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DLTV JOURNAL

The Journal of Digital Learning and Teaching Victoria

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Digital Learning and Teaching Victoria

Contents

DLTV Journal
The Journal of Digital Learning and Teaching Victoria

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Digital Learning and Teaching Journal is published as a resource for all educators engaged in the effective use of information and communication technologies for teaching and learning.

The editors welcome contributions to the bi-annual issues from classroom teachers and other educators in the form of articles, reports of school-based projects and other reviews. Text and graphic files may be submitted to publicatons@dltv.vic.edu.au
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The journal is published by Digital Learning and Teaching Victoria, the new association formed from the merger of the Victorian Information Technology Teachers Association (VITTA) and ICT in Education Victoria (ICTEV).

Editorial

Dr Michael Phillips and Dr Michael Henderson

Editors
Faculty of Education, Monash University

Welcome to our first issue of the DLTV journal for 2015. This journal provides carefully selected articles ranging in focus from early to senior years, cross-curricula to discrete studies, and stories from the chalkboard to discussions of policy. In this issue we have especially chosen articles relating to the challenges and opportunities offered by the new Australian Curriculum: Digital Technologies. The Digital Technologies curriculum has been a topic of discussion and debate for some time and DLTV has contributed to the shape of this new curriculum such as through the provision of expert opinion to ACARA.

As journal editors, we are proud to be able to continue to provide teachers with access to expert advice and exemplars from around Victoria and beyond. In this edition, we would like to draw attention to one of the novel aspects of the Digital Technologies curriculum that is challenging some teachers: Computational Thinking. As evidenced in Figure 1, Computational Thinking forms a key way in which students are expected to think about problems and solutions in both the Digital Technolgies curriculum as well as the Design and Technologies curriculum.

Figure 1. Relationship between key ideas and Technologies subject areas. (http://www.australiancurriculum.edu.au/technologies/content-structure)

The inclusion of computational thinking is both an exciting opportunity and a fearful risk. It is an opporuntity to make our own curriculum area fresh in our eyes. By forcing ourselves to actively re-design and reflect on what, why and how we teach digital technologies we can find better paths to learning outcomes. Whether we agree with the politics or hidden agendas in any policy document, and regardless of the problems of a crowded curriculum and limited time, this kind of change can be good for our practice - so long as we do not merely assimilate the new curriculum into what we have always done simply because it is the path of least resistance. However, we are not so starry eyed to think there is no cost or risk. The cost includes a considerable investment in our time to rethink our goals, add new concepts, and redesign our lessons. The risk is that the language, concepts and expectations around the new curriculum is so many steps from the familiar for many teachers that it's implementation across the state (and the nation) becomes watered down, confusing and ultimately self-defeating. Computational thinking is one such 'stranger' in our midst. One the one hand it has been simply defined as a problem solving method, for example:

> *computational thinking is a problem-solving method that is applied to create solutions that can be implemented using digital technologies. It involves integrating strategies, such as organising data logically, breaking down problems into parts, interpreting patterns and models and designing and implementing algorithms*

(http://www.australiancurriculum.edu.au/technologies/content-structure)

On the other hand, such a definition defies operationalisation. Many teacher's remain confused about how they might implement this in their classrooms. There is no simple approach. DLTV is accutely aware of the need to continue supporting teachers to engage with the curriculum, and 'make it their own'. This issue of the DLTV journal contributes to this ongoing conversation, particularly in relation to computational thinking.

As usual the first section of the journal includes articles relating to events and management of your professional association. The President's report not only summarises all was achieved in 2014 but also gives an indication of some of the opportunities on offer in 2015. These are further highlighted in the DLTV professional learning report and in the DIgiCon Blog which outlines the exciting program for this year's conference. This first section of the journal also includes thoughts from the VCAA's Paula Christopherson which outline ongoing changes and challenges in the curriculum landscape.

The remainder of the journal contains articles of interest for digital technology educators in a wide variety of contexts including those grappling with the best ways to work with concepts new to the Australian Curriculum. In particular, we are thrilled to be able to bring new a paper from last years ACEC conference which examines ways in which flowcharts can be used to teach computational thinking in primary schools. Other articles examining aspects of the new digital technologies curriculum include the positive side effects of

coding in the classroom, structural and teaching the digital technologies curriculum from Scratch. We are also pleased to provide specific information related to the interpretation of the Australian Curriculum here in Victoria through an article focussing on changes to VCE computing.

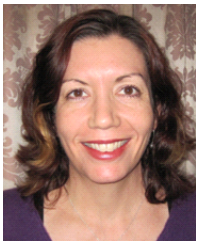
Other articles in this issue offer diverse reading include using digital technologies in in outdoor environments, Art classrooms, early childhood settings, primary classrooms and VCE. The focus of the articles include emerging technologies, game based learning, and STEM. Additional articles explore the challenges associated with preservice teacher education which is particularly appropriate since 2015 is the DLTV year of preservice teacher education. Finally, this issue concludes with a book review of *Invent to Learn* which may provide many of you with some inspiration for some holiday reading.

Introducing our editorial team:

The DLTV journal is published twice each year. We seek high quality articles relating to digital technologies from pre-school to VCE and VET. With such a broad remit we are constantly seeking interesting stories that will be of interest to teachers and leaders across a variety of educational contexts. With this in mind, we are thrilled to be able to introduce eight new members of the journal editorial team. Each of these Associate Editors bring years of experience across the stages of education and across sectors which will allow us to bring you an equally diverse range of articles.

Kerri Batch

Kerri Batch is currently the Director of Teaching and Learning at Aitken College, a low-fee Uniting Church P-12 school in the suburban outskirts of Melbourne. She has taught in a wide variety of subject areas in a career of over 25 years, including English, Literature, Humanities, Music, Religion and Society, and Integrated Studies. A current area of her specialisation is the capacity-building of teachers, particularly in helping teachers to use ICT in engaging and effective ways in all subject areas. Her hobbies include a range of craft and design areas, and buying gadgets.



Jo Bird

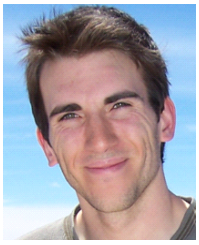
In addition to her work with us on the Journal, Jo is a fulltime doctoral candidate in the Faculty of Education at the Australian Catholic University where her research considers the use of digital technologies in early childhood settings.

Jayne Boon

Jayne Boon is Director of eLearning at Aitken College, a P-12 school with 1200 students, 150 teachers, over 1,00 iPads and a vast array of technology in the classroom. She has been teaching Modern Languages, Media and ICT for many years with a wealth of experience in ICT and eLearning in Australia and the UK. She was a curriculum ICT Consultant for BECTA working on the Academies Program and Building Schools of the Future programs in the UK, providing advice and guidance on infrastructure, integrating ICT into learning and teaching, identifying staff training needs and producing programs to upskill staff in the use of new technologies. Jayne has spoken at conferences and delivered many ICT training events in the UK and Australia.

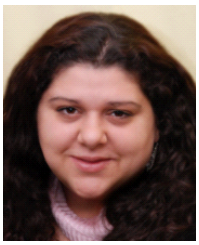
Nicky Carr

Nicky, a lecturer in teacher education, has a special focus on how digital technologies are integrated into classroom learning and teaching, both at a school level and within the higher education sector. Nicky integrates digital technologies in her own teaching and, where possible, works with local schools to add site-based elements to her courses.



Chris Gatt

Chris Gatt has taught Media and English at Northside Christian College for over 9 years. He has always been a bit of a geek, but he really started to understand the benefits of technology for education in 2011 when he was selected to take part in an eLearning training program through Independent Schools Victoria's National Partnerships Program. Shortly after this he was given the role of eLearning Coordinator at NCC. He is passionate about training teachers to embrace technology and its transformative potential in education.

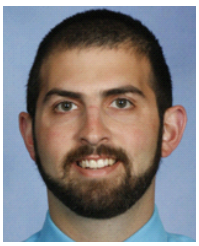


Sawsan Hassan

Sawsan is an early career secondary school teacher and her methods include student welfare, humanities, mathematics and science. She currently teaches Legal studies in VCE and Mathematics and Science in lower and middle school. Sawsan is an ICT peer coach and she is also on the eLearning committee at her school.

Michelle Mercais

Michelle is a primary school teacher who has been teaching for 17 years. She has a strong interest and background in digital technologies and has held a variety of positions, including Learning & Teaching/eLearning Leading Teacher, ICT Peer Coach and 1:1 iPad leader. Michelle has presented at state, national and international conferences on a number of topics, including ICT peer coaching and integrating 1:1 mobile devices. She has also worked closely with representatives from Apple, Cisco, DEECD, IBM and Microsoft on educational projects.



James Vella

James Vella is a teacher of mathematics and information technology and is currently the Learning Area Leader for Digital Technologies at MacKillop Catholic Regional College in Werribee. He also holds an eLearning position at the College. Prior to teaching at MacKillop College, James was a computer technician at Catholic Regional College Melton. Over the years, James has taught Information Technology Units 1 & 2, Software Development, as well as Intermediate IT (Video Game Design, Multimedia & Software Design and Development) and Mathematics. Over this time, he has developed a passion for eLearning and empowering teachers to use technology in the classroom.

More recently, he held a position on the VCAA's Information Technology Study Design Review Panel and was an active member in the development of the Computing study design.

Each associate editor has been closely involved in the production of different articles in this edition and, as you will see browsing through the variety of articles on offer, they have enhanced the breadth and depth of articles in your journal. This edition not only builds on Journal 1.1 and 1.2 produced last year but also extends the work of both the VITTA and ICTEV journals which preceded it.

With thanks

We would like to take this opportunity to publicly thank Dr Donna Gronn for her outstanding leadership as president of DLTV. Donna's remarkable contribution to this professional association has enabled a smooth amalgamation of VITTA and ICTEV into a collegial, vibrant and expert organisation.

From the President

Dr Donna Gronn

As I come to the end of my term as Digital Learning and Teaching Victoria President I would like to share the achievements of our blossoming teacher association. As I write this, DLTV has been the key teacher association for educators in Victoria for 15 months and it is astounding to see how far we have come. Although we do not forget the achievements of our predecessor associations ICTEV and VITTA, we now forge ahead as the one strong Victorian association we have formed.

2014 was a year to get our office and systems up and running and to begin to establish our position within education systems across Victoria. In 2015 we have been focused on formulating and implementing our Strategic Plan based on our vision and mission statements.

Vision Statement

DLTV has a vision of *leadership, empowerment and excellence in digital learning and teaching.*

Mission Statement

The mission of DLTV is that *every learner is enabled, inspired and empowered to participate, contribute and shape their world through digital technology.*

Our Strategic Plan, to be released at the 2015 AGM, will outline how we plan to achieve and implement our vision and mission. We look forward to all educators in Victoria being a part of DLTV in the future. Our membership is growing as teachers and schools realize that DLTV offers a great range of benefits for members and is focused on supporting and advocating for all educators. Please go the DLTV website for details of opportunities for 2015.

Professional Learning

So far, 2015, the year of the pre-service teacher has been a big year for Digital Learning and Teaching Victoria and there is so much more to come. We have continued to offer and expand our professional learning for teachers with over 80 great professional learning events including three regional mini conferences. The Geelong conference was very successful and the Bendigo and Warrnambool conferences are looking like they will be ground breaking. We are working hard with some great regional members and local community members to try to cater for those who cannot make it to Melbourne based professional learning (or those who just want more!). Our aim is to cater for all members across the state.

DigiCon2015 - 24th & 25th July 2015

Our state conference now has an ongoing name that you will see each year. This is DigiCon. You will be able to follow DIgiCon on social media via #DigiCon15 and @digi_con.

DigiCon2015 is to be held at Swinburne University 24th & 25th July 2015 with a theme of Festival of Digital Learning. This will include a main stage of traditional conference sessions as well as a fringe festival of more diverse offerings. Something to cater for everyone.

We were inundated with a call for presentations, which is now closed. Please go to the DLTV Conference site for further information or to the DLTV Registration site to register.

Apart from the conference providing you with brilliant ideas form practicing teachers to use in your classrooms and with your colleagues, the conference this year will also cover (at least) the following National Professional Standards for Teachers. So get in early to cover your professional learning and teacher registration requirements.

Standard 2 – Know the content and how to teach it

2.1 Content and teaching strategies of the teaching area

2.6 Information and Communication Technology (ICT)

Standard 3 – Plan for and implement effective teaching and learning

3.6 Evaluate and improve teaching programs

Standard 4 – Create and maintain supportive and safe learning environments

4.5 Use ICT safely, responsibly and ethically

Standard 6 – Engage in professional learning

6.1 Identify and plan professional learning needs

6.2 Engage in professional learning and improve practice

6.3 Engage with colleagues and improve practice

6.4 Apply professional learning and improve student learning

Standard 7 – Engage professionally with colleagues, parents/carers and the community7.4 Engage with professional teaching networks and broader communities

Funding

We are pleased to announce that we are again being supported by the Victorian Department of Education & Training through their granting a continuance of our SPP funding for 2015-2017. The DET Strategic Partnerships Program (SPP) provides funding to not-for-profit organisations to deliver programs to improve student achievement, engagement, health and wellbeing and/or teacher capacity.

We are also proud to have won the VCAA tender for Workshops in April – May around the VCE Study Design. Workshops are scheduled in schools, based around those offering the specific

VCE units targeted. They include metropolitan, regional and online venues. See The DLTV Events page for further details.

Awards

I am pleased to say that at the State Conference in May DigiCon2015 we will be announcing the winners of two Making IT Happen Awards. These awards are part of our affiliated membership with International Society for Technology in Education (ISTE). Details of the Awards can be found at the ISTE Making IT Happen page. Making IT Happen awards are nominated by the DLTV Committee of Management.

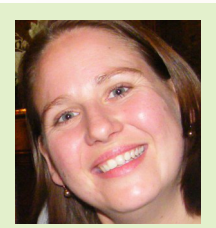
DLTV would not exist without the members and we continue to ask you to feedback to us what is happening in your workplace around Digital Learning and Teaching. Please contact us at any time to share your thoughts, experiences and ideas for how we can assist you and your colleagues, or how you can assist us, in progressing the Learning and Teaching of Technologies across this fabulous state and beyond. If you are reading this journal and you are not a member of DLTV, go to our Membership page to see the benefits of becoming a member of this great professional learning network.

This is my last President's Report for the DLTV Journal as I will be stepping down as President at the AGM in May. I would like to thank the very supportive team we have developed at DLTV. This includes the office team, the Committee of Management and especially the DLTV Executive. The support I have had from each and every one of them has been greatly appreciated and I know how much each of us has developed in our various roles across 2014 and 2015 and will continue to develop in our new roles going forward.

I would particularly like to comment on the tireless work of our journal editors Mike Phillips and Michael Henderson for their continuing work on this journal. They have taken the journal through a period of change and have developed and excellent journal that is valued through all levels of education. Please consider helping Mike and Michael out by being an Associate Editor in your area of interest, or by writing an article for the next journal.

I wish everyone continuing exploration and enjoyment, as DLTV becomes a stronger link in your professional learning network.

Conference Report
DIGICON BLOG



Melinda Cashen
Conference Chair

Melinda has 12 years experience in the primary education sector. A well networked educator, Melinda received the Victorian Information Technology Teachers Association Outstanding Achievement in the ICT Primary Teaching and Learning Community Award in 2011 for her contribution to the DEECD Learning Management System and supporting teachers.

Melinda is an active member in many online networks and has mentored teachers in building an online community of practice. She is passionate about student centred learning and uses technology to develop global connections, collaborate and create. She has presented at many conferences and enjoys sharing learning in a variety of platforms.

As educators we know and understand the importance of providing authentic, rich and fulfilling learning experiences which will allow students to build knowledge. We provide choice for students to empower them to be lifelong learners and give them agency to learn from their mistakes. We use contemporary pedagogies and digital technologies to prepare them for a life in the 21st century. Yet, when we attend a conference our learning is not always treated with the same respect we give to our learning design.

AT DLTV this year we wanted to step outside what has become the traditional conference structure where educators are led through learning experiences in a linear and set structure. We started last year with the concept of a self organising conference and have learned a lot from that experience, which has allowed us to go a step further. But how do we change a conference that has a long history of concurrent sessions flanked by keynotes? And how do we change the tradition that a conference is something you come to where you are talked to. It is even more difficult for a not-for profit who relies on the conference to produce other resources and events for students. We knew we wanted to support our delegates through this change, a change we believe will allow us to think about conferences and professional learning differently.

DIGICON 2015
FESTIVAL of LEARNING

So this year the DLTV conference, which will be known as DigiCon from 2015, took the inspiration from The Edinburgh Festival where in 1947 a group of theatres who didn't want to conform to the traditional constraints of a festival took advantage of the crowds in Edinburgh to showcase their alternative events. DigiCon - a festival of learning, will also have an alternative place to showcase learning. Firstly on the main stage you can expect to see the conference favourites. It will include four keynote presentations and eight concurrent sessions, based around a variety of streams. It might look like it has in the past but behind the scenes there has been a lot going on to ensure the conference is providing a rich, authentic and contemporary approach to professional learning. The careful selection of streams by the committee used feedback from last year's conference as well as identifying current issues or trends in education. This is seen in the Digital Technologies and VCE streams which will look a the new curriculum.

Within the streams, the presenters have met and shared their ideas for presentations. They have created a series of sessions which they believe will be engaging for delegates and they should

know, because they are educators too! Once again the conference committee were inundated with high quality educators willing to share their learning, whether it be a tool they use or the journey they have taken as they lead change. And they have been committed to offering delegates rich, authentic and engaging learning experiences.

Along side the main stage will be the new element to the conference. The Fringe Festival, like at the Edinburgh Festival 70 years ago, will allow presenters to showcase what they are doing in digital learning in an alternative setting and no constraints to time, location, people involved or traditions. Anything can happen in the Fringe Festival.

