge, skills and even ideas gained online through teachers' professional learning networks are transfer to the classroom and make impact on student learning. Semi-structured interviews of fifteen ICT-expert teachers from Australia, Europe and USA are the main data source. The findings presented in this paper focus on how these expert ICT teachers conceive of their professional learning and the affordances associated with learning in the social media context, described here as *Self-Impact* or *My-Impact*. Implications for compliancy measures and professional development design are presented.

Interface, interaction and interactivity: Understanding ImpaCT of technology in classroom from a Cultural Historical Activity Theory perspective

Dr Ibrahim Latheef, *Monash University*

Based on a recent research this paper provides an understanding around different levels of information and communication input output (ICIO) that occurs in a learning episode and how these different levels impact learning when technology is used as a tool in classroom; specifically, Interactive Whiteboards (IWBs). Cultural Historical Activity Theory (CHAT) provides an appropriate framework to examining the ICIO in human activity and consciousness in the context in which they occur. The hierarchical structure of activity as proposed in Leont'ev (1978) helps to identified ICIO that fosters learning. Leont'ev (1978) argues that there are three level of interaction in human labour; operations, actions and activity. Using these frameworks current research has identified a complex system of ICIO around technologies as interface, interaction and interactivity. The findings suggest the level of ICIO is based on the learning goals, and are embedded within an activity system. The findings break down ICIO into interface, as the lowest level, interaction as the second level and interactivity as the highest level of ICIO. The research concludes that higher the ICIO the more learning.

Tapping LMS data: Student participation in "Preparing-for-the-Test" discussion forums

Dr Dorothy Langley, *Holon Institute of Technology*

Learning Management Systems (LMS) are widely used in contemporary higher education as platforms for pedagogical and administrative instruction management. When carefully designed, the LMS can model knowledge organization, appropriate style of communication and improved time management. The LMS can also be useful as a research tool, since it records activities within the course site and data can be extracted via system generated reports (Macfadyen, & Dawson, 2010).

The academic calendar contains stressful exam periods. Students are often confused and unsure of what exactly will be required. As students start preparing for the exam many questions arise, which they would like answered, preferably "instantly". This situation calls for devising an effective solution for publishing, documenting, sharing and answering questions, in an academically sustainable manner.

Over the past decade I have constructed "Preparing-for-the-Test" discussion forums in several course sites to help students prepare for assessment events. Seeking answers to the research question: What was the characteristic student participation in the Q&A discussion forums? I have used three data sources: The recorded discussion strings, data provided by the LMS records and students' response to a post-exam questionnaire. Sample data will be provided from the 2017-2018, 2nd year course with over 70 students, which had a mid-term and a final exam. The mid-term discussion forum showed 3 discussion strings, in which 3-4 students plus the lecturer participated. The final exam discussion forum showed 19 discussion strings, in which 12 students plus the lecturer participated. These data seem to indicate a rather low response level, which might act as evidence against the forum's usefulness. However, the issue of passive vs. active student participation in discussion forums is well documented (e.g. Rovai & Barnum, 2007). LMS collected data create a fuller participation profile, showing over 400 records of student activity in the mid-term forum, mostly involving "accessing" or "viewing" a discussion. Over 2000 records of student activity, involving over 40 students were found in the final exam discussion forum. An interesting finding is that several students re-accessed the mid–term discussion forum in preparation for the final exam. The student activity chart (fig. 1) provides compelling visual evidence concerning the exam-related activity, showing peaks around exam weeks. The results of a questionnaire administered after the final exam shed more light on student views and participation in the relevant forums: 67% accessed and viewed questions and answers; 11% contributed questions; Usefulness was rated "high" or "medium" by about 60%.

In conclusion, lecturers can create instructional impact by providing designated discussion forums in the LMS environment, serving students' needs at critical exam periods in the academic year. The advantages of the suggested forum extend beyond its obvious utility, and reside in the potential for promoting important students' abilities: formulating well-defined questions in appropriate academic style; creating Q&A repositories; becoming aware of peers' questions and trying to respond to them; self-checking comprehension of provided answers; when necessary, posing additional questions.

Makey Makey hands on workshop

Meridith Ebbs, *NSW Project Officer, University of Adelaide*

This workshop will explore Makey Makeys in the context of teaching digital systems. This course will be conducted by one of the University of Adelaide CSER project officers. This workshop will investigate the parts of a makey makey, its function and an introduction its set up and use. This workshop will provide an opportunity to use the Makey Makey with http://scratch.mit.edu. There will also be a simple project to activate a voice recording using Scratch and a Makey Makey. Tips and tricks for using Makey Makey and locating project ideas will also be discussed.

References
Twining, P., Raffaghelli, J., Albion, P. R., & Knezek, D. (2013). Moving education into the digital age: The contribution of teachers' professional development. *Journal of Computer Assisted Learning, 29*, 426-437. doi: 10.1111/jcal.12031

Explore algorithms using Ozobots, Turtle Art and BBC Micro Bit

Joanne Villis, *St Aloysius College*

- Presentation style delivery of information about what algorithms are and what the Australian Curriculum expects us to teach (5 minutes)
- Ozobots: During this time, participants will have an Ozobot to work with in a group (I have 10) and I will present them with the same challenges that I would give to students. During this time, participants will not only have the opportunity to work hands on with the robots, they will be able to discuss how they might use them within their teaching (30 minutes).
- Turtle Art: Again, during this time participants will have access the free software and will work individually or with the person next to them. I will provide them with a basic understanding of the user interface and then provide them with challenges. There will also be a 5-minute group discussion time in relation to Turtle ART and STEM (30 minutes).
- BBC Micro Bit: During this time, I will demonstrate how the Micro Bit works and then participants will have time to explore (I have 26 Micro Bits). Then I will show student work samples and reflections of their use of the Micro Bits (25 minutes).

Teacher Design Thinking: An evidence-based model to support teacher design and technology integration

Professor Lori Lockyer, *University of Technology Sydney*
A/Professor Shirley Agostinho, *University of Wollongong*
Professor Sue Bennett, *University of Wollongong*
Dr Melinda Plumb, *University of Technology Sydney and University of Wollongong*
PhD candidate Lauren Knussen, *University of Technology Sydney*

Designing learning experiences for students is something that teachers engage in every day. But it is a practice that is not well understood, often under-developed and under-supported. Effective design practice can help teachers integrate technology into teaching and learning experiences in a way that will promote better outcomes for their students.