Using an expression of interest process the committee were very happy to have so many people take on board the new direction and offer some great ideas for the Fringe. Bendigo educators Leah Daly and Erin Jackson along with John Pearce from Deakin will be bringing all of the new gadgets they have been using and showcasing how they are using them in the classroom. People who choose to drop by this fringe will be able to test out some of the gadgets, talk to experts about the Maker Movement and speak to educators about how they are using these digital technologies. And the great thing about the fringe is they can stay for 5 minutes or stay all day.

In the Code the Future Fringe, Kate Cooper from Clifton Hill Primary School will have students sharing their experiences of coding at school. And there will be developers on hand to answer your questions about the importance of coding in schools as well as being able to connect you with other developers to partner with your school.

Broadcasting across the two days of the conference, Roland Gesthuizen and Amanda Rablin will be our radio hosts, documenting the conference in a podcast. Roland and Amanda are experts in podcasting, producing a weekly ACEC podcast where they interview educators about current issues and showcasing new directions in education. They will be interviewing delegates at the conference, reflecting on the conference and running their own sessions, live on air. And the great thing is delegates will be able to drop by and ask questions about podcasting.

Other Fringe Festival events include a 3D printing room, mini keynote presentations and a digital making and creating booth. For all of the Fringe Festival there is one thread that ties them; the delegate decides how they learn, and what they learn. It is OK to walk in and out of a Fringe. If you find someone talking about something you already know, we want you to leave and try something else. If you are in a Fringe and you want to stay and chat we want you to do that too. This is a conference where the delegates are in control of their own learning.

Another element of the conference that the committee are very proud of is it's dedication to showcasing Victorian eductors. The 2015 conference will feature four Victorian presenters who will share their passion, experiences and journeys. The conference team was excited to continue with the theme of showcasing the innovative and world class educators we have locally and are excited to hear from Hamish Curry of No Tosh who will open the conference. As an educator, Hamish works with schools sharing world leading approaches to creating ideas. His background in gaming in education and design thinking will frame his keynote as he explores strategies and the ongoing changes required to adapt and innovate in education.

Comedian Anne Edmond will open the Saturday morning conference with a humorous look at how failing can be our best friend. Although not related to digital learning directly, the Saturday morning keynote has proved popular due to its comedic look at learning and motivating the conference audience. Anne has just completed a stint with the Melbourne Comedy Festival and is looking forward to entertaining and inspiring us.

After the great success of our DLTV talks last year we are continuing to showcase Victorian educators such as Celia Coffa and Corrie Barclay who will give an inspiring presentation on their journey in digital learning and teaching, invigorating audiences with stories of the challenges they have faced and overcome.

This year you can expect some changes to the 2015 conference but DigiCon promises to pique the interest of all our delegates. The conference committee, a team of educators, has worked tirelessly to bring the old and the new together in a place where they compliment each other. Like an old building which has been given a new lease of life with a creative architect, the outside facade delivers respect and integrity while the inside boasts a contemporary and exciting perspective. We are looking forward to sharing the new look conference with you.

DigiCon15 is on 24th and 25th July 2015 at Swinburne University of Technology, Hawthorn. Register at digicon.vic.edu.au

Highlights and happenings:

DLTV professional learning report.

April 2015

Mark Richardson

Professional Learning Manager - DLTV

Mark Richardson is the Professional Learning Manager at Digital Learning & Teaching Victoria. He was a former ICT Coordinator in a primary school. He has extensive experience as a professional learning planner, presenter and consultant. His current interests are iPads in the classroom, online learning, digital citizenship, pedagogies for the 21st century, learning space design and Challenge Based Learning. @ictedservices

The professional learning year started of in the last week on the January holidays with two new DLTV events. We had our first pre-service members conference that had a number of useful sessions on how to teach in the 21st century classroom. Content covered online resources, digital pedagogies, the Digital Technologies curriculum and digital citizenship. We are certainly looking forward to presenting more events for our pre-service teacher members, both mid year and in December. The other January event was our first eLearning Leaders' Day. Participants started the year with the latest on the three aspects of eLearning leadership: pedagogical, technical and professional learning organisation.

We had a great day hosting the first TeachMeet Melbourne for 2015. TeachMeet @ the Pub has become a great way for DLTV to kick off the year with both members and the wider education community.

Supporting teachers of VCE IT and VCE VET ICT / IDM is a major component of our PL program. February's forum at Swinburne University was subtitled "Curriculum in Reality" and focused on industry needs and links for year 11 and 12 teachers and students.

Our online offerings for term one were two series of webinars. *Connecting the Dots* was a series of focus groups unpacked the opinions about DLTV of our various membership cohorts. The other webinar series was the *21st Century Toolbox*. This was a free series of webinars for members. There were three great ones on Cybersafety, Making & Playing and Apps for Assessment. There are still two more webinars coming up in this series on Mobile Devices and the Digital Technologies curriculum. No dates yet, but keep an eye on the DLTV website, so that you can register.

The other success for DLTV in term one was the first of our three regional conferences for 2015. *Digitech By The Bay* at the Geelong College was a great Saturday conference. It unpacked "what is innovation?' and explored how participants could use innovative practices in their schools and classrooms.

At the time of writing we are just about to run our second regional conference for 2015, *Digitech in the Goldfields* at the LaTrobe University, Bendigo. The tag line for this conference is *Creators not Consumers* and focuses on the digital pedagogies and curriculum activities that relate directly to the implementation of the Digital Technologies curriculum.

So what's coming up in professional learning at DLTV? The Victorian Curriculum and Assessment Authority [VCAA] has contracted DLTV to roll out eight PL sessions in term two, introducing the new study design for VCE Computing 2016-2019. These sessions are both face to face sessions in metropolitan and regional settings as well as online. Go to the DLTV website to register for these free workshops.

The advertised DigiTech Ready events [Certificate, Bootcamp and Leadership] are all on hold until after the Digital Technologies curriculum is published on the VCAA website later this year. Watch the DLTV eNews and website for updates in the second half of the year.

From the VCAA Corner

Paula Christopherson

Curriculum Manager | Digital Technologies
Victorian Curriculum and Assessment Authority

Paula is a Curriculum Manager at the VCAA, responsible for managing the digital technologies curriculum from Foundation to year 12. She was actively involved in co-developing both the Australian Curriculum: Digital Technologies and the ICT as a general capability resource for ACARA. Paula has presented professional learning sessions at state, national and international levels and was recently awarded a life membership to Digital Learning and Teaching Victoria in recognition of her outstanding contribution to digital technologies education.

If we can have a two-speed economy, we can have a two-speed curriculum implementation program! While things are moving quickly at the senior secondary level things are happening a little slower with F to 10 level.

VCE

A lot is happening in this space - the new VCE Algorithmics study design is being offered for the first time this year and we have approximately 100 students enrolled in the study. Algorithmics is classified as a Higher Education Scored Study (HESS), which means that it is pitched at first year university standard, attracts a study score and contributes to the satisfactory completion of VCE.

Currently there is a range of subjects offered by universities called extension studies – these allow students to study in a field at first-year university standard while also doing their VCE. Students enrol with the university that determines the curriculum and assessment. While students can get an incremental score that contributes to their ATAR, based on their performance in the extension study, the subject does not contribute to the awarding of the VCE because the curriculum and assessment are not managed by the VCAA.

VCE Computing - VCAA together with DLTV are currently running a series of workshops (both face-to-face and online) to support the implementation of the new VCE Computing study design. In 2106 this study design will replace VCE Information Technology, whose accreditation expires at the end of this year. VCE Computing is available at: http://www.vcaa.vic.edu.au/Documents/vce/computing/ComputingSD-2016.pdf

If you were not able to attend a workshop, DLTV will be making available recordings of the online sessions on their website. DLTV will also be running a dedicated VCE Computing PD day in Term 4 as well as publishing a set of resources to help teachers implement the study. It has been five years since the introduction of the last study design, so as you would expect in this dynamic field, there are quite a few changes to the curriculum.

Foundation to Year 10

We are getting closer to the publication of the nationally-developed Digital Technologies curriculum as it will be offered in Victoria. The delay in publication is due to the Commonwealth government commissioning a review of the Australian Curriculum, and the subsequent publication of the recommendations. Some minor amendments have been made to the Digi Tech curriculum in response to the recommendations, with clarity of content driving most of these changes. We are on the cusp of the Digi Tech curriculum finally getting endorsement by the State and Territory Education Ministers. As a consequence DLTV is planning a series of professional development programs in the second semester to support teachers implement this exciting curriculum.

Creativity and ideation

In both the Digi Tech curriculum and VCE Computing the role of creativity has been heightened. And this is supported at the F to 10 levels with the Critical and Creative Thinking general capability. For example, at levels 5 and 6 in the Digi Tech curriculum, students are required to generate alternative design ideas for user interfaces before fully developing their preferred design. Another example is in VCE Computing (Informatics, Unit 4, Outcome 1) where students must prepare a folio comprising alternative design ideas as well as the detailed specifications for the preferred design.

What underpins these creativity practices is the process of ideation. According to Nijstad et al (2010: 35) creativity is typically defined as 'the production of ideas, problem solutions and products that are both novel (original) and appropriate (feasible, potentially useful). Ideation is the process of generating ideas that can be further explored when creating a solution to a problem or opportunity. (Reinig & Briggs 2006:1)

Creativity typically involves both divergent thinking (creative) and convergent thinking (critical) – generating ideas that need to be assessed in order to select the preferred option that in turn will be further developed into a solution. This requires flexibility of thought as well as persistence in systematically striving to achieve an appropriate new or novel solution.

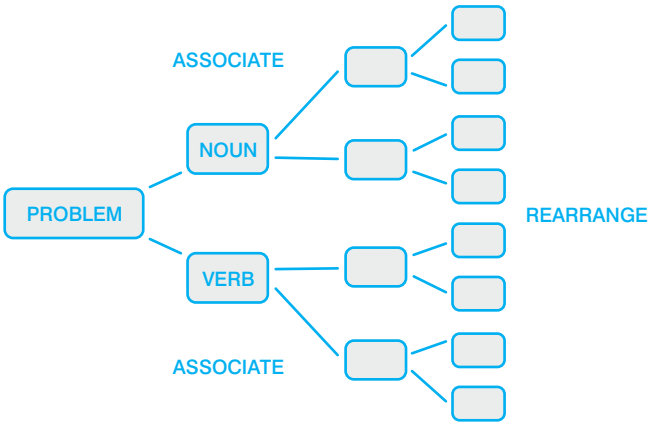
There are a range of techniques that students can be taught to assist in the process of ideation. We need to be careful of not falling into the trap of assuming that creativity is just innate; that we cannot help students become flexible thinkers, hence creative ones. Flexible thinking can be enhanced through using a range of techniques that should be taught and applied.

As Thomas Edison said that his inventions did not happen by accident, rather they came by work. So too must we construct teaching and learning programs that incorporate ideation techniques and a culture of persistence.

You would be already familiar with some ideation techniques such as brainstorming, forced connections/relationships, free word association and SCAMPER (substitute, combine, adapt, modify, put to other use, eliminate and reverse/re-arrange. The selection of the techniques is often dependent on the nature of the problem and the level of cognition of the students.

When developing students ideation techniques the sequential progression typically starts with single-step modifications to an existing solution. Ross (2006: 122) calls this the 'play-it-safe' technique where the creator does not stray far from 'home'. Students progress in their thinking by considering analogies or associations that require more complex thinking including converging or re-arranging elements. The other end of the continuum is using techniques that force thinking to move away from the predicable/routine solution through the use of provocation.

Following is a practical scaffold for what Ross (2006: 124) calls 'attribute splitting' (also known as fractionation). Its mechanism is simple, which makes it attractive for the learner. Essentially a problem is reduced to two key words: a noun and a verb. Each of these words is split into two associated words. The process is typically repeated three or four times. Then the words are examined and re-assembled for new ideas. Below is the structure of this technique.



The process of ideation is the beginning step of finding a quality solution that is novel (to the creator) and appropriate. Developing these creative qualities requires instruction, practise and persistence.

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ACEC Conference Highlight: Using flowcharts to teach computational thinking in primary schools

USING FLOWCHARTS TO INTRODUCE COMPUTATIONAL THINKING IN PRIMARY SCHOOLS

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Abstract

New curricula in UK, US and Australia aim to introduce computational thinking into every school. Computational Thinking (CT) teaches how to solve problems by adopting techniques used in computer science to design programs: problem decomposition, pattern recognition, pattern generalization to define abstractions or models and algorithm design.

A common approach to introduce CT and algorithms is by exposing primary students to visual programs such as Scratch or Kodu. These tools are engaging and they successfully teach students to develop simple algorithms. However, not all primary school teachers are familiar with them, and they may have constraints both in the access to school computers and the lack of time to upskill. Flowcharts are a good introduction to CT, as you could start with simple step-by-step procedures, and gradually introduce decisions, branches and repetition.

Thus, we propose to support/complement visual programming with flowcharts, as they use plain English, require only pen and paper and can be applied to multiple subjects of the primary school curriculum.

In this paper we review ways to incorporate CT with flowcharts into the primary school curriculum that is aligned with the ACARA Digital Technologies curriculum's content descriptions for algorithms at years F-6.

Introduction

Most primary school students regularly use computers to produce their own digital documents such as multimedia presentations or reports. Thus, ICT is embedded in the curriculum but recently there has been a significant drive to extend and/or replace ICT with a basic understanding of computer science concepts. According to Guzdial (Shein, 2014),

"If someone is going to become a knowledge worker, or take on any job, that requires an undergraduate degree, they should know how to read a piece of code that is useful to them and be able to make changes to it." (p 16)

Following this recent trend, a curriculum that aims to teach some introductory Computer Science (CS) at F-10 level has been drafted in Australia (ACARA, 2013). Even though this is a noble goal, that has the potential to provide better opportunities to students in a knowledge economy, it poses many pedagogical challenges, as it is not enough to repackage existing CS curricula and teach them at early stages. One of the major issues is how much programming should be included as basic computer science? Programming is a core skill in computer science and involves abstract reasoning. Children typically develop the ability for abstract reasoning around the age of 12. Furthermore, writing descriptions in an unfamiliar programing language will be difficult for a student who does not yet have a good understanding of the processes that these descriptions are aimed to capture (Lu, 2009).

Two approaches to deal with this challenge are

- Using visual programming (VP) languages, which enable leaners to avoid dealing with syntax, that often distracts them from the process of learning. Besides, by producing visual outputs (animations or pictures) it both motivates the students and provides instant feedback.
- Introducing algorithmic thinking and problem-solving skills that are the backbone of the program creation using examples from everyday life such as writing a recipe or giving directions.

In regards to the second approach, Jeannette Wing (2006) coined the term ***computational thinking*** *(CT)* which she later defined as follows (Wing, 2010):

"The thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent" (page 1)

In other words, computational thinking is what comes before writing the program, and is a core skill that should be taught to every student (Shein, 2014). CT focuses on learning problem-solving skills in computer science, similar to learning problem-solving skills in mathematics. From now on, we will refer to CT to cover in depth the second approach, including algorithmic thinking.

The first approach, visual programming has gained popularity in upper primary and middle schools in the last 5 years. Scratch (http://www.scratch.mit.edu), is the first and the most popular visual program; other VP languages are Tynker (http://www.tynker.com) and Kodu (http://www.kodugamelab.com). A YouTube search for "Scratch games" returns 704,000 videos, many posted by primary students and/or teachers while a similar search on "computational thinking" returns 5,450 videos, most of them posted by academics/industry to promote the need to teach CT, and only a handful involving primary teachers or students. However the second approach is gaining momentum due to curriculum changes in US (CSTA, 2012), UK (Computing at School, 2012) and Australia (ACARA, 2013), that aim to teach computer science concepts to every student.

Introducing the basic concepts of CT (sequential algorithms, conditions and decomposition) will improve the student's critical thinking skills and encourage in-depth learning. We believe having prior experience in CT will enable primary level students to easier understand the fundamentals of visual programming. Furthermore, not all primary school teachers are familiar with visual programming languages, and they may have constraints both in the access to school computers and the lack of time to upskill. Thus, we propose to support/complement visual programming with flowcharts, as a tool to introduce CT at primary level.

The rest of the paper is organized as follows: firstly we will review the scope of CT and its place in the Digital Technologies curriculum. Then we will introduce flowcharts, their notation and explain why they are a good fit to support CT at years F-4. We will also show a range of examples of embedding flowcharts and CT in primary lesson plans, followed by some conclusions.

Computational Thinking in the Australian Curriculum

In this section we will present the key concepts and practices of computational thinking, discuss how CT fits inside Bloom's revised taxonomy of learning (Anderson & Krathwohl, 2001) and see how CT fits in the new Australian curriculum.

There are many definitions of Computational thinking (Lu, 2009; Google, 2012; Wing, 2006), all capturing key concepts such as abstraction, algorithmic thinking and efficiency, but with difference emphasis or terminology depending on their target audience. The definition quoted next is published by the International Society for Technology in Education (ISTE) and the Computer Science Teachers Association (CSTA) (http://csta.acm.org/Curriculum/sub/CurrFiles/CompThinkingFlyer.pdf) and is aimed at school teachers and educators.

"Computational thinking (CT) is a problem-solving process that includes (but is not limited to) the following characteristics:

1. *Formulating problems in a way that enables us to use a computer and other tools to help solve them.*
2. *Logically organizing and analyzing data*
3. *Representing data through abstractions such as models and simulations*
4. *Automating solutions through algorithmic thinking (a series of ordered steps)*
5. *Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources*
6. *Generalizing and transferring this problem solving process to a wide variety of problems"*

Abstraction is a key principle in CT, which is crucial to deal with complexity of problems that require computational thinking skills. Algorithmic design also provides opportunities to learn abstraction, decomposition, iterative and conditional thinking. Other definitions (Google, 2012) use the terms pattern recognition and generalization, which are implicitly included in points 4 to 6 in the list above. Pattern recognition looks for similarities in the problem cases that can be used to design efficient algorithms; pattern generalization and abstraction allows us to represent an idea or a process in general terms (e.g., variables) so that we can use it to solve other problems that are similar in nature.

Computational thinking requires students to develop higher order thinking skills in Bloom's pyramid: applying, analyzing, evaluating, and creating. For example, the CT activity described in Figure 3 later in this paper asks students first to *apply* a simple grammar rule to a list of words, *analyse* the result and *create* an improved version of the rule to accommodate the exceptions they found. They are also expected to *evaluate* the modified rule with a larger set of words. This approach will deepen their understanding of English grammar compared with the standard approach of the teacher providing the complete rule with exceptions to start with, and ask the students only to understand and apply the rule.

The Australian Digital Technologies curriculum has two inter-related strands: (i) Digital technologies knowledge and understanding and (ii) Digital Technologies processes and production skills. This second strand is composed by two components, both focusing on CT as follows:

- "Managing and analyzing data" covers points 2 and 3 of the above definition.
- "Specification, algorithm and implementation" covers points 1, 4 and 5.

In regards to organize and analyse data, students in F-2 are expected to recognise and play with patterns in data (content description ACTDIK002) and to collect a range of personal, family and class data and use digital systems to organise and present the data (as explained ACTDIP003). Furthermore, students in years 3 and 4 should recognise a variety of different data types and explore different representation of the same data (ACTDIK008) and collect, access and present different types of data using spread-sheets, databases or other software to create information and solve problems (ACTDIP009). By the time students reach years 5 and 6, they should acquire, store and validate different types of data and interpret and visualise data in context to create information (ACTDIP016).

In order to learn algorithmic design, students in F-2 are expected to follow, describe, represent and play with a sequence of steps and decisions needed to solve simple problems (ACTDIP004). On the other hand, students in years 3 and 4, should be provided with opportunities to learn how to define simple problems, and describe and follow the algorithms needed to solve them (ACTDIP011); they should implement simple digital solutions as visual programs with algorithms involving branching and user input (ACTDIP011). When students are in years 5 and 6, they should be able to follow, modify and describe simple algorithms involving a sequence of steps, decisions, and repetitions that are represented *diagrammatically* and in plain English and implement the solutions using visual programming (ACTDIP019, ACTDIP020). Flowcharts fit naturally here as they are structured diagrams used to represent an algorithm. Other algorithmic notations include natural language descriptions (although these can be verbose or ambiguous) and pseudocode.

Flowcharts

A flowchart is a visual representation of the sequence of steps and decisions needed to perform a process. Most processes can be described using the 4 basic flowchart shapes shown in Figure 1(a). A process will have a start point and one or more exit points, which are represented with an oval shape. Each step in the sequence is noted within a rectangular shape and indicates an action, command or task to be completed. Steps are linked to each other by directional arrows. Decisions are represented with a diamond shape and test a condition or a Yes/No question to decide which step to complete next.

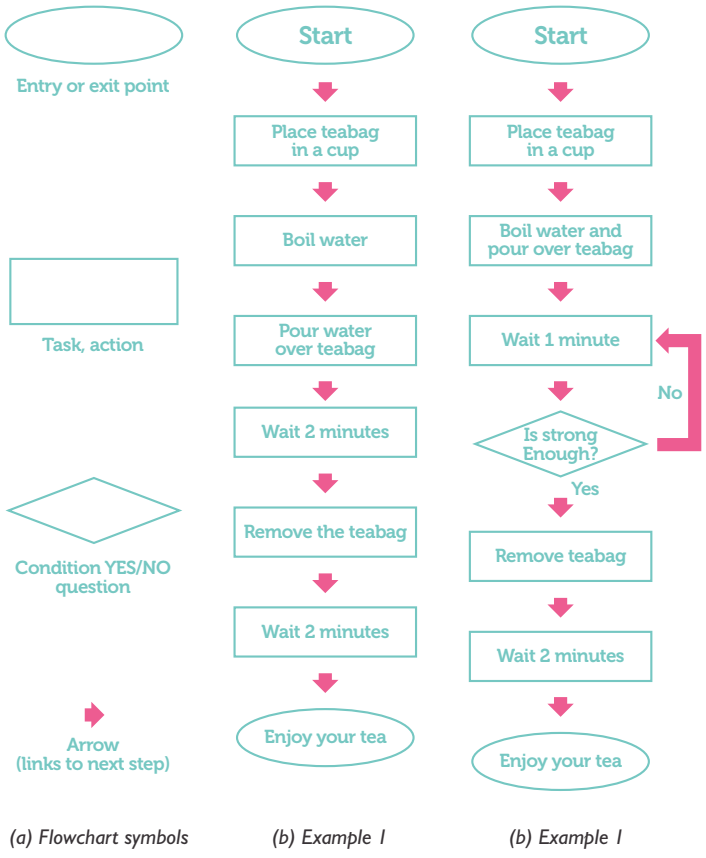

Figure 1. Flowchart symbols and example of use to describe a "make a cup of tea" algorithm.

Simple procedures, such as a cooking recipe, are a list of sequential steps. Figure 1(b) shows how to make a cup of tea using this flowchart notation. This diagram shows the six steps required: place the teabag in a cup, boil the water, pour it over the cup and wait 2 minutes to infuse, then remove the teabag and wait for the tea to cool down. This process is clear and concise but will produce a cup of tea of fixed strength, regardless of how strong you like your tea. Figure 1(c) includes a condition, represented with a diamond shape, so you can adjust the waiting time to your own preference. Note the arrow from the condition returning to the previous step shows how repetition is described.

Flowcharts support computational thinking by breaking a complex process into a series of steps and decisions. Each flowchart step can be refined by asking yourself "Is this step necessary? Can it be improved?". For a teacher handout to the introduction of flowcharts, refer to the online flowchart worksheet (Robotics Academy, Carnegie Mellon University, 2005).

Reasons to use flowcharts

Flowcharts are a good tool to gradually introduce computational thinking at primary level. Charts and posters are widely used at Year F-4, to explain simple class rules and processes. Many of them could be easily converted to flowcharts so that students become familiar with the flowchart notation and can read simple descriptions such as those shown in Figure 1. Students at Year 3-4 should be able to write their own flowcharts to describe daily actions and alternatives and become fluent in breaking big tasks into smaller tasks. Furthermore, flowcharts support visual learners who prefer to access and understand new information using images, maps and other graphical representations. Flowcharts can also be used in kinesthetic activities in which students perform the actions shown in the flowchart.

Flowcharts are also a simpler tool for primary teachers to learn and master compared with most programming languages. Some CT activities at primary level include simple *Python* or *javascript* programs. By using a flowchart in place of the program, we remove the need for primary teachers to learn a programing language in order to teach computational thinking. Familiarity with flowcharts will also help both students and primary teachers to be ready for the introduction of visual programming languages at upper primary level; they could easily grasp the concept of creating and executing programs by writing and carrying out the actions of the equivalent flowcharts.

Embedding flowcharts in the primary school curriculum

In this section we will see how we can make minor changes to primary school activities by editing the lesson plans to include the use of simple flowcharts. Most of the examples are based on activities that have been published online by primary teachers.

Flowcharts in Maths

There are two different ways to use flowcharts when teaching Maths. The first approach is to use flowcharts to teach a complex process such as multi-column subtraction. For example, Figure 2 shows the flowchart for 2-digit subtraction. This flowchart was inspired by a poster on subtraction provided in an online mini-lesson (Teachers pay Teachers, 2013) that has the correct steps to explain regrouping but did not follow the standard notation introduced in Figure 1(a).

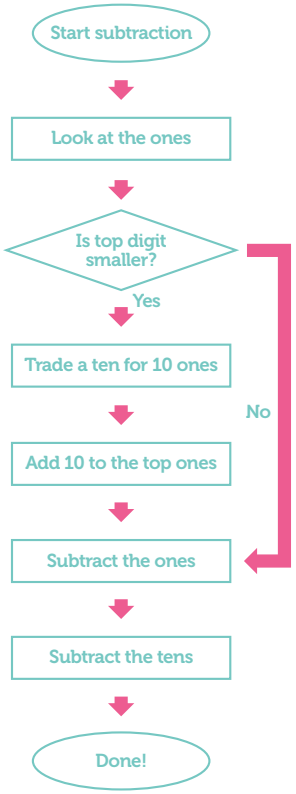

Figure 2. Flowchart description of subtraction procedure

We replaced the two alternative paths (with and without regrouping) with the correct decision step to check if the top digit is smaller than the bottom one. If the answer is *YES* the next two steps complete the regrouping; otherwise these steps are skipped. In this approach, the flowchart notation helps the teacher to be explicit and unambiguous in their description. Students will follow the teacher's instruction by reading and carrying out the flowchart steps. They are working at the lowest level of the Bloom's pyramid (applying).

The second approach makes students work at higher levels of Bloom's pyramid by asking them to write or extend a flowchart to describe the processes they have learned. For example, after they have used the subtraction flowchart we could review their understanding of addition by asking the class to write a flowchart that describes the process of adding 2 numbers. Another possible extension activity could ask the students to extend the current flowchart for 3-digit number subtraction.

Similarly, we could use flowcharts to cement the learning of a process by worked examples, as shown in the "Percentage change" activity at the "Exploring Computational Thinking" (Google, 2012) online repository. This activity provides 5 word problems and it shows how to calculate the percentage for three of them. After students complete all the 5 problems, the activity asks students to design an algorithm that another student could follow to compute percentage increases and decreases. Some sample questions are provided to identify the key steps of the algorithm. The second part of the lesson provides a python solution, which they are asked to compare with their algorithm. This step could be used as a way to link flowcharts with their first exposure to the programming language *Python*. Alternatively, we can replace the *Python* code provided with its equivalent flowchart. In both cases, by comparing algorithms students can learn that there are multiple ways to approach a problem, and may realize that they have skipped over some steps.

Flowcharts in English

We will start with a simple example provided by (Lu and Fletcher, 2009), in which Year 3 students are asked to sort a list of sentences in chronological order. The paper explains how this exercise, shown below, gives teachers a chance to discuss the concepts of state and search space and suggest three homework questions to reinforce the lesson on exploring a range of solutions.

Given the four sentences

1: I don't want pizza again for a long time.
2: I ate ten pieces of pizza.
3: Later that night, I got sick.
4: I felt very full.

Which of the following sentence orderings is correct?

a) 1, 3, 4, 2
b) 4, 3, 2, 1
c) 2, 3, 1, 4
d) 3, 1, 4, 2
e) 2, 4, 3, 1

Homework questions

1. What is the correct ordering between 2 and 3?
2. Which of the states in the search space have 2 and 3 in the wrong order? Can these answers be correct?
3. What are some other possible states not listed?

We could adapt this exercise so that the four sentences are printed in rectangular cards and students are asked to pin them into a board to create a flowchart. Similarly, we could print the steps of a cooking recipe into cards and ask the class to sort the steps, while discussing the reason to choose that particular order.

When developing writing at upper primary levels, we could ask students to write their own stories, with one sentence per card, shuffle them and give them to another student to sort them in the correct order. If the order chosen by the second student does not match the original story, it may reflect the need for linkers from one sentence to the next.

There are many other examples used by teachers with step-by-step instructions that would need only minor notation changes to become standard flowcharts. With regular exposure to this consistent notation, primary students will gradually become fluent in reading and writing their own flowcharts.

Pattern recognition and grammar rules

Flowcharts are good at explaining grammar rules and their exceptions. We will illustrate this with the activity "Present Participle" from the online lesson repository *Exploring Computational Thinking* (Google, 2012) that we have modified by replacing the Python program provided with the equivalent flowchart (Figure 3). This example teaches the formation of the present participle by looking at many sample verbs and identifying the underlying pattern.

Students are asked to follow the flowchart actions shown in Figure 3 with four sample verbs: *play, make, create and sing*. After looking at the words produced, the class is asked to discuss which words are now misspelled and how to correct the spelling. Could they modify the flowchart so that it works for the 4 sample verbs?

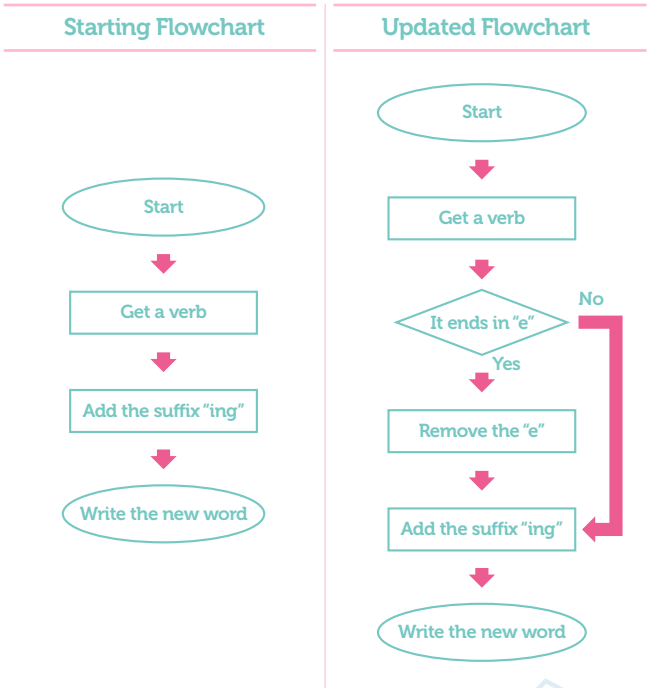

Figure 3. Present particle formation rule

Students are expected to identify that there is a different rule for the verbs ending with 'e'. Then, they should be able to add a condition to the flowchart after the first step with an action to remove the last letter if the letter is 'e', as shown in the updated flowchart in Figure 3. Therefore, this activity is teaching the grammar rule for the present participle and at the same time introducing the concept of patterns and pattern recognition. After the flowchart is updated, the testing of the rule is repeated with a new set of sample words: *run, learn, jump, stop and see*. This step should lead students to identify and discuss the last special case for the formation of the present participle, so that it correctly produces *running* as the present participle of the verb *to run*.

A similar approach is used in the activity "Indefinite Articles" from the lesson repository (Google, 2012), that asks students to investigate patterns in the usage of 'a' and 'an'. After studying several examples, they should be able to write a flowchart to explain when to use each of these indefinite particles.

Classroom routine flowchart

Flowcharts provide a good representation of routines in which a list of steps is carried out in a regular order. Many primary classrooms have daily routines in which students are expected to unpack/pack their bags, hand in any notices, etc. Figure 4 shows an example of the "start of the day" flowchart developed by local teachers during a professional development session, after a brief introduction to the flowchart notation.

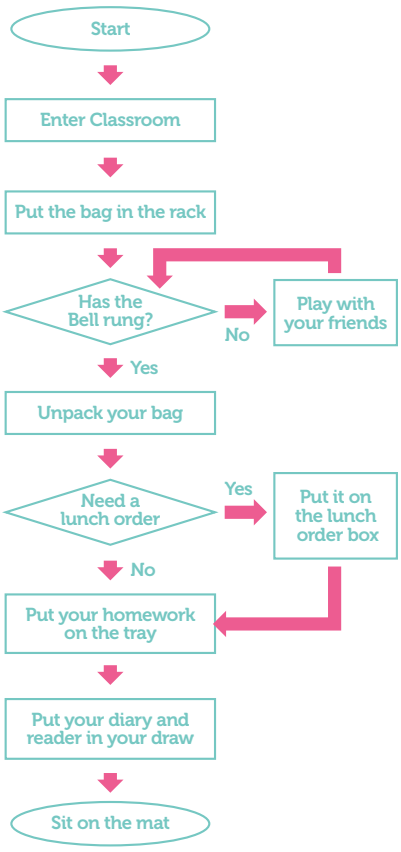

Figure 4. A Start-of-the-day algorithm

Some teachers may have a notice board that lists this set of actions, which can be easily converted (if is not already) into a simple flowchart. Similarly, other school routines could be described in this manner. For example, an emergency plan or a bullying response plan can be described using a flowchart. When appropriate, students could be asked to develop their own response plan for a given scenario. By comparing and merging actions from different flowcharts, the class could agree on the best strategy and the final flowchart could be posted to remind students on the response they have developed. Quality Learning Australia (2008) case study for a Grade 5/6 Mathematics Program at a primary school in Victoria shows the result of this approach: a hand-written flowchart that describes the learning process a student should follow when doing their Maths homework. Similarly, it includes a second flowchart describing action students could take when they complete their work.

Glass rules

1. Follow teacher's directions
2. Raise your hand to speak
3. Listen when someone is speaking
4. Be respectful to everyone
5. Do your best

Not all class checklists are algorithms. For example, a list of class rules as the one shown above should not be made into a flowchart; instead of doing steps 1 to 5 in order, we have to follow the five class rules all at the same time.

Phil Bagge provides an excellent set of CS resources for primary schools at Junior Computer Science (http://code-it.co.uk), including a range of flowcharts to describe the rules of popular playground games such as "IT"or "hide and seek". It also provides some bugged flowcharts to run an activity in which students need to find out what is wrong with the flowchart and correct it.

Other exercises for developing Computational Thinking with flowcharts

We conclude this section with a list of simple flowchart exercise ideas for primary students.

Activity 1. Find the algorithm (years F-4)

Many regular items come with their own algorithm. For example, a Lego box has an algorithm to build the ship, piece by piece. The instruction to make a loom band bracelet is another algorithm. Ask students to find in their home life another example of an algorithm.

Activity 2. Simple step-by-step algorithms (years F-4)

Describe one of the following procedures using a flowchart.

a. How to draw a smiley face
b. Hot to make a paper snowflake
c. How to tie your shoe laces
d. How to make a paper hat

Activity 3. Choose your own algorithm (years 2-3)

After the students have completed two or more flowcharts, you could ask them to think of a procedure that has 3 to 5 steps and create a flowchart for it.