This workshop will engage participants with the findings and outcomes of an ARC-funded project that investigated the design practice of 48 early career and experienced teachers in public, independent and Catholic schools in NSW. The findings have been translated into a teacher design thinking model aimed to support teachers in their design work.

Creative project-based ideas for teaching digital technologies in the secondary classroom

David Grover, *Macquarie University, Department of Education*

The workshop will explore the strengths of a project-based approach to teaching Digital technologies for the Australian Curriculum by introducing a range of ideas suitable for immediate classroom implementation. Participants will have opportunities for hands-on experiences with a number of activities.

The power of the wow, increasing student agency using online tools and techniques

Brian Host, *Inaburra School*

STEAM and the Maker Movement

- It takes its theoretical roots from Dr. Seymore Papert, founding professor of MIT Media Lab and research colleague of Jean Piaget.
- Integrates design & systems thinking - empathise, define, ideate, prototype and test.
- Empowers imagination and new ways of thinking about how things work.
- Embraces new technologies and applies them in novel situations, growing the sense of amazement, wonder and engagement with the world around them.

Embedding STEAM into the curriculum

To support students in STEAM in the curriculum, teachers should:

1. Regularly engage students in making, sharing, collaborating and reflecting by allowing student to create multiple representations of understanding.
2. Give feedback to help students remake and reiterate content-specific products, processes and knowledge.
3. Encourage students to better the lives of others.

Ed-tech game show

Brett Salakas, *MLC School*
Zeina Chalich, *#aussieED*

Join this session and experience a fun, new way to end a day of learning. The Ed-Tech game show will pit teams of teachers against each other as they battle to create fun, engaging lessons with a range of Ed-Tech tools to suit a variety of hypothetical circumstances. Audience participation is crucial as teams score points and we battle to find the ACCE Ed-Tech Game Show champions.

Creative problem solving: Essential skills today's students need for jobs in tomorrow's age of automation

Dr Tim Kitchen, *Adobe*
Clara Galan, *Adobe*

Creative problem solving is the process of redefining problems and opportunities, coming up with new, innovative responses and solutions, and then taking action. This presentation by Dr Tim Kitchen & Clara Galan from Adobe looks at the results of a recent global research project showing that tomorrow's jobs will demand creative problem solving skills. It also focusses on skills that will help students thrive in the future and how education systems are fostering these skills.

Teaching the iGen

Dr Kristy Goodwin

Dr Kristy Goodwin draws on the latest research from the neuroscience, technology and child development disciplines to inform health professionals and educators about how 'digitalised childhoods and adolescence' are shaping kids' health, development and learning outcomes. Dr Kristy outlines how screen-time is influencing kids' social, emotional and physical health outcomes, as well as their cognitive performance. She tackles issues such as healthy screen-time limits, screens and sleep, self-regulation skills, physical activity levels, attention spans in the digital age, the demands and risks of social media, healthy digital habits and other current topics facing educators. Dr Kristy equips professionals with simple and effective strategies to help them effectively work with the iGen in the classroom and leverage technology in learning experiences. Kristy also arms them with vital information to help them confidently guide parents, as they navigate the digital terrain.

Making Photoshop puppets come alive with Adobe Character Animator

Dr Tim Kitchen, *Adobe Education*

Adobe Character Animator is a unique application within the Adobe Creative Cloud that enables users to animate digital puppets in real time by tracking facial features via a webcam. This workshop shows how to animate and manipulate built in and downloaded digital puppets made with Adobe Photoshop.

Make digital posters and turn them into simple videos with the free Adobe Spark Apps

Dr Tim Kitchen, *Adobe Education*

The Adobe Spark apps have revolutionised the way Adobe tools are used in education because of their simplicity. Being both iOS and web-based as well as free of charge, they are very accessible for iPad and non-iPad schools.

Teaching Mathematics through Animation

Brett Kent, *Hilltop Road Public School and Australian Catholic University*

This session will highlight the mathematical thinking required when creating 2D animations with Adobe Animate. Adobe Animate (formally known as Flash Professional) is part of the Adobe Creative Cloud and one of the world's most popular 2D animation creation tool.

Diving into Micro:Bit - From intro to robotics

Australian Computing Academy

The micro:bit is a great tool for teaching Digital Technologies in the classroom. In this workshop we'll take you from displaying a smiley face through to line-following with a robot chassis and on to Dab Dab Revolution. Learn about how scalable this tool is for different year levels and outcomes.

Object Oriented Programming in elective Digital Technologies

Australian Computing Academy

Object Oriented programming is a requirement for the Australian Curriculum: Digital Technologies elective Year 9 and 10 course.

Implementation in the Digital Technologies Curriculum - Covering the curriculum in Stage 4 and beyond Develop the skills necessary to teach the implementation portion of the Australian Curriculum: Digital Technologies (Years 7, 8 and above). Understand the requirements for user input, sequencing, branching, iteration, functions, structured data and even modules and get hands on experience with general purpose programming language programming activities.

High impact learning and teaching using 3D design and 3D printing in primary school Makerspaces

A/Prof Matt Bower, *Macquarie University, Sydney*
Dr Michael Stevenson, *Macquarie University, Sydney*
Prof Garry Falloon, *Macquarie University, Sydney*
Dr Anne Forbes, *Macquarie University, Sydney*
Dr Maria Hatzigianni, *Macquarie University, Sydney*

Makerspaces and 3D printing have been heralded as enabling new forms of creativity and student-centred learning. However, there is limited research examining their impact on learning, particularly for younger children. This study aimed to characterise the nature of learning and teaching when 3D design and printing was integrated into everyday classroom activities and identify influences on learning outcomes and learner engagement. Utilising pre- and post-questionnaires, classroom observations, teacher reflections, teacher focus groups and student interviews, the mixed methods approach examined students' learning in offline and online makerspaces activities. Participants included twenty-seven teachers and K-2 students in their classes from across three public primary schools in Greater Sydney. Findings suggest that 3D design and printing activities in makerspaces help students to develop their creative thinking, problem-solving, critical thinking, design thinking, inquiry and STEM capabilities, while promoting high levels of engagement, collaboration and autonomy. The makerspaces module enabled K-2 students to see how science, technology, engineering and mathematics related to the world around them, and teachers observed how teaching in makerspaces shifted them towards more open, communal, collaborative, purposeful, contingent and dynamic pedagogies. Professional learning and teaching experience in makerspaces made significant contributions to teachers' confidence, enthusiasm and professional identity.

Digital Literacy and Gen Z. The unpacking of expectations

Vicki-Lee Tyacke, *Curtin University*

Generation Z are the first generation who have no personal reference to a pre-internet society and their lives have been immersed in a digital culture. This generation are often referred to as the digital natives, the "native speakers" of digitally focused language. They have grown up in a highly diverse environment, constantly engaging with digital technologies, demonstrating savviness using technologies for social networking purposes, browsing and searching for information. With this high level of exposure to the digital environment it is often assumed by educators Generation Z students have achieved digital proficiency, however tech-savviness does not imply students are tech-smart.

From an education perspective there is concern with regard to the digital literacy abilities of young New Zealanders. It is purported they do not have the level of digital literacy required to be able to utilise e-technology for not only for academic purposes but also for the vocational sector as they transition from secondary school into their post school pathways. This creates a challenge for the New Zealand Government whose priority is that the New Zealand education system develops "young New Zealanders … to be equipped with the values, knowledge and skills to be successful in the 21st Century" (Ministry of Education, 2014, p.4).

This study is positioned in the academic post school pathway to explore the digital literacy of New Zealand secondary school students and their level of digital preparedness for tertiary studies. An exploratory case-study research design and inductive approach to data analysis was utilised to enable the researcher to develop an understanding of the participants' knowledge of digital literacy and the interplay between the secondary and tertiary sectors in New Zealand.

It is anticipated this study will provide guidance to both the secondary and tertiary sectors to enable a smoother transition for secondary students into tertiary level study to meet the New Zealand Government's expectations.

Exploring social regulation in Minecraft

Roland Gesthuizen, *Monash University*

When teachers introduce virtual worlds such as Minecraft to a classroom, they need a detailed understanding of how student behaviour and socialisation will be regulated. Collaboration demands an interplay between self and social regulation; that is, the ways in which individuals plan, monitor, act upon and evaluate their own behaviours and influence others. Social regulation equally has a role in collaborative creative expression, with the individual mediating and justification of their expression within the context of being a member of a broader group.

Teaching *Bitcoin* for impact in mathematics in the primary school classroom

Gaya Pillai, *Lakemba Public School*
Jane Hunter, *STEM Education Futures Research Centre, University of Technology*

Bitcoin is a peer-to-peer electronic cash system; it can be 'mined' by solving complex mathematic problems and each time it is mined the transaction is etched in a *blockchain* or a continuously growing list of records. These 'blocks' are linked and secured using cryptography and are sent to a distributed ledger of participants. *Bitcoin* has recently captured the attention of the world in a series of sometimes controversial media headlines. Even if the digital currency never really takes the place of fiat money the *blockchain* technology underlying it is changing the way people do everyday transactions. The idea of 'distribution' within *Bitcoin* is the key to its value within a future focused curriculum. The impression of there being no centralised body holding or distributing *Bitcoin* and hence, it's essentially 'decentralised' and 'distributed' nature is becoming increasingly relevant to more transactions in our everyday lives. These distributed models will enable the average person to contribute on a national and global scale and will necessitate the '*block chain'* to monitor and manage these micro transactions requiring millions of small players connecting to a wider network in order for it to work. This snapshot presentation introduces how a Stage 2 teacher in a primary school research project used *Bitcoin* to stimulate student interest in science and mathematics as part of a STEM unit of work that engaged an engineering process to explore the future of products and services in Australia. Students were intrigued by a competition to 'battle it out' solving maths problems and collected *Bitcoin* as rewards. The *Bitcoin* is updated and recorded on each student's ledger, which is replicated and distributed identically throughout the classroom. With the class is essentially becoming the *blockchain* of distributed participants. We argue there is significant value in using real world interactions like *Bitcoin* in the context of STEM education to not only teach financial literacy but also upskill students in their knowledge of cryptocurrencies as part of essential mathematics and science learning in primary school classrooms. During the 7-minute presentation ideas, photographs and strategies/processes used in the creation of the integrated unit of work that was underpinned by the *High Possibility Classrooms* framework, will be shared to enable researchers and teachers to consider *Bitcoin* and the *Blockchain* as a critical element in broader discussions about digital technologies and the place of technology enhanced learning where problem solving is a key element in STEM education.

Reflections of global IMPACT from the Microsoft Education Exchange conference

Simon Harper, *Killara High School*

When 400 of the world's most innovative educators (MIE Experts) gather together in one place, amazing things happen.

I was very honoured to be chosen to represent Australia at the fourth annual Microsoft E2 | Education Exchange in Singapore in March 2018. This event celebrates the incredible work of the some of the most innovative educators from around the globe. The essence of E2 is celebration, recognition, collaboration, and inspiration.

The week had a combination of individual and international teams collaborating and sharing innovations in the following areas:

- Keynote speakers from the Singaporean education system sharing key thrusts and innovations which have led to them being one of the top education systems in the world.
- **Global Educator challenge** had mixed international teams hacking an existing lesson to include innovative ideas to spark student creativity, empower all types of learners through global collaboration, and impact the environment positively. These projects centred around the four themes of algorithmic thinking, decomposition, abstraction, and pattern recognition.
- **The Learning Marketplace** is a mini trade show with every educator showcasing their work. The Learning Marketplace gave participating educators the chance to see how other teachers are using Microsoft technologies in their classrooms in innovative ways. Teachers gathered new lesson ideas, made connections, and left inspired.

My presentation will show case innovative leadership, practice and innovation from every continent around the world. This will frame high impact teaching strategies utilised by teachers from a uniquely global level that is not possible from a normal technology conference. This presentation will have many practical applications, resources, and inspiration for educators everywhere.