Activity 4. Write and refine algorithms (years 3-6)

Describe the steps to one of the procedures listed below using a flowchart.

a) Cross the road
b) Go from their home to school (by foot, car, bus)
c) Get ready in the morning to go to school
d) Build a sand castle

Note these tasks have more steps and there are opportunities for decision making and using conditionals. Thus, it is likely you will get many variations; it is also an opportunity for a class discussion on how to refine flowcharts. Besides, having multiple solutions to the same problem offers the chance to discuss problem solving and the fact there is more than one correct solution for a problem.

Activity 5. Testing and debugging an algorithm (years 3-6)

Divide the class into two groups. Each group works on creating a flowchart for a secret procedure of their choice. In turns, students from one group should perform the actions as described in the other group's flowchart and work out what the secret procedure was. If they get it right, the flowchart was correct. If not, the flowchart needs to be refined.

Computers do exactly what the action says, so we need to be very explicit with the task description. Discuss how much knowledge and context human bring to every day task. For a funny video that illustrates this point, see the "Program your teacher to make a Jam Sandwich" video at https://www.youtube.com/watch?v=IeBEFaVHIIE.

Summary

The new subject Digital Technologies will require primary teachers to introduce computational thinking (CT) in an already crowded curriculum and with limited school hours. In this paper we have reviewed the scope of CT and proposed the use of flowcharts as a first step to introduce algorithm design and decomposition at the F-6 year levels.

Flowcharts are simple to learn and support visual and kinesthetic learners. Fluency in reading and modifying simple flowcharts will set the foundation for more complex algorithmic thinking in the middle and upper school years. The paper has provided examples of a range of CT activities at primary level that can be embedded with minimal effort into other curriculum subjects.

Flowcharts provide a mechanism to focus on design a computational solution before learning to code. This is the standard practice followed in large scale software development. Thus, flowcharts provide a good opportunity to develop such practices from an early stage.

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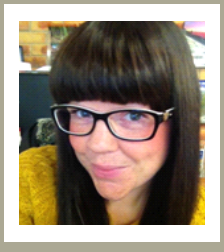
Taking the tech outside:

Learning with technology in outdoor environments

Creating meaningful learning experiences – *"It is not enough to simply provide entertaining activities tenuously related to the curriculum. The key is to structure appropriate challenges that provide sustained emotional and cognitive interest leading to important learning" (Lowe et al., 2010, p. 239)*



Gemma Gooding

Gemma is a recent Master of Teaching (Primary) graduate from Monash University and she is passionate about 21st century teaching and learning. One of her key areas of interest is finding ways to link the use of innovative technologies with the curriculum to provide students with meaningful, authentic and exciting learning experiences

Sarah Harland

Educator (St John's Primary Frankston East), M.Teach Graduate, Monash University (Australia)

Sarah Harland is an apps qualified individual, Grade1/2 educator at St John's Primary in Frankston East. After completing her Masters of Teaching (Primary) at Monash University she is keen to implement 21st century learning, to ensure her students learning is meaningful and supportive to their individual needs. The range of technology options and collaborative staff efforts at St John's provides a myriad of opportunities to embrace student diversity.

Introduction

Integrating technology in the classroom

Being aware of your own relationship with technology can affect how you integrate it into your classroom (Mama & Hennessy, 2010). Connecting students to their learning in emotionally meaningful ways as teachers is our ultimate aim. Students bring a level of complexity to multimedia learning spaces through their previous experience with technology (Gee, 2003), through utilising technology educators are meeting students in a world they are familiar with, excited about and interested in (O'Rourke, Main, & Ellis, 2012; Selwyn, Potter, & Cranmer, 2009). The promotion of this type of engagement with technology has proven to also positively affect educational achievement (Blasco-Arcas, Buil, Hernández-Ortega, & Sese, 2013).

Learning in outdoor environments

Evidence suggests that learning in natural outdoor environments results in positive effects on students' in-class experiences (Dillon & Dickie, 2012). Other benefits associated with conducting learning in natural environments include:

- Development of social, physical and cognitive behaviours
- Lowered effects of mental health issues which hamper the ability for some students to pay attention
- Improved student self efficacy
- Enhanced teaching strategies for learning and enthusiasm by teachers
- Increased student respect and care for their own environment

(Dillon & Dickie, 2012)

Combining the two - balancing technology in outdoor environments

Louv highlighted that children are suffering from *Nature deficit-disorder* (Louv, 2008). When considering multimedia experiences as a learning tool in a natural setting, designing learning that does not detract from the aesthetic experience of the outdoor environment is fundamental. Varying between aesthetic and multimedia learning provides this balance. It is important to provide time for students to participate with technology amongst nature to promote a connection between the two (Holloway & Mahan, 2012).

Putting It Into Practice

The inspiration for incorporating innovative technology in the primary classroom

During a workshop with Dr Michael Phillips and Dr Michael Henderson (Monash University Australia) we were exposed to the use of Augmented Reality (AR) as a multimedia education tool. This session sparked our interest in exploring different ways we could use augmented reality as a tool for teaching and learning in the primary school setting. We decided upon developing a unit of work based around Australian landscapes, which utilizes AR within outdoor environments, this then opened up the opportunity to engage and enhance student learning amongst nature outside of the normal 'in-class' experience. The use of technology within this unit of work was important as it allowed for enhancement of student ICT skills, which is a ongoing priority within the Australian Curriculum (Australian Curriculum, Assessment and Reporting Authority, 2014).

Our Idea - Augmented Reality in the outdoors

Part of the unit of work includes an outdoor treasure hunt using ipads and the augmented reality application *Aurasma*. During the treasure hunt students are provided with clues that lead them to rotating activities. These activities alternate between ones which are focused on the **Aesthetic** of their surroundings or the use of **Augmented Reality**. The two activity types ensured a balanced experience between learning through physical experiences and ICT enhanced experiences.

Aesthetic Activities - We proposed that students complete tasks based around the four senses of sight, smell, touch and sound to allow opportunities for students to physically connect with their surroundings. Students would be required to provide a rich description of their location using their choice of photos and descriptive writing pertaining to that location (For example - Descriptive words or a written paragraph detailing the smell and sound in that particular space).

Augmented Reality (AR) Activities - The clues for these activities would direct students to find the AR trigger image. Once found, students would use the Aurasma Application on the iPad to scan the trigger image and access the AR overlay. Each trigger image would have at least two overlays, the first being a source of information for the students to access (e.g. a short informational video), the second, an activity or task which is required to be completed (e.g. a short online quiz) prior to moving on to the next treasure hunt location. As students progress through the treasure hunt each activity is designed to target a different level of Bloom's Taxonomy, encouraging lower to higher order thinking (See diagram 1).

Tips and Tricks - What we learnt along the way

- Scaffolding - To ensure the units success, breaking down essential elements of knowledge and skill vital to run the augmented reality sessions is pivotal. When developing our unit of work we adopted a backward by design approach to carefully scaffold the experience to ensure students had explicit teaching, group discussions, collaborative activities and individual work to reinforce their understanding
- Planning - Consideration of your resource options and contingency plan:
    1. Low Resource: No Internet Option (Augmented Reality) - The option to use the Aurasma application without internet connectivity is a possibility through the use of informational text images and videos, which are saved as offline files in the Aurasma studio portal. This option would eliminate the need for internet but would potentially increase the required time the teacher needs to prepare for the excursion.
    2. High Resource: Considerations for on going use of the unit of work with permanently fixed trigger images, creation of website/wiki of information for student learning
    3. Possible BYOD Scheme (Bring Your Own Device)
    4. Weather contingency plans - The concern with students relying on AR for their learning experience means wet days could arrive spontaneously. For coverage in these situations a waterproof smart iPad cover could be purchased for times intermittent weather. Consideration needs to be given to climate of your chosen surroundings.
- Knowing the Technology - Using innovative technology can be a challenge. It is essential to familarise yourself with the functionality of the technology prior to introducing it to the class. One important consideration for our unit was having trigger images that didn't detract from the natural surroundings
- Critical reflection - Like any program its essential to continually reflect on the learning and teaching and whether the technology is enhancing or hindering those facets. Continual adjustment of programs of this sort is vital to ensure you meet the needs of your students, as one set program is not always going to suit every student or every class.

Diagram 1: Augmented Reality – Process Flow Example

Trigger image clue

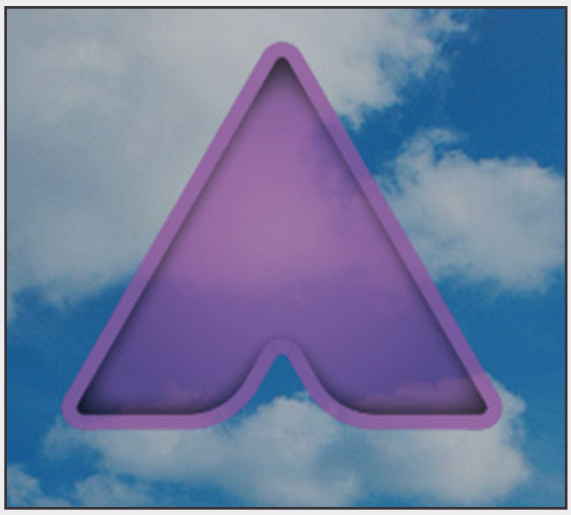
Students find the trigger image by deciphering the clue

Find your Aura below this native

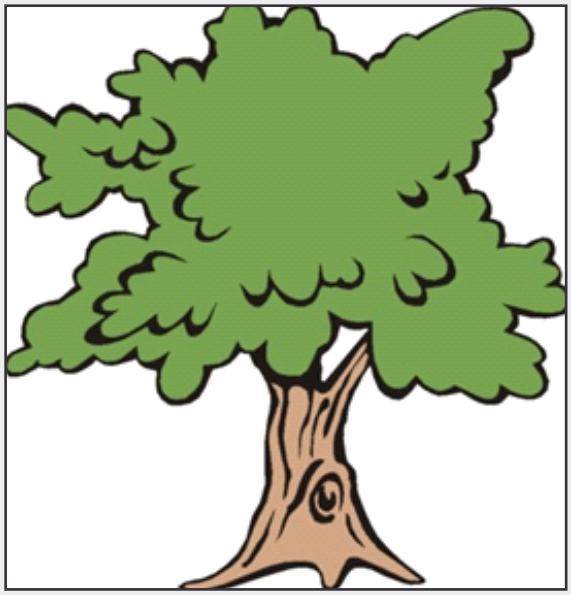
I have strong scent that is sometimes used in perfume or cleaning products

I was the home for snuggle pot and cuddle pie

A famous Australian animal lives in me and eats my leaves



been set up prior by the teacher. Students scan the trigger image using the Aurasma app to activate the augmented reality

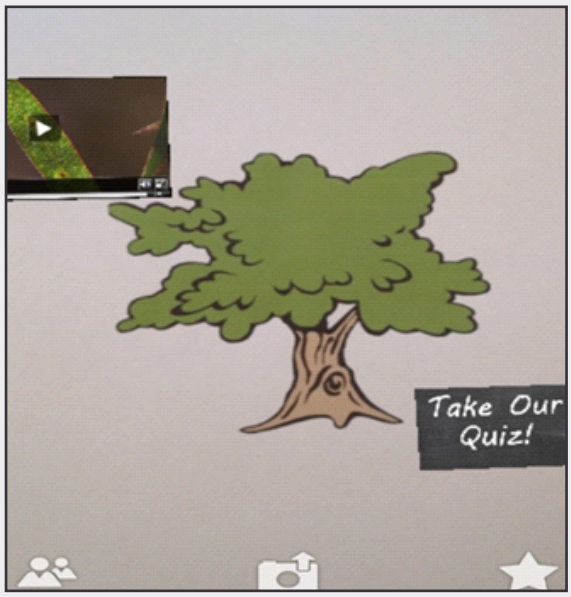


Scan trigger image

Students scan the trigger image using the Aurasma App

Trigger image with Video and Quiz overlay

Through the iPad students then see the augmented reality overlays, in this example a video and online quiz will appear



Information Overlay – Video

Students watch the video to learn about Eucalypts trees in varying Australian landscapes

Activity Overlay – Quiz

After watching the video students will then complete the quiz using the knowledge they have gained from the video

Eucalyptus trees provide the following benefits in the Australian landscape

A. ◯ Lower the water table (help address salinity)

B. ◯ Provide wind breaks

C. ◯ Provide shade

D. ◯ All of the above

Quiz completion

After completing the quiz students will then be to move to their next location

Hope you enjoyed the quiz! Your score report is presented below

Your Certificate

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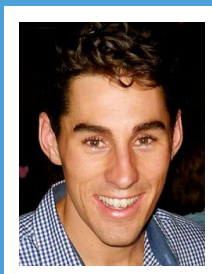
Connected learning: The changing landscape



Leigh Murphy

Leigh Murphy is Education Services Australia's Manager for User Engagement. ESA is a not for profit ministerial company owned by all Australian Education ministers. Leigh's speaks to educators around the country on tools to connect and share their ideas, questions and practices with their colleagues across the country. Prior to working at ESA Leigh was the Professional Learning Manager at ICT in Education Victoria and Digital Learning and Teaching Victoria. He also taught and had a leading role at Orchard Grove Primary School in Melbourne's eastern suburbs. Leigh is passionate and knowledgeable about connected learning technologies and their impact on teaching and learning opportunities for students and teachers.

t is widely understood that we're in an era of rapid and comprehensive change. Once traditional features of the economy are crumbling; old models of media such as newspapers and free-to-air television are struggling; political cycles are more rapid; communication is instant – and disposable. Some of the shifts we are seeing are fundamental, particularly the areas of information, learning and knowledge.

We are seeing digital content owned, managed and distributed in so many evolving ways. Information is being accessed from numerous sources, by multiple devices; some even question the need for a body of core or essential knowledge in a networked world where information is so readily and comprehensively available.

Many content providers and publishers are seeking to adapt to this ever-changing environment as once accepted notions of intellectual property and copyright are being challenged by a sizeable minority.

Educators are pioneering here - they manage to negotiate family, community and employer expectations in the course of their everyday work. It is no surprise, then, that education is also changing significantly and with ever-increasing speed.

Education is changing both as a direct consequence of the impact of technology and because we have a far richer understanding of the sorts of strategies that deliver the most powerful gains to student learning.

The operating environment for teachers, therefore, is fluid and dynamic – it also sees calls for increased accountability for teachers and for schools.

How these different factors are shaped into effective policy and high-quality practice is a key challenge for educational leaders.

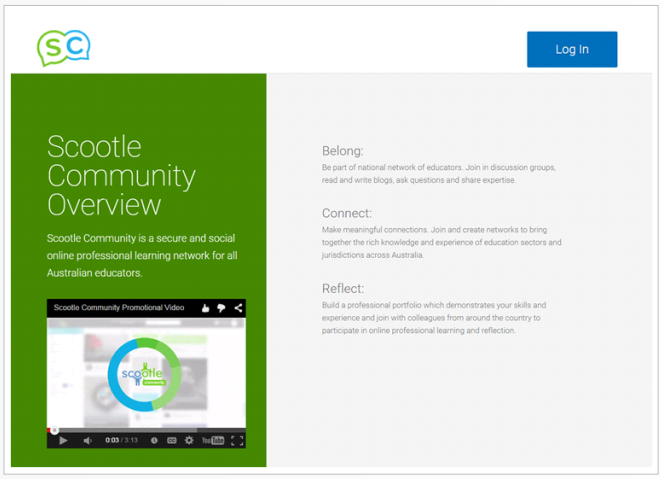
Teacher learning

Obviously, we need a highly skilled and capable workforce. Initial teacher training cannot be expected to anticipate all the skills necessary in such an evolving environment. How then, to do this work? Again, we have learned a great deal about what constitutes effective professional learning, and it has been pleasing to note the efforts that employers and other authorities have gone to create programs that are relevant and useful. Teachers need information and access to learning whenever and wherever they need it.

There are many organisations that deliver professional learning, and their delivery modes remain familiar to most of us. More recently, MOOCS have added to the range of online professional learning models available. We have come to know that effective learning is often networked. Teachers learn best from a combination of expert knowledge and dialogue with informed colleagues and peers. Opportunities to reflect and discuss often serve to reinforce key learning and facilitate a move towards the most appropriate next steps.

Scootle Community

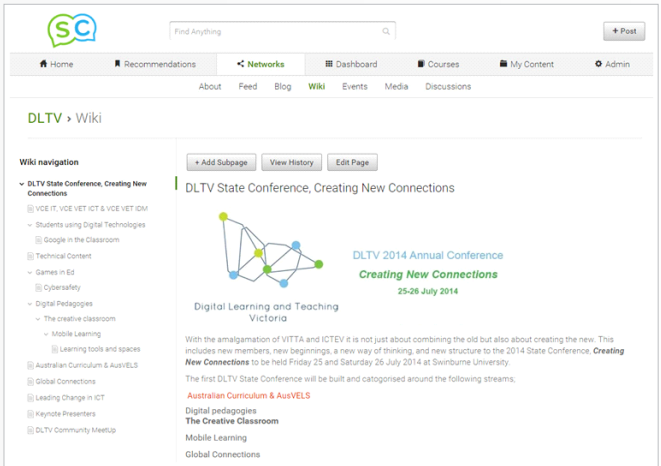
Education Services Australia, a not-for-profit company owned by all Australian education ministers. It develops, shares and deploys nationally-owned education infrastructure (see other national tools and services at http://bit.ly/EducationServicesAustralia). ESA has created Scootle Community (https://community.scootle.edu.au) a professional digital community for teachers to discuss and share ideas, resources and professional practice with their peers across the country.



Funded by the Australian Government and developed in collaboration with the Australian teaching profession, Scootle Community is a private space for teachers to engage in professional dialogue and sharing with other educators from around the country. The platform is a tool for all Australian educators to give and receive teaching and learning recommendations, advice and information in a connected and collaborative social learning environment. It is of course, free-of-charge for all Australian educators and pre-service teachers.