Online persona: Building capacity in education organisations to lead and model effective digital citizenship and digital footprints

Helen Kardiasmenos, *Belmore South Public School*
Jane Hunter, *STEM Education Futures Research Centre, University of Technology*

In 2018 it is more important than ever to lead and model effective *digital citizenship* and *digital footprints* for not only students, but for school leaders in the teaching profession through building an authentic online persona. Adina Sullivan, a K-12 technology integration specialist from the US likens the *digital footprint* to a "digital tattoo", and encourages users of technology to "choose their tattoo wisely" as removal is messy. She invites the profession to think carefully about the impact of the *digital footprint* on professional perception and hastens to add that if teachers do not consider their *digital footprint*, it can impact online reputation, real-life reputation, employment prospects, admission to professional associations and the reputation of people with whom they associate online. In a study of more than 1000 teachers conducted by the University of Phoenix College of Education in surrounding school districts 80% of teachers felt untrained in how use social media for professional purposes. This snapshot introduces how a middle level leader in a primary school studying for a Master of Education degree in an Australian university used these ideas and research findings from various studies to argue that successful school leaders and teachers should be using social media daily and modelling how to use such tools for students and colleagues. Construction of a model of 5Ps for creating and monitoring a *digital footprint* is a practical way to take action it includes the elements of Product, Positive, Presence, Proactive and Privacy. The model is an effective guide for how leaders might begin social media conversations in schools. We argue there is significant value in using social media for professional purposes and carving out an online persona that is both expert and authentic is possible. Furthermore we note that in many universities academics struggle with a social media presence and their issues have much in common with the teaching profession in schools more broadly. During the 7-minute presentation the 5Ps will be explored with resources and suggestions for how to commence and lead discussions with staff and colleagues in widening professional understanding of *digital citizenship* in today's world.

Switching young people onto STEAM: Tales from a teacher in a southwest Sydney primary school

Tara Cooke, *McCallums Hill Public School*
Jane Hunter, *STEM Education Futures Research Centre, University of Technology*

S T E A M is an acronym that refers to the subject disciplines of Science, Technology, Engineering, Arts (including the Humanities) and Mathematics. It's a necessity that it's taught well in primary schools and in education right now it encapsulates a movement that is much more than the sum of its parts. Through S T E A M it is possible to develop primary school age students exploration of real world problems, their knowledge of the component disciplines and the digital competencies and dispositions that will enable students to become active citizens in a rapidly evolving world. In 2017 research to build teacher capacity and confidence in STEM using the technology enhanced learning framework of *High Possibility Classrooms* was conducted in three southwest Sydney primary schools. The lead author was one teacher in a S T E A M teaching team in a total of 21 teachers in the study. As a mid-career teacher engagement in the action research project led to a redefinition of professional identity and what was understood about how primary school-aged students learn. By including the Arts/Humanities it informed a planning process using inquiry-based learning reliant on big ideas, hands on learning and experimentation. Sharing what students do in the classroom with parents via the Seesaw app also opened up a whole new level of desirable interactivity and inclusion in classroom learning. Such actions support a redefinition of the impact of teaching in primary schools. This snapshot presents how one teacher engaged in this school-university partnership collaborated with an academic partner (second author) and used the notion of 'pressure and support' to address challenges in their own practice to respond to the complex task of multi-subject integration. During the 7-minute presentation examples using the Seesaw app and its role as a tool to measure the positive impacts of classroom learning in STEAM will be discussed as well suggestions for how to recognise positive impact when it happens in education settings.

3D Design and Global Design Project

Kate Tyrwhitt, *St Michael's College*

By utilising apps such as Makers Empire the students have been creating objects that range in function and forms of expression. By linking to the Visual Arts curriculum and Units of Investigation learners use the different features in Makers Empire to create original designs and objects to be printed in 3D. Students from years 1-6 have been using the app with years 3 and 5 collaborating with an American school in Wisconsin in a Global Design Project by using FlipGrid and Padlet to share their learning and develop relationships with students in another country by engaging in a shared 3D design Project using Makers Empire.

Comparing professional learning programs in coding and computational thinking for K-6 teachers in New South Wales: Preliminary results

Daniel Hickmott, *University of Newcastle*

In New South Wales, the new K-6 Science and Technology syllabus includes the Digital Technologies strand. The outcomes in this strand are focussed on the teaching of computing skills, such as algorithm design, visual programming and data representation. The NSW Education Standards Authority (NESA) encourages teachers to integrate these skills across the Key Learning Areas (KLAs) and, in 2016, they developed a guide to coding and computational thinking across the curriculum.

In 2018, as part of my doctoral research project, I developed professional learning programs to support K-6 teachers learn these computing skills and apply these skills in the teaching of a variety of KLAs. These programs were conducted face-to-face in weekly after-school sessions over a school-term, with additional support from researchers in the following term. One of the main aims of this research project is to find out whether teachers that participate in a professional learning program focussed on integrating computing skills with one KLA (Mathematics) learn and teach computing skills differently to the teachers that participate in a program that integrates computing skills across all KLAs. In this snapshot talk, I will share our experiences designing and running the professional learning programs and discuss the preliminary results from the research conducted during the programs.

Incorporating 3D design and printing into primary school classrooms

Megan Koop, *Blakeview Primary School*

3D design and printing provides primary school students with opportunities to use critical thinking skills to collaborate and find design solutions to real life problems. The objective of this snapshot presentation is to provide introductory ideas about how 3D printing can be incorporated into primary school classrooms through project-based learning. It specifically describes a project undertaken by a Year 2 class to design a nature play space. After gathering data involving all classes across the school, students worked in pairs to plan their ideas, then incorporated 3D designing using the Maker's Empire App and finally printed the elements that would form a play space. Those 3D models were then used as the deign plan for our space which was then constructed. Students were involved in the whole design process from start to finish, allowing a sense of ownership and accomplishment, particularly when seeing the final product. High levels of engagement were experienced by all students involved in the project and an increase in peer interaction was evident through the high level of collaboration and peer assessment.

Project Spark - Engaging young minds for brighter futures

Amanda Maree, *Brighton Primary School*

PROJECT SPARK is a whole of school, sequenced robotics program at Brighton Primary School which forms part of our STEM learning approach. PROJECT SPARK aims to improve student engagement and to develop 21st century skills including: programming, problem solving, collaboration, risk taking, resilience and creativity. PROJECT SPARK was ignited by way of a $30,000 grant from Schools Plus. One of the strengths of this project is the phased increase in complexity of the robots to suit the needs, capability and age ranges of students.

Building capacity in teachers and student mentors was key to initiating PROJECT SPARK. Professional learning remains essential to maximising the impact on student learning. Close collaboration with Tasmanian Department of Education Curriculum Services and the University of Adelaide ensured quality professional learning for teachers.

Central to PROJECT SPARK is the explicit seamless integration of robotics into learning programs with strong links to the Australian National Curriculum General Capabilities and specific curriculum content rather than being regarded as an add-on robotics lesson. For example, Prep/1 students are learning to program the Blue-Bots to move in different directions and follow a simple path linked to their inquiry on recycling centres. Grade 1/2 students are learning to code Ozobots to knock a tenpin over linking to their inquiry into forces. Grade 3/4 students are exploring properties of matter by programming LEGO WeDo 2.0 robots to travel over a range of different types of materials. Finally, Grade 5/6 students are using their LEGO EV3 robots to replicate migration journeys to Australia. The EV3's have been transformed into ships, boats and aeroplanes. Assessment rubrics are used to interpret and grade student learning against clear criteria and standards.

Looking forward it is our goal that when you walk into a classroom you notice a previously disengaged student working collaboratively with a partner or small group, using a robot to solve a problem related to his/her learning.

Teachers have noted a marked increase in student engagement resulting from PROJECT SPARK and we believe that the project is in fact "engaging young minds for brighter futures". We would love to share our journey and what we have learnt so far with you, particularly around authentic integration and assessment of student learning using robotics.

3D design and global design project

Kate Tyrwhitt, *St Michael's College*

By utilising apps such as Makers Empire the students have been creating objects that range in function and forms of expression. By linking to the Visual Arts curriculum and Units of Investigation learners use the different features in Makers Empire to create original designs and objects to be printed in 3D. Students from years 1-6 have been using the app with years 3 and 5 collaborating with an American school in Wisconsin in a Global Design Project by using FlipGrid and Padlet to share their learning and develop relationships with students in another country by engaging in a shared 3D design Project using Makers Empire.

Getting published: Demystifying how to publish in journals, books and textbooks

Associate Professor Michael Henderson, *Faculty of Education, Monash University*
Dr Michael Phillips, *Faculty of Education, Monash University*
Associate Professor Therese Keane, *Department of Education, Swinburne University*
Dr Jason Zagami, *School of Education and Professional Studies, Griffith University*

In this presentation you will hear from highly experienced and successful authors and editors who will demystify the process of getting published in academic and professional journals as well as books and textbooks. You may be a researcher, a research student, or simply someone who wants to share what is happening in your own classroom. This session will provide an overview of the journal and book publisher review process. We will talk about the differences, standards and 'tips and tricks' of publishing. If you have a publication idea bring it along and discuss it with the presenter.

Challenging stereotypes, creating change: Improving girls' participation in STEM

Rebecca Davies, *Sunshine Coast Grammar School*

Recent research shows that Australian women comprise of only 28% of the workforce in STEM related fields (Rickard, K. and Crowther. A., 2015). This is despite the fact that early primary aged girls show an equal interest in STEM as boys the same age (Hobbs, L. et al. 2017). If we want to improve women's' participation in STEM related fields we need to begin by analysing what is happening in our schools.

Educators need to be encouraging girls to continue their love for STEM throughout primary school and into high school, but this is not currently reflected in our schools. Teachers and school leaders recognize the need to increase girls' participation in STEM but do not always have the strategies for implementing change.

Together we will deconstruct current teaching research and practice in order to explore how we can improve girls' participation in STEM in schools, particularly in extracurricular coding, robotics, and science clubs. Participants will walk away with a range of strategies that they can take back to their schools to make an immediate difference.

References
- Hobbs, L., Jakab, C., Millar. V., Prain, V., Redman, C., Speldewinde., Tytler, R., & van Driel, J. (2017). Girls' Future - Our Future. The Invergowrie Foundation STEM Report. Melbourne: Invergowrie Foundation.
- Rickard, K, Crowther, A 2015, *The slower track: women in the STEM professions survey report*, Professionals Australia, Melbourne

STEM in a box

Roland Gesthuizen, *Monash University*
Dr Ibrahim Latheef, *Monash University*

Curiosity, creativity, and problem solving underpin the pedagogical content knowledge required for integrating STEM in teaching and learning. Preparing teachers to engage in STEM requires the design of hands-on learning challenges that nurture these competencies in an engaging and non-threatening manner, where learning is play. To engage and empower our students, we designed a technology package called "STEM in a Box" that could be used by our remote students across Australia. We will showcase this package to delegates, outline how this was used, explore some of the new additions that we made and solicit suggestions for our next release.

The presenters at Monash University Faculty of Education have developed, implemented and taught a Graduate Certificate of STEM course with students presenting with a wide range of different backgrounds, sectors and physical locations spanning most Australian states. A particular challenge was how to best support their learning to tinker and explore the digital origins of STEM. Whilst the faculty of stablishing a popup makerspaces at their new Education building at the Clayton Campus, we were keen to simulate this experience for our distant students, expose them to the makerspace culture, constructivism pedagogy and different technology tools that they may find in a STEM center or maker space.

This presentation will outline our approach to support local and remote students by designing, producing and shipping a package that we called the "STEM in a Box". Our packages contained a range of digital technology components including a budget computer, electronics, robot and virtual reality equipment that was supplemented by videos, online forums and participation in an immersive 3D environment. This workshop will outline the planning and design thinking used to help develop this project, drawing upon current research, contemporary practice and the digital origins of STEM. It is envisaged that this project is an exemplar for best practice for STEM teaching and learning that can be readily modelled and adapted by neighboring schools to build STEM and digital technology capacity.

Automated city model using voice controls demonstrating the internet of things

Clarence Goh, *Parkes Christian School*

A city is built using LEGO and is automated with Raspberry Pi and Arduino with the assistance of smart plugs. An applet is made using IFTTT and Google Assistant is then used to trigger multiple instances of the working city which includes a fully working and automated mini cinema running a movie, trains, street lights and traffic lights. This project was developed by students and will be used for students. It has the benefit of covering all topics in the Australian syllabus for IT with minimal hardware, space and cost. It benefits regional schools as these factors can be limiting. The built city is then tested for effectiveness in a classroom environment. This project is listed in the Google Transformation Centre.

The Kookaberry Primary STEM Learning Platform

John Phillips, *The Auststem Foundation*

The AustSTEM Foundation, a not-for-profit charity, has collaborated with Australian industry to develop a Stage 3 (Years 5/6) classroom tool, the Kookaberry, to engage students and educators directly with the science, technology and mathematics both in the world around them and within them.