The tools and search functionality within Scootle Community allow educators to promptly make connections and find teaching and learning resources which meet their needs and interests easily and precisely.

In Scootle Community, teachers can join networks or create networks – many individual schools are creating networks for their own use, by learning area, or year level. Networks can be open to all teachers within Scootle Community or they can be established as private and restricted to nominated members. Teachers themselves have created networks according to areas of professional interest, and some professional learning bodies such as Digital Learning and Teaching Victoria have already begun to use Scootle Community as the platform for collaborating and sharing ideas regarding a particular project or outcome that teachers might be working towards.

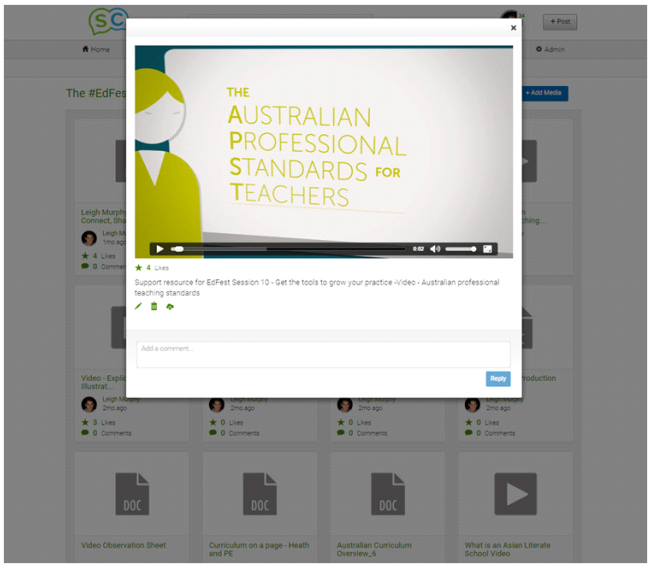


One of the great things about Scootle Community is that it is sector agnostic: it works for teachers across the government, Catholic and independent sectors, in every Australian state and territory. It is also available from all devices.

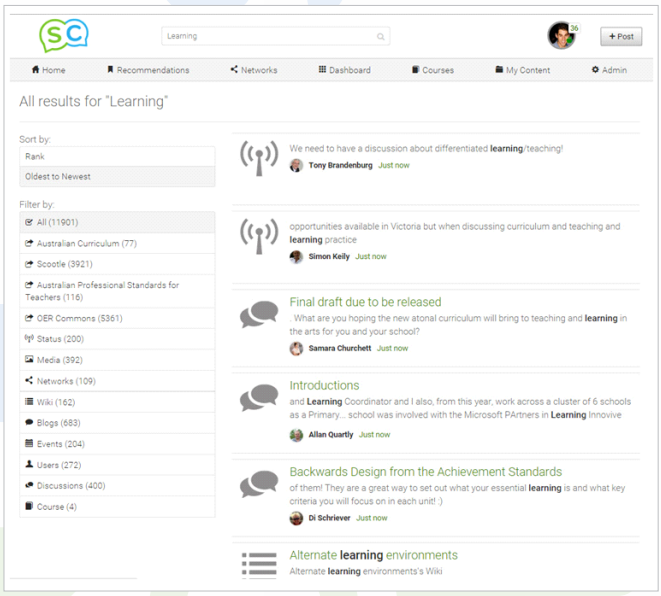
It's easy to join, simply login with your Scootle password see http://bit.ly/ScootleCommunityUserGuide for more information on access.

Contemporary features

Scootle Community has all the features you would expect of a sophisticated professional networking tool including a number of new functions which have just been released. Members can upload their own content of any file type or share externally hosted content such as YouTube video which can be embedded in discussion posts, blogs or network wikis. You can now turn on 'email notifications' so that you receive email alerts for your invitations and interactions. The great thing about Scootle Community is that it is powered by sophisticated predictive analytics from Declara. This means that the platform sends you suggested connections, networks and content that might be of interest to you, based on your previous activity and profile.

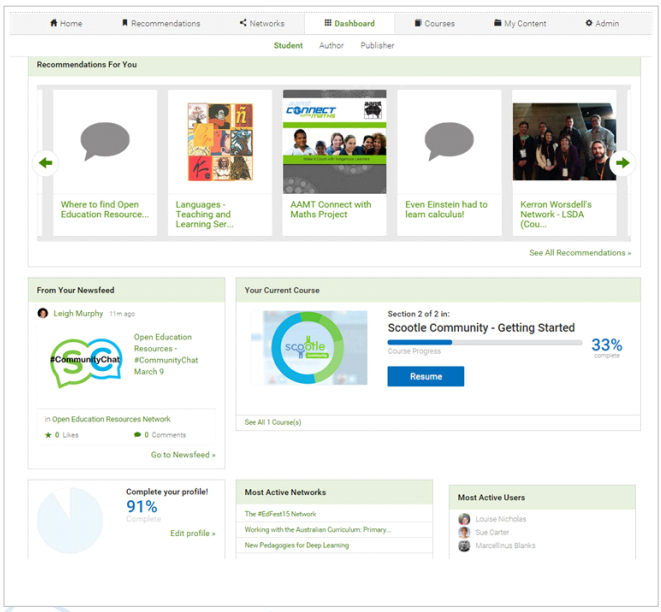


One of the other things users are very positive about is its sophisticated search capacity – Scootle Community is a great place to look for teaching resources, including many creative commons Open Educational Resources. The platform's search functionality allows you to filter by the Australian Curriculum, Scootle, AITSL standards, OER Commons, Media, networks, Wikis, Blogs, Events, Discussions, Courses and more.



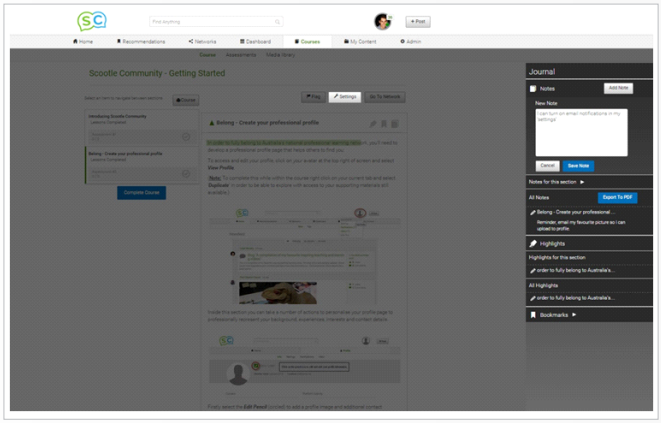
In order to fully belong to Australia's national professional learning network, you'll need to develop a professional profile page that helps others to find you. You can personalise your profile page to professionally represent your background, experiences, interests and contact details. Remember that Scootle Community is accessible only to Australia's education community, through Scootle's edu email authentication process, so this profile will be viewed only by your peers.

When you land on the home page as a user, you'll see the national newsfeed featuring all content shared publicly across the platform. Users can also navigate to your personal dashboard with content, connection and network recommendations selected for you. as well as course and profile progress. Recommended content will often take the form of articles and posts that might be relevant and as you use Scootle Community, these will continue to change, based on your choices and preferences. It's worth exploring by clicking on the possibilities provided.



Course functionality

Another new feature of Scootle Community that ESA will be developing over the forthcoming months is the 'Course' functionality the platform offers. Courses are currently being developed and will be opened soon which enable educators to explore teacher professional learning concepts with experts and their peers.



The advantage that platforms like Scootle Community offer contemporary professional learning is that they can be as dynamic and responsive as the contemporary education environment demands. Networks of common professional interest can be formed quickly and easily – they can be established for as long as the need is there.

We know that some of the most effective professional learning is reflective, where teachers explore areas of common interest with focus and insight, grounded in professional practice. In a context that is shifting as rapidly as today's, access to up-to-date information and expertise is both helpful and inspiring. So is connection with knowledgeable and enthusiastic peers who may be grappling with the same issues elsewhere. Scootle Community is a significant initiative in the national education landscape whose value will continue to grow through the contributions and conversations of its members.

To find out more, simply visit https://community.scootle.edu.au.

http://bit.ly/NewLookScootleCommunity

AUTISM AND IPADS

Annelie Zuccolo

Annelie Zuccolo taught Secondary Media for 5 years but currently teaches a Grade 5/6 class at Northside Christian College as well as fulfilling the role of Leader of Curriculum and ICT in Primary. She helped to lead the rollout of a one-to-one iPad program in her school section in 2012 and is passionate about 21st Century learning.

Teaching a student with autism in a mainstream class has its challenges and rewards.

When I faced the prospect of teaching an autistic child in a mainstream, upper primary class for the first time, I had to develop a programme that would cater to his needs and learning goals. My student was high functioning and was aiming to build independence, however he had poor social skills with no eye contact. He loved to act and perform in front of the camera, and thrived on schedules and repetition, so these were strengths I knew I could build on. To address his particular needs, I realised one of the most significant resources I had at my disposal was the iPad and so I began to think of ways to use this to encourage learning and engagement, and to develop his strengths and build towards his personal goals.

My attention was initially drawn to the use of the iPad because, around that time, autism and the use of iPads as a means of communication and engagement was a hot topic. Many articles and news items were published presenting the notion that iPads could help students with autism to overcome problems of communication and to reinforce basic skills necessary to navigate the world around them. I began to do extensive research and contacted various organisations that specialised in the education of autistic students, such as Autism Victoria, to learn how to effectively use the iPad as a resource for this student. For me, the most convincing argument came from an article that quoted a parent of a child with autism: "What the iPad has done has given her a sense of control that she never had before... She knows when you touch it, something is supposed to happen. She knows she doesn't need to cry, she needs to point." (iPad Gives Voice to Kids with Autism)

After reading this, I began to see the advantages of using an iPad as an effective tool of communication. It could help to provide a safe environment for learning by assisting the child to communicate basic needs, emotions and feelings. Fundamentally I believe that if any student feels safe and in control within the classroom by being able to communicate their desires and feelings, then I can fulfil my teaching obligation, which is to address the learning needs of the student and assist with creating personal goals to help build academic and social skills, regardless of personal learning differences.

Another article I read helped to clarify my thinking about the role the iPad should play in assisting my student. Daniel Donahoo, a reporter for Wired, said "While there are some apps that are more specific to use with children with autism (like AAC [Augmentative and Alternative Communication] apps), all apps can provide developmental experience depending on how they are used and the child's own developmental trajectory and interests. You can't have a "Top 10 Autism Apps." The iPad is an attractive digital device. It can be used for children with a disability as an effective developmental transition tool. But don't confine a child to an iPad. If they start drawing on the iPad, think about having another go with the crayons." This statement not only acknowledges the trend in using iPads for autistic students, but also highlights an important point in the relevance of using iPads in the classroom for all students. That is, the iPad should never be used simply as a tool of substitution, it should be engaged with the belief that it enriches, develops and enables students to actively seek learning. The iPad provides opportunities to tap into a global community of international students, classrooms and teachers as well as providing opportunities to communicate with professionals and gather resources and perspectives from around the world. It also allows students to create and produce beyond what technology has provided previously. iPads are not a tool that will ever directly improve learning outcomes, but I believe they do increase student

engagement and that when students are engaged and involved in their learning there is an opportunity to expand knowledge and understanding.

Through this research process I was able to substantiate how valuable a resource the iPad was for this particular student. Along with this, I gathered specialist reports, and read his personal school reports, which helped me to devise a programme based around the strengths and goals of my autistic student and look at ways to use the iPad for certain activities. I created a list of 'learning areas', which I felt encompassed the scope of this student's personal learning journey. They were:-

- Social Management
- Cause & Effect
- Communication
- Motivation
- Numeracy
- Literacy
- Puzzles and Problem Solving
- Manipulation

After this extensive process, I then began to look at the range of apps available for mainstream education and started to see how these could be applied to meet the needs of a student with autism. I wrote personal lesson plans to incorporate specific learning activities on the iPad as well as more traditional activities for the student's aide to follow.

Five notable apps that were used and inspired many activities were Pocket Pond, ABA Flash Cards, Joke Telling App, Tom Cat and Conversation Builder. These apps were particularly relevant to my autistic student's needs as he loved to perform and the main learning goal was centred around building conversation and social skills with other students.

Some Activities relating to Pocket Pond

After the aide would demonstrate the cause/effect relationship of looking after the fish, feeding them, and cleaning the pond, the student would count the fish, build a vocabulary of nouns, write out adjectives to describe the fish and create simple sentences. He would also name the fish after students in the class, building relationships and knowledge of who his classmates were. It was also a calming tool and he could take screen shots and write basic stories.

An Activity Inspired by ABA Flash Cards

My student was so impressed with the emotions presented in this app, such as 'happy' and 'sad', that he took images of himself expressing the different emotions and instead of relying on the app, we printed the images off and he would place them on the wall to describe how he was feeling.

Some Activities inspired by Joke Telling

Considering one of the strengths of my student was performing in front of the camera, every day he would use the joke telling app to learn a joke and create a video of him telling it. This would involve him learning about expression, performance timing, and the meaning of the joke.

Some Activities Based on Talking Tom and Conversation Builder

To develop his reading ability, my student would access simple plays and scripts and would record himself using different voices for the various characters via apps like audio memos. He used these apps to practise conversations and record videos. Each week, the student would write, rehearse and record one social skill tip and then we'd create a QR code and allow students in the class to watch it and add comments. He particularly enjoyed using Tom Cat to add humour to his videos.

Initially I found the prospect of preparing a learning programme for an autistic student daunting, but through the process of research I gained the confidence to integrate him within my mainstream classroom. I was able to develop a consistent plan that worked to achieve specific goals, using the iPad as an effective support.

My student was engaged during the time he used the iPad, he used it to convey emotions well and to build connections with friends in the classroom as he was using the same apps but for different purposes, and we had a brilliant digital portfolio of all that he had achieved at the conclusion of the year.

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http://www.huffingtonpost.com/dr-marion-blank/60-minutes-autism_b_1091378.html)

iPads are not a miracle for children with autism

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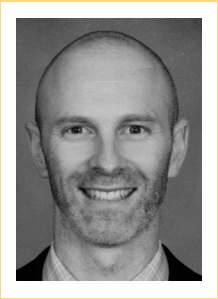
The Digital Technologies Curriculum from Scratch



Jeremy Kalbstein

Jeremy Kalbstein is a consultant and trainer on Digital Technologies, cyber safety and eLearning. Combining a mix of education and corporate training experience with professional development and a Harvard-inspired pedagogical approach, Jeremy works with educators and education leaders to develop sustainable educational technology models. He has an in-depth understanding of the Digital Technologies learning area, vast experience developing and implementing new digital curriculum from scratch and an innovative and highly valued implementation method. His latest work has him developing infographics, explainer videos, online communities and online learning courses. Jeremy lives in Melbourne and is married with two children.

Sir Ken Robinson, respected educator, author and presenter, asserted in his TED Talk from 2006 that schools are killing creativity. The Australian Curriculum's Digital Technologies curriculum provides an opportunity for schools to redress this and resurrect creativity.

The Digital Technologies curriculum is mandated to be implemented within schools by 2017 and whilst it has not found its way into the AusVELS as yet, it should do so in the near future. Naturally, understanding the depth and breadth of the curriculum and how to implement this within the classroom is essential.

WHAT IS THE DIGITAL TECHNOLOGIES?

The Digital Technologies learning area aims to help students become 'innovative creators of digital solutions" to meet both current and future needs of society. In short, it is broken down into 2 strands.

1. Knowledge and Understanding looks at the components of digital systems including hardware, software and networks as well as how to represent and structure data symbolically.
2. Processes and Production Skills explores the collection, management and analysis of data.

The key to successful understanding and implementation of Digital Technologies is the relationship between the two strands. "Together, the two strands provide students with knowledge, understanding and skills through which they can safely and ethically exploit the capacity of information systems (people, data, processes, digital systems and their interactions) to systematically transform data into solutions that respond to the needs of individuals, society, the economy and the environment." (Australian Curriculum, 2014) In other words, Digital Technologies aims to enable deeper understanding of digital systems and how data is represented in order to develop the necessary skills to develop digital solutions to problems and opportunities. These necessary skills involve not only using digital systems but also in using critical, creative and computational thinking.

Computational thinking is essentially trying to think like a computer. Of course, computers don't think! So, what this actually means is to apply the computational thinking concepts such as decomposing, abstraction, algorithms and logic that are used by software engineers, across other areas of learning and life.

HOW CAN THE DIGITAL TECHNOLOGIES BE IMPLEMENTED?

There are three key components that can not only assist with the implementation but enhance it as well as extending student thinking, learning and understanding in the process.

The first component is the "digital technology" which in this case is a program developed by MIT called, "Scratch". Scratch is a program that teaches students how to create interactive stories, games and animations through the use of programming language and thinking, and the language of thinking. The beauty of Scratch lies in its user-ability. With the recent creation of Scratch Jnr, children at pre-school age through to teens (and even adults!) can develop digital solutions appropriate for their age level. Supporting Scratch is ScratchEd - an online community for educators to share experiences and stories as well as post in discussion boards or find people.