It is a credit card-sized, microcontroller-based, plug-and-play, technology platform designed for Primary teachers and students with little or no software or coding experience.

It is compatible with both the Arduino and the Micro:bit, and capable of supporting aspects of the Digital Technologies curriculum through high school.

Supplied with many different sensors, it can be quickly configured to operate in many different roles such as a heartbeat monitor, gas detector, crash avoidance, tone generator, quiz engine, randomiser, accelerometer, time piece, soil moisture and ph monitor, student response tool, or robotic controller.

To foster equity in STEM and technology-enabled learning, it will be made available nationally to all Year 5 children. It will put the experience into experiential learning across the curriculum; and provide the feedback required for individual student-paced learning across all subjects.

Designing digital solutions using the BBC micro:bit

Martin Levins, *Australian Curriculum, Assessment and Reporting Authority*
Deanne Poole, *Australian Curriculum, Assessment and Reporting Authority*

The BBC micro:bit is a compact, codeable computer bursting with features. The micro:bit can be used by students from primary to secondary to create all sorts of solutions across many learning areas. School gardens are a popular activity in Australian schools, and an excellent resource for the teaching of biological science and food and fibre production. Micro:bit technology can allow students to build digital devices to collect data about the garden, measure pH or sunlight and even create a device to regulate the watering.

Micro:bit can allow students the creative freedom to design digital solutions to real world problems.

Participants will:
- review the Digital Technologies curriculum (presentation)
- become familiar with the BBC micro:bit
- investigate options and extension opportunities
- design a working fruit detector
- identify professional learning needs for themselves and their school (brainstorm activity)
- use the UNESCO Sustainable Development Goals to identify opportunities to create 'real' solutions
- engage with a variety of existing BBC micro:bits projects to identify opportunities

Introductory robotics workshop coding made easy with LEGO Education EV3

Joanna Burk, *Modern Teaching Aids*

Discover why now more than ever robotics is fast becoming a major tool in the classroom for teaching Science, Technology, Maths, Literacy and more.

Robotics offers your students a highly engaging medium designed to help them develop 21st creative thinking, problem solving, and team work and communication skills.

Teachers attending this workshop will be introduced to the EV3 hardware through a quick build robot exploring the use of motors and sensors:
- Program using the introductory level of the EV3 software which provides an integrated learning experience
- Explore the curriculum material available to match your needs and requirements in the classroom
- Teachers will also be introduced to the national robotics competition of **RobocupJunior Australia**

Implementing Digital Technologies in primary school

Anna Kinnane, *Digital Technologies Hub*
Martin Richards, *Digital Technologies Hub*
Leanne Robertson, *Digital Technologies Hub*

Delve into the Digital Technologies Hub Scope and Sequence. The Digital Technologies Hub has released a Scope and Sequence for F-10. Work with the creators to explore the Scope and Sequence and look at models of implementation across the primary school.

Focus on some key concepts including algorithms, data, digital systems and designing digital solutions. This session will include ways to differentiate tasks to enable success for all students and explore assessment tasks to inform student learning and teacher practice.

This is a hands on workshop. You will get to explore activities from the Scope and Sequence for the age group you teach and also find out how to integrate digital technologies in a meaningful way across a range of learning areas.

Digital portfolios with Adobe Spark Page and Spark Video

Dr Tim Kitchen, *Adobe Education*

The Adobe Spark apps have revolutionised the way Adobe tools are used in education because of their simplicity. Being both iOS and web-based as well as free of charge, they are very accessible for iPad and non-iPad schools. This session looks at the glide show feature of Spark Page and how it can be used in conjunction with Adobe Spark Video to make engaging and very informative digital portfolios.

Computational Thinking strategies

Sarah Hobson, *Australian Curriculum, Assessment and Reporting Authority*
Shane Byrne, *Australian Curriculum, Assessment and Reporting Authority*

Participants will:
- Unpack the Computational Thinking skills in the Digital Technologies curriculum (presentation)
- Develop a deeper understanding of computational thinking through scaffolded unplugged and activities including:
    o different types of computational thinking skills
    o sequencing as the first step in algorithmic thinking
    o visual programming languages and simple algorithms in a geometric context
    o how choice (branching) works in algorithmic thinking
    o how data can be useful to teach concepts across learning areas
    o how computational thinking can be used to support literacy and numeracy
- Understand ways computational thinking could be used in everyday teaching and learning activities (discussion)

Implementation in the Digital Technologies Curriculum - Covering the curriculum in Stage 4 and beyond

Australian Computing Academy

Develop the skills necessary to teach the implementation portion of the Australian Curriculum: Digital Technologies (Years 7, 8 and above). Understand the requirements for user input, sequencing, branching, iteration, functions, structured data and even modules and get hands on experience with general purpose programming language programming activities.

Designing and assessing digital technologies learning

Rebecca Vivian, *Computer Science Education Research Group, The University of Adelaide*
Martin Richards, *Digital Technologies Hub, Education Services Australia*
Katrina Falkner, *Computer Science Education Research Group, The University of Adelaide*

The Coding Across the Curriculum Resource Review and Report identified that a number of quality resources exist for K-12 Digital Technologies. However, the report recommended that additional guidance and support was required to support teachers to effectively use resources to develop learning and teaching sequences that align with curriculum objectives and to assess student learning. The Digital Technologies Hub was launched to bridge this gap by curating and developing resources aligned with the Australian Curriculum: Digital Technologies. In their latest work, the Digital Technologies Hub has released a scope and sequence providing a framework for Digital Technologies implementation across year bands and topics, along with additional assessment resources and support. This workshop supports teachers to harness these resources to build their own learning and teaching units for Digital Technologies in primary and secondary classrooms.

The stages of cognitive development of the novice programmer

Raymond Lister, *University of Technology, Sydney*

This paper summarizes research programme of the author and his collaborators, over several years. That research has identified cognitive stages that students pass through as they learn to program. These stages correspond to neo-Piagetian stages − sensorimotor, preoperational and concrete operational. Pedagogical approaches consistent with these neo-Piagetian stages are briefly outlined.

Cracking the code: The story of how Python Programming Language and Design Thinking assisted students from low-socioeconomic backgrounds in Victoria to collaborate, engage and code with purpose

Sarah Dowell, *Wyndham Central College*
Paulo Silva, *Wyndham Central College*

In Australia, there remains some confusion regarding STEM and how its integration into classrooms can benefit students. Coding has appeared more often in the media over recent years as an essential component of education for all. Consequently, many organisations in Australia (see Coder Dojo) have developed successful, volunteer-based programs to assist young people to gain valuable computational thinking (CT) skills. However, evidence suggests that educators in many Australian schools still struggle to develop relevant computer science curriculum capable of assisting students to develop coding and CT skills. Some of the reasons for this struggle may rise from lack of support from school leadership, limited time, and a teacher's lack of professional development. These challenges are particularly acute in low socio economic settings where resources may be scarce. Worryingly, Australia has consistently recorded weak participation and poor performance of low socio-economic status (SES) students in STEM related subjects. This is concerning because the widening of this so-called technological skills gap might have both negative equity and economic implications for Australian society.

We live in a pivotal moment in human history, one in which knowledge and advances in technology can significantly improve our quality of life and, optimistically, decrease inequality in the world; importantly, students from low SES backgrounds ought to be aware that their contribution is welcome, valued and needed. In this paper, the successful yet challenging implementation of a new-tailored Coding curriculum for low SES students (Year 9) at a low SES school in Werribee, Victoria is discussed. Students had the opportunity to gain valuable 21st century skills by learning and using Python Programing Language and Design Thinking throughout a Project-Based Learning assessment task; importantly, working collaboratively under the motto "code with purpose".

Apart from assessing academic progress, students' STEM Engagement (SE) and Growth Mindsets (GM) scores were collected at the start and end of the term. Around 80% of students (n=35) increased their SE score by at least 26%, whilst the GM score results were mixed; 66% of students improved their GE scores (10-15%), whilst the remaining regressed. These results are a reminder that schools have a vital role to play in regards to engagement in STEM related subjects and the creation and maintenance of a GM culture. Importantly, results suggest that the current technological skills gap for low SES students can be closed with methodical planning, differentiation and employment of novel pedagogical approaches (Challenge-based learning and gamification).

Integrating 3D printing with teaching at Monash College

Dr Shannon Rios, *Monash College*

This paper explores the use of 3D printers at Monash College Diplomas as a tool to develop interactive teaching materials and as a teaching aid to enhance student learning. 3D printers were introduced into "Introductory Engineering Computing" as a way to both modernise unit content and expose students to the basic principles of 3D modelling and design. Students were given introductory lessons on 3D modelling and 3D printing and then asked to design modifications to an in-house designed robot and improve its performance. Student surveys indicated an increased engagement with the unit content and most students developed non-trivial improvements to their respective robots, with some students creating completely new designs.

As well as being used to teach design and 3D modelling skills, the 3D printers have also been used to improve lessons by creating unique and custom models for demonstration purposes. One example of this is for "Introductory Physics" In this unit the teacher highlighted that students were struggling to understand the shape and structure of the electron cloud orbitals in different types of atoms as 3D shapes are difficult to understand fully on a 3D structure. To solve this problem we have printed a series of models that represent this phenomena. Feedback from the teacher for this unit has so far been very positive, as they were previously using crude hand-made paper models which were too fragile to pass around class and easily damaged. A similar project was also undertaken for "Introductory Chemistry" to produce molecules and chemical structures.

Another project that the 3D printers have been used for is to produce universal joints for the production of spaghetti bridges in "Engineering Design". This subject is a 1st year university equivalent unit that focuses on mechanical, civil and materials engineering and has students working in groups to produce a bridge made from spaghetti. One issue with the spaghetti bridges is joining the spaghetti is difficult, with masking tape or hot glue being the only viable solutions. To overcome these shortcomings a hemispherical adaptor joint was designed that allows for several spaghetto to be joined together non-permanently and without glues, thus simplifying the build process saving time, mess and money. These parts have been trialled successfully and a wider scale deployment will be undertaken in the future.

Digital Technologies in the K-6 classroom

Karen Binns, *St George Christian School*

In this workshop, participants will be given time to learn about and experiment with a range of embedded technologies. Having been inspired by the number of ways these digital technology tools can be employed to address K-6 outcomes, participants will then be given time to view units of work and then brainstorm further activities to take back to their classrooms and share with their colleagues.

A range of unplugged, hardware and software will be available to cater for participants with varying expertise and classroom interests. This will be a practical workshop where we see how embedded technologies really work in the classroom with actual units of work.

A crisis online

Dr Sarah Prestridge, *Griffith University*

Over the last 10 years there has been consistent and remarkable growth in online education. Many students must transition from their historical experience of an almost fully face-to-face learning environment to a blended and or predominately fully online learning environment. Online learning requires students to develop and apply skills that enable them to participate in inquiry, discussion, collaboration, reflection and manage their own learning. Students must self-regulate these learning processes to self-direct their development of new concepts as well as contribute not only to the co-construction of content, but also to the community of inquiry. Self-regulated learning (SRL) results from student's self-generated thoughts and behaviours that are systematically oriented towards the attainment of learning goals (Zimmerman, 2008). SRL has been investigated from the early 2000s, however, there is a lack of examination of the relationship between SRL and online learning.

Coupled with SRL, are the complexities associated with changes in pedagogies needed for teaching online. Teachers need to redesign not just their pedagogical practices but also their understanding of what constitutes effective teaching and learning in these online environments. Research in these pedagogical progressions has not matched the proliferate growth in the online teaching and learning domain. However, there is evidence of typologies of online teaching competencies that identify specific practices that have been based on traditional face to face teaching (see Brinthaupt et al., 2011) or higher education contexts (Edwards, Perry, & Janzen, 2011). Importantly, the IMPACT framework, used by Distance Education in Australia, has developed a model to support effective teaching online (Authors in press). This framework emerged out of the collective experiences of students, teachers, parents and the community, who learn in a fully online environment. It was also designed with the intensions of using ICT effectively in an online environment.

This session examines the relationship between SRL and online pedagogies as a rejoinder to the point of crisis flowing for students experiencing a fully online learning environment. A precis of the current research on SRL and pedagogical strategies specifically targeting the development of SRL followed by an overview of online pedagogies together with the IMPACT framework as a foregrounding theoretical model for teaching online. A series of questions will then be posed to generate dialogue about supporting students' development of SRL in mainstream schooling. A collective response to the guiding question: How do we support the development of students self-regulated learning so they are effective learners online? will be sought.