The second component is Harvard's "Visible Thinking". Visible Thinking is a framework that aims to develop students' thinking skills and dispositions and to deepen their content learning. This includes but is not limited to curiosity, creativity and being skilled at, alert to and eager to take thinking and learning opportunities. To enable authentic thinking and learning

opportunities, Harvard identified 8 cultural forces that define our classrooms and direct thinking. One of these cultural forces is 'Language'. In 2012, Harvard released some descriptions and definitions of the concepts, practices and perspectives of Computational Thinking with Scratch. The language associated with Visible Thinking aligns with the language of computational thinking. For instance, the computational thinking perspective of 'expressing' is essentially concerned with creating. Creativity is one of the four visible thinking ideals as well as being present in one of its dispositions of having a creative mindset. The computational thinking perspective of 'questioning', which entails questioning the world, connects seamlessly with the visible thinking move of wondering and asking questions as well as the link between questioning and curiosity and learning. Additionally, the Visible Thinking framework incorporates the three dimensions of the AusVELS Inter Disciplinary Thinking Processes domain:

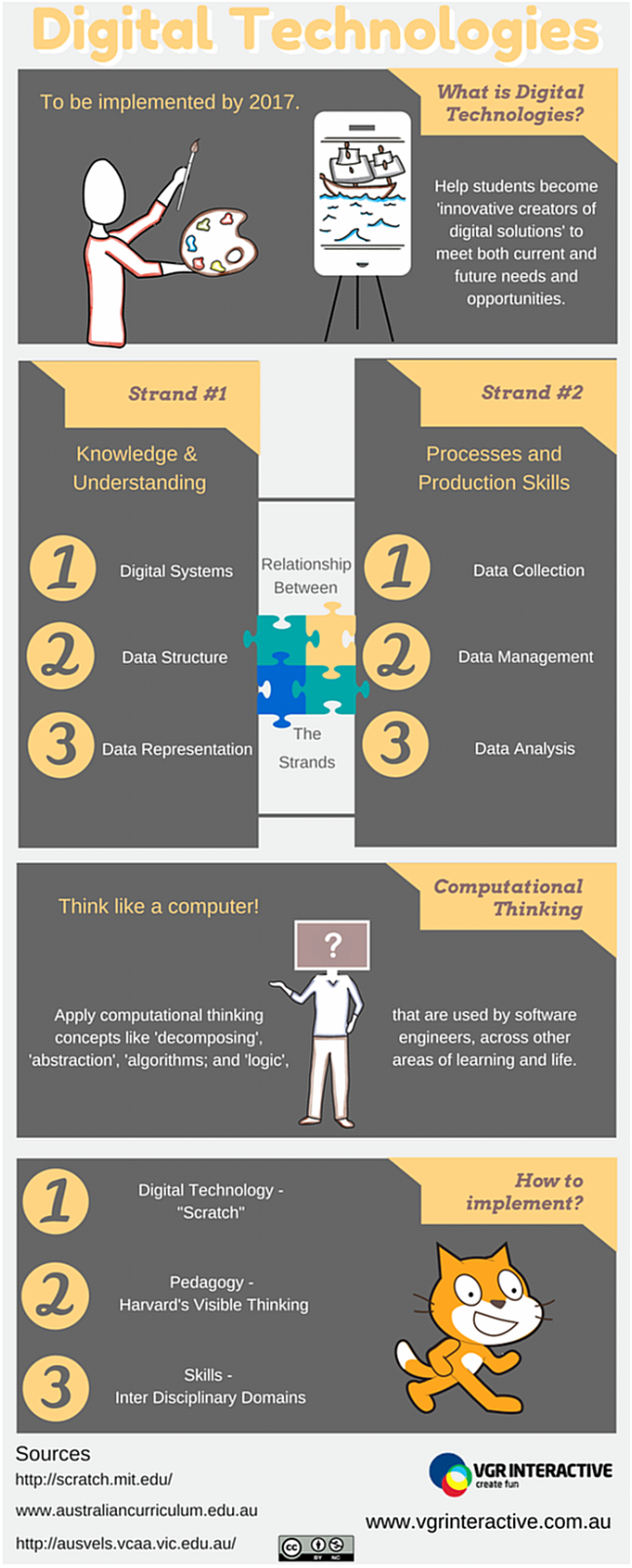
1. Reasoning, processing and inquiry;
2. Creativity; and
3. Reflection, evaluation and metacognition.

The third component involves "Tony Wagner", the Expert in Residence at Harvard Innovation Lab. Tony Wagner identified 7 survival skills that students need for their future. These skills, as is the case with the Visible Thinking framework, also link and incorporate the dimensions of the AusVELS ICT Inter Disciplinary Domain:

1. ICT for visualising thinking;
2. ICT for creating; and
3. ICT for communicating.

Using Scratch as a tool for facilitating the digital technologies curriculum not only provides an opportunity for developing computational thinking skills but also for cultivating additional skills such as creativity, collaboration and social responsibility.

To summarise, utilising the Visible Thinking framework devised by Harvard as the pedagogical approach for implementing the Digital Technologies learning area of the Australian Curriculum will support, enhance, extend and challenge learners' understanding of digital systems and how data is represented. Whilst simultaneously developing computational thinking skills alongside generic and ICT-related skills for the creation of digital solutions that address current and future problems and opportunities as well as providing essential skills for life and the world of work.



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Positive side effects of coding in the classroom

Jack Lawicki

Jack is a primary school teacher and developer. He strives to provide young learners with opportunities to pursue their passions and interests. He believes that all students should learn the basics of computer science because it teaches you how to problem solve and think creatively. Jack has been running Coding Club for the last two years.

Organisations, governments and educators across the globe have proposed numerous reasons why coding should be compulsory in all classrooms. This include that coding will prepare students for future jobs and develop digital literacy in digital natives.

We will have to wait for the future to arrive to find out if the intentions of introducing coding into the classroom are achieved. However, if you start including coding experiences in your classroom you will not have to wait for the future to gauge the positive effect learning to code has on students. You will see the positive side effects immediately.

The unintended side effects learning to code has on students are multiple and varied here are my top 7.

Start coding and students will start to:

1. Set their own intentions.

   Once students realise that they can create games, websites or programs they start coming up with their own learning intentions. “I'm going to figure out how to create…..”

2. Try things out.

   If you never have a go you will never know. Learning to code helps you embrace mistakes or failures as a natural component of learning and creating. A mistake isn't a mistake it is just a trial that showed us what doesn't work and has helped us take a step closer to our finding out what does work.

3. Receive and value immediate feedback.

   When coding you don't need teachers, peers or even yourself to provide feedback. Developing programs involves testing programs and testing programs quickly lets you know if what you did worked. If it didn't work then you know you need to try something else to solve your problem.

4. Analyse primary sources to help solve problems.

   After having a go at figuring out things for themselves, and realising that their approach hasn't worked yet, students will often analyse games, programs or sites that are similar to what they would like to create. This helps them realise that we can use the collective knowledge of humans to help us solve our problems.

5. Seek and provide assistance from classmates.

   As students progress on their coding journey some quickly become experts in specific fields. This enables students to become the teachers of the class. Encourage students to use each other as the first resource they call upon for assistance.

6. Reflect on their learning.

   When given time to reflect students start realising that frustrations, mistakes, joy, pride and detours are all a natural part of learning and becoming successful. Students will also start reflecting on previous learning when solving new problems. “Wait a second… I've done something similar to this when…” will be heard often in your coding classroom.

https://itun.es/au/ulY16.l learn2code

7. Enthusiastically share their creations.

   You will never have to encourage students to share their work in the coding classroom. In fact you may have to enforce limits on the amount of sharing that happens. Students feel proud of their creations and can't wait to have mates try out their games.

The future is difficult to predict and the exact skills students will need for future success is truly unknown. However, if you include coding in your classroom students start learning in a fashion that helps them be successful now.

So… How do you include coding in the classroom?

My rough formula for introducing coding to your classroom looks like this.

Step 1: Decide what environment you will use.

If on iPads and above Level 2 use

HOPSCOTCH

If on iPads and below Level 2 use

If on PCs/Macs and above Level 2 use

Step 2: Set students some creative challenges that help them learn the basics and provide some resources for them to get started with.

The initial challenges I set students are:

1. The Draw Challenge.
   - Program a sprite (character) to draw a square.
   - Create a program that turns the square into a picture.
   - Draw a square using less blocks.
2. Frogger/Crossy Road Challenge.

   Build a game like Frogger, which most students recognise as a game called Crossy Road. The aim of the game is to move your sprite across the street while it dodges the traffic.

The resources I provide for Hopscotch lessons are walkthrough videos and PDFs/Slides. You can access the iBook resource I provide students for the Draw Challenge here.

https://itun.es/au/ulY16.l

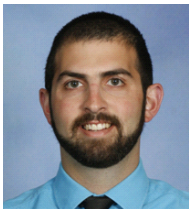
Hopscotch also contains built in tutorials and challenges called Levels that are fantastic for students to learn with.

If using Scratch the Scratch website has many video tutorials and challenges to help students get started.

Step 3: Encourage students to create the games they want in the world and give them time to create them.

Providing opportunities for students to learn to code might result in the development of skills required for future success. Time will tell. Providing opportunities for students to learn to code results in students experiencing success now. For me having students experience success now is the best way to prepare them for future success.

Structural changes to VCE COMPUTING



James Vella

James Vella is a teacher and Learning Area Leader for Digital Technologies at MacKillop Catholic Regional College in Werribee. He was a member of the recent VCE Information Technology Review Panel and has been involved in all stages of the development of the new study design and associated support materials. James will also be involved in the delivery of the upcoming implementation program and will be presenting two sessions at the forthcoming DLTV Conference in July.

VCE COMPUTING – SOME CHANGES

The Victorian Curriculum and Assessment Authority's (VCAA) has recently released the VCE Computing (formerly Information Technology) study design. As with any study that has been reviewed and updated, several changes have occurred. This article will provide a snapshot of the major "structural" changes across all of the units of study. It is also important to note that the information contained in this article relate to the Computing study design, that is being implemented in 2016.

Name changes

One of the most noticeable changes has been the change of title for the study and by extension, some of the units. The table below outlines these name changes in detail

2011-2015 Name	
Information Technology (Study Title)	Computing
IT in action (Unit 1)	Computing (Units 1)
IT Pathways (Unit 2)	Computing (Units 2)
IT Applications (Unit 3/4)	Informatics (Units 3/4)

You will have notice that Software Development (Units 3/4) is noticeably absent from the table above. This is because they are the only sequence of units in the study not to undergo a change of name.

These changes have taken place.

Assessment

Assessment is another area of noticeable and considerable change, especially in both Unit 3/4 sequences. In the 2011-2015 implementation of the study, assessment was primarily comprised of School Assessed Coursework (SAC) (worth a total of 25% each across Units 3 & 4) and the end of year examination (50%).

The study marks a significant shift from this structure, with the introduction of a School Assessed Task (SAT), in both Informatics and Software Development. In both sequences, the SAT sits across Unit 3 Outcome 2 and Unit 4 Outcome 1. The introduction of a SAT has also changed the contribution of the SACs to the study score. Unit 3 and Unit 4 coursework is now contributes only 20% (10% each), while the SAT contributes a total of 30% to the calculation of the study score. The examination's contribution to the study score remains at 50%.

SAT criterion for both sequences of studies will be released early in 2016.

Key concepts

VCE Computing has introduced four Key Concepts, which act as a lens through which to conceptualise and organise the content of the units. The four key concepts are:

- Approaches to problem-solving
- Data and information
- Digital systems
- Interactions and impact

All of these concepts have been implicit over the years in previous Information Technology study designs and have evolved over time in accordance with current curriculum trends and industry practice. You may refer to the study design for further information on each of the Key Concepts.

Mandated Software Tools

This article will not delve into the intricacies of the mandated software tools for each Area of Study, but will point out a

significant point that, from anecdotal experience, many have failed to pick up on. This point is based around the language of "*required to study and use*", as opposed to "*required to use, but not required to study*".

"*Required to study and use*"

Software tools that are required to be studied and used have software functions that are explicitly referenced within the key knowledge and key skills. Therefore, there is an expectation that in the delivery of the teaching and learning program that students will have the opportunity to gain an understanding of any underlying principles and concepts associated with the use of the stated software tool and proficiencies in the stated software tool/s required to meet the requirements of the outcomes.

"*Required to use, but not required to study*"

Software tools that are required to be used do not have software functions that are explicitly referenced within the key knowledge and key skills. Therefore, there is no expectation that in the delivery of the teaching and learning program that students be given the opportunity to gain a proficiency in a stated piece of software. They are not being assessed on their skill in using the software, rather they are being assessed on the content that is represented through the use of the software tool. For example, students will not be assessed on how well they depict their proposed network through the use of software, rather they will be assessed on the appropriateness of the selected components.

Professional Development

Alongside the release of the new Computing study design, during April and May, Digital Learning and Teaching Victoria, in collaboration with the VCAA are hosting a number of physical and electronic implementation sessions, where teachers can gain an even better insight into the new study design and will have the ability to gain clarification about some of the finer points of the study. These sessions will take place in a number of metropolitan and regional locations across the state.

The forthcoming DLTV Conference (Friday 24th and Saturday 25th July) will also facilitate a range of sessions aimed at informing teachers about the forthcoming study. In 2016, the VCAA will also run SAT training for teachers, in order to get them familiar with the processes involved in conducting a SAT and how to utilise the provided SAT criteria.

All the very best with the implementation of the new study design.

PREPARING THE NEXT GENERATION OF DIGITECH TEACHERS

I'm a teacher educator who is pretty passionate about integrating digital technologies into the classroom. I have been for just on twenty years! I teach pre-service teachers about integrating digital technologies into school classrooms.

Over the years I have tried to show my pre-service teaching students a range of applications that I know teachers in primary and secondary schools are using in their classrooms. I also talk with them about the principles that underpin effective integration of digital technologies, and links with learning theory, as any good university lecturer should. I urge my students to think about going beyond 'glitzing up' existing ways of teaching that just adds a layer of technology to current ways of doing things, to re-thinking how digital technologies might transform what happens in a classroom.

However, every year I came up against a blocker – only a handful of my students ever see the things I talk about and demonstrate being implemented in real classrooms. The majority of my students, even this year, see very limited ways of using digital technologies during their practicum experiences. So I would end up at the end of semester with pre-service teachers who knew more about a handful of applications than they previously did, plus some theoretical understanding of how digital technologies might make a difference in the classroom.

I decided that there must be a better way. If my students weren't having the digital technologies experiences I wanted them to have on their practicums I would create such an experience for them. So I knocked on the door of a local primary school and asked if I could bring my students to them, once a week for four weeks, to use digital technologies in real classrooms, with real curriculum and real students. I went site-based!

In 2014, after six weeks of teaching each other a range of apps and thinking about why and when they might use them, 25 students worked in teams to plan and implement digital technologies-enriched curriculum in six primary classrooms, mostly Grades P-4. Each room had access to either iPads or netbooks. My students worked closely with the classroom teachers on planning, within the bounds of the school's existing curriculum (focused on learning about the local community) trying to identify opportunities where using digital technologies would enhance the learning experience. Then every Monday afternoon for four weeks, they would take over the classroom.

At the end of the four weeks, children were creating comic strips about how to call an ambulance in a medical emergency using ComicLife and Bitstrips for Schools; creating digital stories about doctors and dentists on educreations; Skyping with CFA firefighters about bushfires; filming each other with their iPads as they acted out an emergency then editing the video on iMovie; and reflecting on their learning using Popplet.

My aim was for my pre-service teachers to gain practical experience of integrating digital technologies in a real

Nicky Carr

Nicky, a lecturer in teacher education, has a special focus on how digital technologies are integrated into classroom learning and teaching, both at a school level and within the higher education sector. Nicky integrates digital technologies in her own teaching and, where possible, works with local schools to add site-based elements to her courses.

classroom. I wanted them to experience first hand the complexities of integrating technologies in a practical setting (the iPads not being charged, the lack of access to particular websites and the processes they needed to go through to make sure access was available, the tensions between the children as they all took turns with limited equipment and so on). But I also wanted them to experience the benefits of using digital technologies in the classroom. And they did.

But not only the pre-service teachers. The classroom teachers also saw changes in the approach to learning by their students whenever technology was introduced. Classroom teachers commented on how engaged all the students were in the technology-enriched tasks, particularly those students who frequently displayed challenging behaviours. In particular, the classroom teachers were impressed with the collaborative skills that developed as the children worked together on their digital technology projects, guided by my pre-service teachers. The classroom teachers were also surprised at how quickly and easily their students learnt how to use each app.

Most of the classrooms my pre-service teachers worked in were classrooms where technology was used in limited ways – Reading Eggs as a literacy rotation, or 'educational' apps on the iPads or Mathletics for those students who finished their set work early. Rarely was technology an integral part of the curriculum in these classrooms. In agreeing to my proposal to bring my pre-service teachers to the school, the school leaders saw this project as a way of demonstrating, to some of their teachers, more meaningful ways of integrating digital technologies into the classroom.

During the four weeks, the Assistant Principal organised for her student IT Champions from Grade 5/6 to come into the classrooms and help out. Not only did they help with some of the practicalities, but they also learnt how to use new apps that they then took back to their own classrooms.

At the end of 2014 I went back to the school to do some professional learning with the staff. At the end of my presentation I asked for questions. The first question, from one of the classroom teachers, was, 'Nicky, are you bringing your IT students back this year? Please?' So this year we are about to do it all again, this time with 33 pre-service teachers in 11 classrooms. We've been asked not to use Popplet as all the teachers in the school make regular use of this app, as a direct result of our site-based experiences. At the time of writing my pre-service teachers have explored Popplet and other visual thinking apps, blogging tools, audio editing tools, Book Creator, Piktochart, iMovie, various comic creator apps, animation apps like Tellagami and Voki, edmodo, QR codes and Aurasma. We're about to explore possibilities for incorporating these into the school's curriculum. Can't wait!

Etutor experience as a preservice teacher

Suzanne Byron

Suzanne Byron is a previous RMIT Bachelor of Primary Education student who worked on the etutor project. She is currently studying civil engineering, whilst researching the impacts of our current learning methodologies on students with chronic illness. Suzanne is the Education Academic Affairs Officer for the Swinburne Student Union and sits on the Swinburne University Enterprise Innovation and Architecture Forum, and the Learning and Technology Forum, whereupon the integration of technology at the university level is determined.