References
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- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American educational research journal*, *45*(1), 166-183.

The impact of a practically digital classroom

Robin McKean, *CSER University of Adelaide*

Literacies and learning have been **ImpaCT**ed by the merging of English, Media Arts, HASS and Digital Technologies with opportunities for Critical and Creative Thinking in this **Practically Digital Classroom**.

Students use a variety of mixed reality and multimodal technologies to engage imaginatively and critically with English literature in general and historical narrative in particular via the curriculum aligned interdisciplinary art of reading, writing, viewing, speaking, listening and storytelling.

A new literacy has evolved as students produce their own multimedia branching stories as print text; creatively code and craft or remix stories into interactive multimedia; immerse themselves in the virtual, and, storyboard and digitally build in 3D in order to create from their own multidimensional perspectives and experiences.

They are given the opportunity to enter the virtual reading room of the National Archives, journey and interact with immigrants over land and sea and develop knowledge, understandings and empathy when availing themselves of this multimedia and archival information and evidence. Learning is **ImpaCT**ed further through the use of narrative with interactive literary study sets and immersive journalism tools; online collaborations in real time for critical, creative and historical thinking activities and participation in tutorials and workshops that scaffold student learning and allow them to bring settings to life 'from inside the pages', use their creative smarts to virtually portray the relationships between characters, create character constellations and more clearly demonstrate different points of view.

Attendees will access the learning experiences using a web mix of freely available resource links and scaffolded tutorials that will translate the ImpaCT of the Practically Digital activities into their own classroom practice.

Computational Thinking: Creating ImpaCTful apps with App Lab

Matt Jensen, *St Mary's College Ipswich*

This workshop will explore how code.org's App Lab can be used to support student learning about Computational Thinking and the Digital Technologies Curriculum Years 5-8. Participants will experience the app development process from a student perspective through problem definition and decomposition, user interface (UI) and algorithm design, programming and evaluation. App Lab from code.org is a programming environment where you can make simple apps. It enables the user to design the UI, code in JavaScript and then share in seconds. No prior knowledge of App Lab is needed, but it would be helpful if participants have some knowledge of block or text coding. Participants will need to bring a laptop device and a code.org account would be helpful. Matt Jensen is currently Technologies Curriculum Leader at St Mary's College Ipswich, a Catholic girls' school in metropolitan Queensland. He has been using App Lab with Year 7-9 students to teach computational thinking and UI and algorithm design for 2 years. More broadly, Matt's subject areas include digital technologies, English, drama and business and he brings a wealth of knowledge in using digital learning tools in the classroom.

Morse code network with BBC micro:bit

Nathan Alison, *Digital Learning and Teaching Victoria*

This workshop will introduce teachers to a sequence of activities for exploring network theory in a hands-on way using the BBC micro:bit. This can help schools to implement the Knowledge and Understanding strand of the ACARA Digital Technologies curriculum using a relatable metaphor, while giving opportunities for students to apply coding of classroom electronics.

Personalised Learning: 5 things every educator should know about

Melanie Gillies, *Reflex Technology Group*

Personalised, or individualised learning, is a growing trend within classroom programs. Most schools are talking about it; most educators resonate with it; yet few of us have limited success with implementing it. Personalised learning involves the tailoring of pedagogy, curriculum, and learning environment to meet the needs and aspirations of individual learners. According to AITSL, personalised learning is "a teaching approach that puts the student at the centre of their learning – understanding how different personalities learn best, and tailoring the teaching and learning to meet their individual needs."

But what about personalised learning for teachers? Teachers are often asked to differentiate and individualise learning for students in the classroom, yet they rarely get the same kind of attention when it comes to their own learning and professional development needs. Educators are forever searching for ways to align every student's skill readiness against relevant learning content, however when it comes to a decision making of school-wide professional develop, we tend to implement a one-size-fits-all approach.

In this workshop we will share how schools are using technologies to overcome challenges of adopting personalised learning. Personalised learning not just for students, but for teachers as well. The focus of this demonstration will be how technology can be used as a great enabler of this personalisation process, and how to use data to measure the impact of individualised teacher and student pathways.

Industry panel - Day of STEM: What are technology employers looking for in the next generation?

Iwan van Tilburg, *Education Outreach, Australian Signals Directorate*
Emma Broadbent, *Social Innovation Group, Regional Manager ANZ & Pacific Islands, Cisco Australia & New Zealand*
Matthew Connolly, *Associate Director, Cybersecurity Partnerships, Optus Business*
Moderated by Martin Levins, *Immediate Past President, Australian Council for Computers in Education (ACCE)*

Public and private sector technology employers have made repeated public calls for more STEM professional s as they struggle meeting workforce needs in the digital age. Primary, secondary and tertiary schools have increased efforts to implement different STEM learning programs that explore areas like robotics, coding, and careers. Employers have stepped up efforts to develop closer relationships with school systems, bridging the gaps between emerging technologies and innovation taking place in the workplace, to classroom learning through the Australian Curriculum - Digital Technologies. The panel aims to explore what leading Australian employers are looking for in new recruits from their hard skills in the STEM subjects, subject knowledge and intrapersonal skills in communication, leadership and problem solving. The panel will also explore different entryways and the application process in order to better inform educators on how to prepare students for the STEM jobs of the future.

Panel Structure
- Introductions - 5 minutes
- Panel Questions - 30 minutes
  - What are the critical skills and traits you are looking for in candidates?
  - How are you currently working with schools and universities?
  - What advice can you give to the educators in the audience?
- Audience Q&A - 10 minutes

Digital Technologies goes to school

A/Prof James Curran, *School of Information Technologies, University of Sydney*

The Australian Curriculum: Digital Technologies is already 6 years old, so it would have started school this year. What will the first teacher report card for Digital Technologies say? Australia has over 280,000 teachers and 3.8 million students to introduce to Digital Technologies. How many and how well have we reached them so far? What will Digital Technologies look like as it gets older? This talk will discuss our progress with the Digital Technologies roll out and the importance of the key concepts in getting teachers started with unpacking the curriculum and avoiding it becoming an anachronistic teenager.