Teaching online is difficult. But worthwhile

Our culture heavily relies on reading physical indicators of emotions, difficulties and personality. The internet hides that, and lets you be the person that you wish to represent or share. Even in face to face scenarios, your personality can change based on how safe and comfortable you feel with the environment and the people; the internet amplifies that, in both positive and negative ways. Being able to connect with people based on a common experience, like, dislike or feeling is important in building trust and a relationship, however the online environment enables people to have entire power over revealing any part of themselves; which can pose challenges when it is used as an educational setting.

RMIT introduced a program, eTutor, in conjunction with two Melbourne-based primary schools, and schools in India, Nepal and Malaysia. School students would work in groups to enhance their English skills, learn about each others' cultures, engage with technology whilst collaborating on a group tasks and projects all through the safe eTutor online environment, whilst being guided and supported by pre service teachers.

eTutor presents similarly to a social media page; with a newsfeed, individual profile pages, blogs, and a private messaging component, whilst being safe and secure via individualised password logins. Each group had a separate newsfeed and access to members, however interaction was permitted across groups.

Our initial expectations, as pre-service teachers, was that engagement and interaction would be fairly easy. Post a few things, suggest the students do similarly, and a connection would be formed. We were experienced and confident at social media; we could do this. But, due to students having irregular login times, no real obligation to sign in, and claimed bad internet connection, it was incredibly difficult to begin and strengthen the initial relationships. Being on the other side of a computer meant that we could only post on the students' walls, send them messages and hope that something we were posting would catch their interest, yet we had no way of knowing whether they had looked.

Some of the students were quite keen, and in an effort to keep them motivated and engaged, more tasks were added, such as writing about and describing their favourite food, or elaborating on what they like to do in their spare time. Adding photos that meant something to them was encouraged. However some of the students still hadn't uploaded a profile picture, or written more than one post. There were no situational topics that we could bring up, couldn't comment on the character on their pencil case, or even what appeared to be their favourite colour. We were blind to who they were, and were reliant on them sharing the information.

Correcting students' mistakes was also integral to their learning, however there was the difficulty of conveying tone or reading facial expressions. We incorporated the sandwich method, a compliment, constructive feedback, compliment, to soften the correction. However, when the students continued to spell incorrectly or use the wrong homophone, we faltered. Understanding a person from a few posts is much harder than in a classroom setting; our only teaching experience so far. There was a fear of pushing these students away, or causing them to lose their confidence in the online environment.

Losing social context was also hard, you didn't know whether they typically needed encouragement or were more autonomous with their desire to learn. Not being able to see

facial expressions, how they converse with their peers, their social context, how they were mixing with fellow students or how they were managing school, as well as any family matters, made being supportive, nurturing and relevant to individual students quite difficult. Furthermore, awareness of how they found certain tasks relied on honesty and openness from the student, as opposed to typically reading facial and body expressions. Therefore optimising challenges and tailoring tasks to each student became more demanding and potentially more crucial for their engagement without the teacher standing behind them. Moreover, judging the students' English competency level was problematic. Relying on reading posts, blogs and comments limited the scope of examples to assess, as well as only being a true judgement of their written English. We learnt, perhaps too late, about the importance of providing clear and consice instructions.

Throughout the time period of the project, the Indian students were absent for large amounts of time due to cultural celebrations and festivities. Whilst resulting in periods of no interaction, the holidays allowed an insight into the students' lives; a talking point and something to build a connection on, for both the pre service teachers and the local students.

eTutor was a big learning curve. Communicating through online means, blindly and without full involvement or participation of all students, resulted in many challenges. Some that we felt more competent to solve than others. The pre-service teachers didn't measure up to their own expectations, mostly based off the ease of sharing and communicating with people of similar ages online and previous in-school placements. Engaging students purely through digital means was a lot harder than anticipated, but clear and concise communication is relevant in any educational setting.

Culturally the pre service teachers and the students learnt a lot about each other. Being able to view posts across all groups meant we were all exposed to aspects of life from a variety of cultures. As global citizens we are moving forward into an increasingly culturally diverse context, and eTutor prepared students for working together, and finding commonalities despite different backgrounds. The experiences from eTutor encouraged autonomy, responsibility for self-learning and acceptance of other people, all things that we can take away as more developed students; whether that be primary, secondary or university level.

Support for the eTutor project has been provided by the Australian Government Office for Learning and Teaching. The views in this article do not necessarily reflect the views of the Australian Government Office for Learning and Teaching. Archival information about the eTutor project can be found at http://emedia.rmit.edu.au/etutor/

Obstacles to the implementation of a whole school approach to eLearning

Sawsan Hassan

Maths, Science and Legal Studies teacher
at East Preston Islamic College. DLTV Associate Editor.

Implementing a whole school approach to eLearning comes with many obstacles and the degrees of difficulty faced by these obstacles are often underestimated. The purpose of this article is to make transparent the issues that may hinder the progress of whole school implementation of eLearning. General school policy, occupational health and safety policy and student welfare and wellbeing policy are some of the many policies that need to be altered to allow for successful implementation.

Implementing a whole school approach to eLearning is a very long process. ELearning committees are popping up at many schools to address this long process and address its issues. One of the first issues that has to be addressed is school policy. At face value it appears to be one of more simple to overcome. On the contrary it is one of the most time consuming issues to address as it requires a complete overview of school policy from all aspects.

Initial meetings of the eLearning committee elicit much enthusiasm and eagerness to implement eLearning across the school. Ideas are plentiful and willingness is high. As quickly as ideas are shared, so too are the issues associated with them. Staff are going to be using ICT in their teaching more readily, so occupational health and safety policy needs to be addressed. Additionally, students are will be using their own devices therefore amendments need to be made to rules in school policy to allow and encourage students to use ICT. Furthermore, as students are going to be more connected to the cyber world at school, more emphasis must be placed on cyber safety and cyber bullying in the student wellbeing policy. All these policies are usually developed through different committees and the active collaboration between different committees.

As a newly formed committee the eLearning committee has to develop a plan to address these policy changes. It is a really difficult task to coordinate a plan that addresses alteration in all of these policies. Two main constraints are lack of time and lack of resources. Time is of the essence for all teachers, however for alteration of policy and for implantation of eLearning to occur there needs to be a time commitment by committee members to ensure constant progress. Committee members are often full time teachers that have full loads. Time release is essential to allow for committees to meet and develop plans and for inter-committee collaboration to occur. Once management is convinced for the need of eLearning in a 21st century school, investment into eLearning begins, however this is not sufficient for continued and increased investment to implement and maintain a whole school approach. Management needs to be convinced of not only the need for eLearning, but also the need for a whole school approach to eLearning. This requires the sacrifice of teachers and aspects of management to meet in their own time or during other meeting times to try and make progress. Although it is an arduous task, when management is convinced resources start to flow through and implementation begins to progress two fold.

A whole school approach to eLearning requires policy to change to address the new needs of all the key players in a school. Policy change takes time and inevitably there are difficulties and constraints on progress. This is not necessarily always a negative. Slow progress is still progress and gives space to address implementation of eLearning from all angles. It also allows time for the professional development of teachers that will be implementing eLearning. Moreover, other aspects of the implementation like educating students about cyber safety and cyber bullying can begin.

Issues of whole school implementation of eLearning are plentiful and more updates are to come. However, regardless of all the many issues that will need to be addressed, it is undeniable that the implementation of a whole school

Art and eLearning

When we talk about e-learning in the visual arts it's usually left to the experts to display their skills and knowledge of the amazing things their students create under their guidance. This is fabulous and I look in ore at their skills and wonder how I could ever help my students create similar things.

As an Art teacher I am somewhat of a novice when it comes to e-learning. Not due to any failures of my own but due to the lack of resources but rather than being afraid and not trying at all, I just go for it and learn with my students. Not surprisingly I also learn from them.

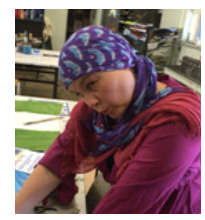
With the introduction of ipads at the school, the opportunity to expand and enhance students learning has increased both the theoretical aspect and the creative aspect of teaching Art. Of course you have to allow for a few selfies, but I have found a whole range of activities that incorporate eLearning into my teaching.

One of my favourite activities which has worked across various year levels (I teach from Foundation to year 10) involved students using apps like “artset”, “pro create” or “brushes” to create an art work. Students that have higher level skills in Art embrace the opportunity to improve on their skills using these applications as they allow students to use their current skill sets and to improve on them. Those students who dislike art or have lower level skills in Art are both engaged and able to use their existing skill set and improve on them. I have found that students are more able to explain why they chose to do what they did and how they created different effects using the ipad, and as more resources are available to them and things can be changed quite easily, they are less hesitant to try new things. In art as for most subjects, this is a positive step forward.

Students also really have to think about the process of creating art not just the finished product. So through all the steps of creating an artwork students take screenshots and create a display using “pic collage”, or “Key note” that explains how they created the piece of art. Students' displays become an electronic visual diary that they can then share with the world or on a smaller scale with the class if they choose to do so. Creating stop motion videos for example has really encouraged students to explore the genre of cartooning. They discovered how difficult it was and develop a real appreciation for those who create such time consuming works.

Having an interactive white board in my art room has been an invaluable supporting resources for viewing the art works of other artists, displaying students work and watching videos.

E-learning in my art room is a shared journey that gets more and more exciting the more I learn about it. One obvious change has been the reduction in the number of times that I hear “I'm not good at art,” and I can't wait to hear all students say “I'm really good at art”. Elearning is really helping to engage all students regardless of the current abilities and interest in art.



Ms Tane Cane

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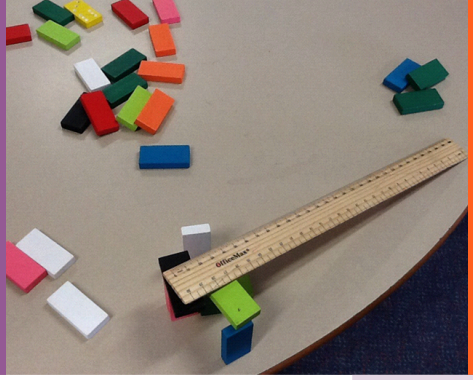
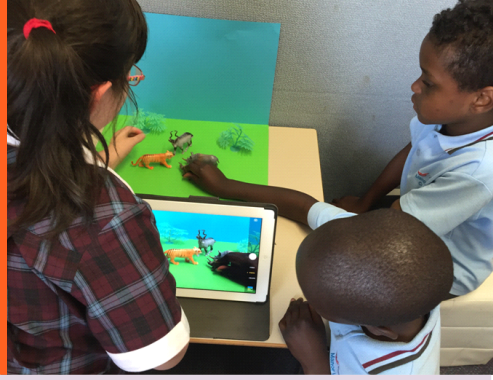
Bachelor of Fine Art (ceramics)

https://www.youtube.com/watch?v=0uDDEEHDf1Y

Kidztek:

Full STEAM Ahead in the Early Years Classroom

Last year, after a number of years teaching older students, I made the move to a grade 2 class. Towards the end of 2013, I requested this change due to my observations when working with the junior levels as a Digital Learning coach. I saw a need for more support and guidance in using technology in creative and innovative ways. Having led the 1:1 iPad program in grade 6 for three years, where students used their iPads as a way to enhance and showcase their learning, I felt it was time to provide the younger students with this same opportunity.

Walker Learning Approach

One of the biggest differences I noticed in my move to an Early Years level, since the last time I taught grade 2, was the implementation of the Walker Learning Approach. This is an Australian developed pedagogy, designed by Kathy Walker, that engages students in personalised learning experiences. For more information about this learning and teaching approach, please explore the following links:

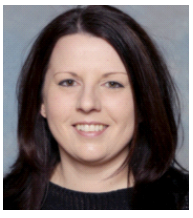
The Walker Learning Approach (http://walkerlearning.com.au/)

Early Life Foundations (http://earlylife.com.au/)

The Walker Learning Approach Philosophy and Pedagogy Compatibility with National Early Years Framework and Australian Curriculum (http://earlylife.com.au/info/sites/default/files/WLA%20Pedagogy_Key%20Elements.pdf)

Personalised & Play-Based Learning: The Walker Learning Approach - Kathy Walker (https://youtu.be/u8khzw5iPu8)

During the Walker Learning Approach, or Investigations, as we refer to it at my school, students are tuned into their learning experiences for the day, move to and between a number of



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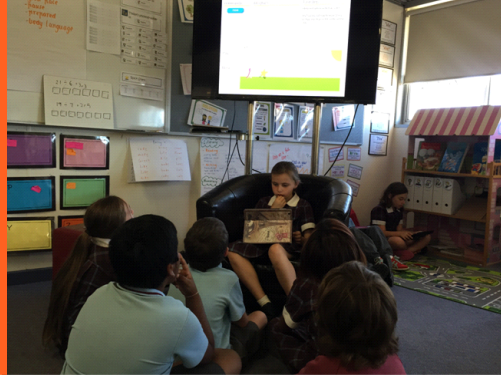
@michellemeracis

Michelle is a primary school teacher who has been teaching for 17 years. She has a strong interest and background in digital technologies and has held a variety of positions, including Learning & Teaching/eLearning Leading Teacher, ICT Peer Coach and 1:1 iPad leader. Michelle has presented at state, national and international conferences on a number of topics, including ICT peer coaching and integrating 1:1 mobile devices. She has also worked closely with representatives from Apple, Cisco, DEECD, IBM and Microsoft on educational projects.





centres (with intentional provocations) where they investigate a range of skills, then reflect on their learning at the end of the session. The centres the students explore include reading, writing, mathematics, science, collage, construction, block construction, dramatic play, sensory and tinkering.

Throughout the year, I noticed how much my students loved working at the mathematics, science, collage and tinkering centres. My students often asked if they could draw pictures at the writing centre too, which led me to setting up an art centre. Having an art background myself, I would often talk to my students about their personal interests, then share artists and art works they may be interested in. For example, my students interested in ballerinas explored the works of Degas.

These experiences and conversations helped me see that my students were keen to explore STEAM concepts, aka Science, Technology, Engineering, Arts and Mathematics. I thought long and hard for quite a while, trying to develop a way to build on my students' interests in these areas so they moved between centres similar to the Walker Learning Approach, yet had more freedom in selecting what they wanted to do and explore. This is how KidzTek was formed.

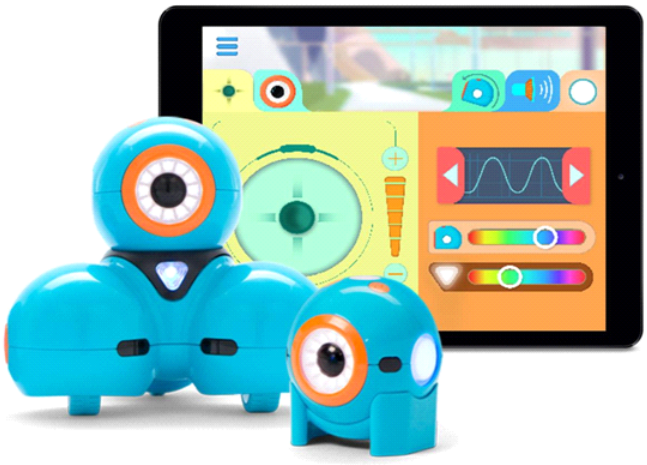
KidzTek

KidzTek was created primarily to expose my students to elements of STEAM. Unlike the Walker Learning Approach, the centres, or rather activities, don't necessarily include skills the students are learning or consolidating throughout the day or week; the activities actually reflect the students' interests on that particular day.

When I first introduced KidzTek to my class last year, I asked my students if they knew what STEAM stood for. They didn't know, which is what I expected. I wrote the letters down my whiteboard, with the corresponding learning area represented by each letter. I asked the same question again. After many guesses and prompting, my students were eventually able to identify most of the words. Engineering was the one they stumbled on. We listed the types of activities they could undertake in each area, and, not surprisingly, many of the activities reflected those already at centres for Investigations. As a result of this, and as a means of providing my students with new opportunities, I listed a few additional activities. These included coding, stop motion, K'Nex, marble runs and Rube Goldberg machines, which were actually part of my initial brainstorm, as documented in my KidzTek blog (http://kidztek.global2.vic.edu.au/2014/11/10/stepone/).

Play is the highest form of research.

Albert Einstein

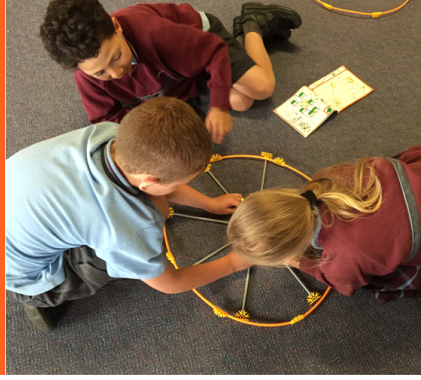


My students were really interested in knowing more about these activities, as they had heard about some of them, but hadn't seen or explored them. I thought about talking through each activity, so my students had a clearer picture of what each was about, but decided not to. I felt that this would have impacted on my students constructing their own learning and collaborating with their peers to work through any challenges. I did, however, share a short clip with them, Audri's Rube Goldberg Monster Trap (https://youtu.be/0uDDEEHDf1Y), as way to reinforce design, construction, prediction, evaluation, perseverance, resilience, failure, success and reflection. The clip was a big hit and, you guessed it, my class was buzzing with excitement and enthusiasm to explore, create, learn and share.

2014

During term four, when I introduced KidzTek to my class, I ran the session weekly – each Friday afternoon. My students were always excited to participate, often coming back inside from their lunch break with a clear intent regarding what they were going to do.

Earlier in the year, I set up a class blog, after being contacted by an app developer. The app, Easy Blog Jr, allows you and your students to post text, photos and videos directly to your blog with only a few taps. Please refer to my posts for more information (http://kidscollaborate.global2.vic.edu.au/category/blogging/). I wanted to capture my students' learning and thinking during

KidzTek, so I decided to link the app to my KidzTek blog too. Each week, my students would ask for my iPad, take a photo, voice record a recount or reflection, show me for approval, then press submit. I loved the way my students were becoming global authors. They would often play back their recording and record themselves again if they felt their message wasn't clear, prior to sharing their post with me. I embraced this independence and reflection, and encouraged my students' ability to take control of their learning.

Last year, one young boy, who transitioned to my class during term four from my school's onsite support (specialist) centre, was the first student to create a closed circuit that lit a globe and played music. Through perseverance, he also made the 'helicopter blade' fly. You can't even begin to imagine how proud he felt when the class cheered on his effort and achievement.

Two students decided to explore some coding apps on my iPad. During the following session, one of these students connected my iPad to the Apple tv and began teaching a larger group of students who wanted to learn how to code. She demonstrated what to do, then passed my iPad around, watching the tv screen and providing support. Coding became quite popular after that session, with around 10 students gathering each week to learn to code together. The amazing thing about this is that I did not show any of my students how to code. I only showed them where the coding apps were located on my iPad.

This experience, or rather program, has shown me "what is possible". I have seen my students welcome STEAM concepts and thrive on exploring them further, on their terms, at their pace.

2015

This year I have introduced KidzTek to my new class. They, too, have welcomed the experience. Surprisingly, though, they have different areas of interests. Maker spaces and tinkering is more their style. My classroom is bursting with boxes and old circuit boards. My students' parents are amazing in topping up our supplies. Active imaginations also run high. One student pulled apart a circuit board and used the parts to create a remote, similar to the one in the movie 'Click'. It was great when his peers and family played along with his 'invention' and commands, e.g. pause, rewind, fast forward. Another student made night vision goggles, whilst another made a Transformer.

I've shared with my class my interest in robotics. I have ordered 'Dash and Dot' (https://www.makewonder.com/) and cannot wait for them to arrive so my students can have a play. In the meantime, I am setting up some 'simple robots' kits. These include materials similar to those I used during a workshop I attended at the FutureSchools Expo in March. Shortly after working with Daniel Green and Dr Sarah Boyd from the Macquarie ICT Innovations Centre, I came across a kit posted by Tinkerlab (http://tinkerlab.com/) on Facebook – Make Your Own Tinker Box & Build Robots (http://www.kcedventures.com/blog/make-your-own-tinker-box-build-robots-stem-project-for-kids). This has been my inspiration. It contains many items you can purchase from stores like Jaycar, e.g. springs, wires, globes, magnets, plastic ties, etc. Mine also includes battery holders, hobby motors and insulation tape. I'm looking to add copper wire too. I cannot wait to see what my students create when I introduce them!

KidzTek
Explore Create Learn Share

I haven't been able to run KidzTek sessions as frequently with my class this year, due to timetable constraints. This, however, hasn't affected my students' enthusiasm. If anything, it is feeding it. Interestingly, my students from last year have asked if I plan to run KidzTek as a lunch time club. I am definitely considering this, as clearly there is a need to provide students, particularly primary aged students, with opportunities to explore STEAM concepts. Imagine the possibilities these experiences will create!

For more information about Michelle's KidzTek program, please refer to her KidzTek blog (www.kidztek.global2.vic.edu.au).

For information about how Michelle integrates iPads in her learning and teaching program, please visit her personal blog (www.kidscollaborate.global2.vic.edu.au).

Jayne Boon's

APP SMASH

Resources for teaching the Australian Curriculum: Technologies

CODING IS COOL!

Preparing children for the future by teaching them the necessary thinking skills and the ability to create their own code early in their schooling has never been so important. Not only is coding cool, its also a huge amount of fun for teachers and students and also for getting parents involved. Schools with iPad programs can take advantage of the many free apps available to use with their students and through Apples VPP options, even those with a cost involved are often available at half price to schools buying 20 or more copies of the app. The apps make learning coding fun and students can begin learning the concepts of coding before they can even read and write because the apps are often intuitive and visually appealing. Most iOS apps concentrate on captivating the imagination of younger learners and teaching them the necessary skills of coding and computational thinking at an early age. I've had huge a huge amount of fun exploring these apps working out which ones I liked and how we could use them with our students and to fulfil Australian National Curriculum requirement. Many hours of fun creating rather than consuming!

Daisy the Dinosaur – Free
https://itunes.apple.com/us/app/daisy-the-dinosaur/id490514278?mt=8
Children have fun learning to program Daisy the cute green dinosaur but at the same time learn the fundamentals of loops and conditional formatting. Young learners simply drag and drop into their program into Daisy's world to make her move. The app encourages children to think analytically and problem solve from an early age. Teachers and parents can create programming challenges to engage and excite. **Grades: Prep+**


Tynker – Free: https://itunes.apple.com/au/app/tynker-learn-programming-visual/id805869467?mt=8
Tynker for Schools – $7.49: https://itunes.apple.com/au/app/tynker-for-schools-learn-programming/id853501339?mt=8
Codey's Quest, Lost in Space, Dragon Journey, Lazer Racer – Tynker puzzles increase in complexity as students progress throughout the app. In app purchases are offered for a variety of journeys. Students learn the skills of pattern recognition, problem solving, algorithmic thinking and elementary debugging. More complicated concepts of sequencing and conditional logic are also introduced as the various journeys and adventures progress. Tynker for Schools includes all puzzles and characters and links to the Tynker web interface allowing students to access projects from web or iPad and teachers can create and manage their classrooms and review progress as well as showcasing individual student work. **Grades: 3++**

Scratch Jr – Free
https://itunes.apple.com/au/app/scratchjr/id895485086?mt=8
Scratch Jr complements the familiar Scratch online blocks based programming language. Its simpler interface has been especially redesigned for younger students so they can easily snap together the programming blocks to make characters move, jump, dance and sing and in doing so they learn problem solving skills. **Grades: 1-3**

Cargobot – Free : https://itunes.apple.com/au/app/cargo-bot/id519690804?mt=8
Cargobot was created using Codea! It's engaging and challenging app where students are introduced to programming skills as they work their way through a series of tutorials to learn the features and controls used in the app before moving onto the five levels of play. They learn to control a robotic arm, moving it into the required locations in as few steps as possible or risk crashing the crane into a wall! **Grades: 5-12**

Hopscotch – Free

https://itunes.apple.com/au/app/hopscotch-programming-made/id617098629?mt=8

Hopscotch School Edition $12.99

Students learn to program Hopscotch monsters and creatures to move, dance and interact using loops, variables and conditionals. In app purchases are offered for further characters. Hopscotch is available as a School edition with all characters available. **Grades:2-8**

Codecademy: Hour of Code – free

https://itunes.apple.com/au/app/codecademy-code-hour/id762950096?mt=8

Codecademy: Hour of Code is a simple introduction to HTML and Javascript coding in small bitesize chunks with the aim of getting students started and then moving onto the Codecademy website. **Grades: 6+**

Codea – $18.99

https://itunes.apple.com/us/app/codify/id439571171?ls=1&mt=8 $14.99

The most expensive of the coding apps at the moment but also one of the best and most challenging for students. Having experience of other coding apps would be useful before using this app. Codea is an easy to use visual coding app based on Lua programming language. It's ideal for iPads and students can touch their code, tapping on colours and sounds to make changes. They can use existing code to learn from and or create their own code and develop their own apps. Cargobot was created using Codea. **Grades: 4+**

My Robot Friend – $3.99

https://itunes.apple.com/au/app/my-robot-friend/id555121423?mt=8

Students learn to program their robot through a series of mazes to a treasure chest and receive rewards as they complete each level. They are able to unlock mini-games, earning extra costumes and accessories along the way. Students are progressively challenged by arch nemesis Fat Cat who consumes cheese, burps and attempts to thwart their every move! **Grades: 3+**

Move the Turtle – $3.79

https://itunes.apple.com/au/app/move-turtle.-programming-for/id509013878?mt=8

Move the Turtle introduces young learners to the basics of programming using graphical commands in a colourful environment. They earn stars to progress to the next chapter and learn to build their own programs using commands such as move, turn, repeat and conditions to determine the direction of the turtle. Students are able to see their programming error and make changes to make the program run correctly. **Grades: 4-6+**

Robozzle – Free

https://itunes.apple.com/us/app/robozzle/id350729261?mt=8

The objective is to teach the spaceship to collect all the stars on the game board. Students instruct the spaceship to turn left or right, change the colour of blocks. Difficulty varies from quite simple to very difficult. Robozzle is a free app but comes with in app purchases to upgrade and purchase more credits. **Grades: 6+**

Kodable – Free

https://itunes.apple.com/au/app/kodable/id577673067?mt=8

Kodable free introduces the concepts of coding and logic, if and then statements and loops. Guided access is available to ensure that students remain on task and concentrate on the coding aspect of the app. New concepts are introduced in short video tutorials and each stage builds on the knowledge and understanding from the previous level. The first level 'Smeeborg' is included in the free version along with the written curriculum. In app purchases are available for further levels – Function Junction, Bugs Below and Fuzzy Fun. **Age range: 7+**

TO GAME OR NOT TO GAME in early childhood settings

Biography

Kim is an early childhood educator with over fifteen years' experience. She has been a kindergarten director, manager of an early learning centre and a sessional TAFE trainer. A drive to provide best practice curriculum for children and families has always been an integral part of her philosophy. Currently she is expanding her skillset by completing an Associate Degree in Professional Writing and Editing. One day she hopes to be a published novelist.

Abstract

Working digital technologies are becoming more widely used in early childhood settings. This article provides an early childhood educator's perspective on the some of the benefits of introducing this learning area into their play based curriculum.

Charlie stood back aloofly and watched his classmates play and chat. In his eyes, he had a longing to join but was unsure how to initiate a friendship. As his educator, I gently guided his interactions but he refused my help. He was not ready. He needed to find his own outlet. Puzzles were an interest which he completed with expertise on his own. Reflecting on the curriculum, I began to realise that the experiences that were available were not meeting his needs. Then computers were introduced into the curriculum. Immediately, like a bee to honey, Charlie gravitated to the computers and that is where he began to shine. What Charlie went on to teach me was that you should never underestimate a child's capability with technology. The purpose of this article is to provide a practitioner's perspective on the use of working digital technologies within an early childhood setting.

As a kindergarten educator, I have always tried to stay true to traditional forms of play based learning in the early childhood setting, such as: art experiences, cause and effect equipment, open-ended experiences like the sandpit, and pretend play. On entering an early childhood setting, one can immediately see

Kim Lousada
Chisholm Institute

the types of experiences that have been offered to children for the past one hundred years. You will find children visually recreating their imagination at the painting easel, problem solving while trying to put a puzzle back together, structuring a block tower to make sure it doesn't fall over, climbing outside and making pretend chocolate cakes in the sandpit. Children in the past have also had access to non-working technologies through pretend play. Often a pretend play post office will be set up with an old non-working computer and a phone will be in the make believe home corner.

Maria Montessori (1965) believed

> The functions to be established by the child fall into two groups: (1) the motor functions by which he is to secure his balance and learn to walk, and coordinate his movements; (2) the sensory functions through which, receiving sensations from his environment, he lays the foundations of his intelligence by a continual exercise of observation, comparison and judgement. In this way he gradually comes to be acquainted with his environment and to develop his intelligence.

Dr Montessori provided life-supporting environments for the children who attended her original schools, the *Casa dei Bambini*. In our current early childhood settings, are we providing life-supporting environments in regards to working digital technologies? Or are we in danger of neglecting the needs of a generation who will not only be immersed in various forms of technology but will also have only ever known a society driven by digital technology?

In more recent years, a range of technologies have been slowly introduced into early childhood settings. The iPad helps educators and children engage in problem solving and project based experiences. When children ask those tricky questions that I don't have an answer to, together we can sit down and search for the answer. A question we ask is *"How can we find out?"* The answer is often *"Look on the computer."* The iPad is frequently used as a research tool to discover answers to questions like *"What do worms and snails eat? What is the white stuff inside the large ice block?"* Immediately we can provide the answers for children, as well as set up interactive experiences where they can watch educational videos to help inform them. A part of intentional teaching is educating the children to be respectful with any form of technology. The children are asked to keep it on a particular webpage. They are very good at swiping! They often need reminders.

From my experience, I find I am less likely to play CDs, instead reaching for the iPad to play a song from YouTube at group time. This enables the children to request songs they are currently interested in. As an educator, it also gives immediate access to songs that you might not have on CD or, dare I say it, cassette. The children especially love watching the animated Wonky Donkey. Incorporating technology and puppets is a great way to appeal to a child's love of language and dramatic arts. In the past I have used animated puppet versions of books like *'The Green Sheep'* and physical puppets to help children learn how to read. I have used fractal art animation to increase children's attention spans and to help calm their emotions.

Other ways I have used a range of technologies include communicating a child's development within the curriculum to parents; for example, emailing newsletters and learning stories, as well as showing photos from the day on a digital photo frame.

How did I come to a place in my teaching where I was comfortable to use a range of working digital technologies? I have always run an open ended, play based curriculum with a small amount of structured activities like puzzles and games. It is an indoor/outdoor environment with flexible meal times and a curriculum mixed with emergent interest based experiences and intentionally educator planned experiences based on children's needs and wants. Quite a few years ago I had a family donate a computer. At first I was hesitant to introduce a computer into the early childhood service but I wanted to have a collaborative partnership with the family, so I thought why not try it. What happened truly surprised me.

The computer was set up and a group of children gathered around the new shiny thing. It was in fourth term and I felt it would be a good extension of their learning. The basic skills the children would be learning included mouse control incorporating eye to hand co-ordination, cause and effect games, problem solving, basic mathematical skills, expanding concentration, attention to task, sharing space and turn taking. It proved to be a very popular experience. Do we in traditional ways of thinking in early childhood dismiss technology and view it suspiciously? If you have a strong pedagogy based on best practice, then I believe you need to observe the children being thoroughly immersed and engaged in this experience, and consequently plan and provide appropriately.

Adult led interactions were still required throughout this experience. I began to notice that the children benefitted from guidance with turn taking. A timer was implemented, as well as a numbered table for the children's names. The children were encouraged to write their own names on the table. This learning opportunity provided a chance to extend the acquisition of early literacy and numeracy, as well as the social convention of turn taking in a structured activity. All are vital skills required for life and for school, which the children would be attending in the near future.

More recently, in a different kindergarten setting, the children engaged with two computers side by side. Once again, they had to write their name on a list for their turn. I would, of

course, assist the children who were still developing this skill. A timer was installed and time limits were negotiated. If a child tended to spend a bit too much time engaged at this experience, I would redirect them to another area. It is the same strategy you would employ for the child who spends all of their time in the sandpit or at the box collage area. We often get worried about too much screen time but we also have to ask ourselves are we being fair about our analysis of usage in other areas in the environment? Often we value the learning that occurs at the box collage table more than that which occurs at the computer.

Once the children became familiar with the technology, they were able to discover the next level of games, exceeding their current capabilities. The group of four year olds called me over and wanted me to show them how to play a new game. I am not a gamer but I gave it a go and tried to work out the basic commands. I left them with enough information for them to start playing. Within two days they had surpassed my abilities, putting me to shame. The game they had chosen was for eight year olds. I had four year olds teaching five year olds how to play this advanced game.

Here's the thing I learnt through both experiences: on both occasions, two socially withdrawn children began to come out of their shells. Charlie began to engage with this experience and his confidence grew daily. He was incredibly skilled with the computer and became a true leader, helping other children complete tasks with the computer. Charlie would assist the children to navigate the mouse, showing them how to get to particular games and then how to move through the game. Children began to call on Charlie to help them. The children knew. They could see the expertise in one so young. Charlie began to move past his shyness. This was evident as he started to approach educators and ask for help, he became vocal in his play outside and he continued developing the connections he had made at the computer with his peers at other play experiences.

The sceptic had turned believer, my hesitation had disappeared. All because I stayed open and let the children show me the way with technology. In the future, I would like to incorporate more forms of technologies and give the children a stronger sense of agency with this equipment. For example, it would be great for the children to have their own digital cameras and video recorders. They could film and take photos of their creations – dances, wooden block buildings, rivers in the sandpit or anything that caught their imagination. New software is developed all the time to enhance children's education. Incorporating some of these programs (for example, making digital puppets) would also be of benefit to the children.

I feel that technologies will have a larger part to play in early childhood settings in the coming years. Children from young ages come into our settings well versed in these forms of communication. It will be up to us as a profession to create innovative ways to utilise these technologies, to learn how to meet the children's diverse needs and interests in this burgeoning area.

References

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Invent to Learn

BOOK REVIEW

Book review: ***Invent to Learn: Making, Tinkering and Engineering in the Classroom*** by Sylvia Libow Martinez and Gary Stager, Constructing Modern Knowledge Press, 2013

Reviewed by Kerrie Batch

Kerri Batch (B.Ed., M.Ed., M.A.C.E., M.A.C.E.L.) is currently the Director of Teaching and Learning at Aitken College, a low-fee Uniting Church P-12 school in the suburban outskirts of Melbourne. She has taught in a wide variety of subject areas in a career of over 25 years, including English, Literature, Humanities, Music, Religion and Society, and Integrated Studies. A current area of her specialisation is the capacity-building of teachers, particularly in helping teachers to use ICT in engaging and effective ways in all subject areas. Her hobbies include a range of craft and design areas, and buying gadgets.

This book is incredibly inspiring – it far surpassed all of my expectations. As an experienced teacher who is new to teaching technology and design, it's exactly what I needed to give me hundreds of ideas on how I can meet the needs of my students and shape my school's new, Australian-curriculum-compliant design and digital curriculum to be thrilling and rewarding for our students. Through this book, though, Martinez and Stager have also managed to get me to rethink my approach to teaching English, offering lots of sensible advice on how to tap into the innate creativity of children, which I've found to be both exciting and unexpected.

At first glance, the book is rather unassuming. The cover is monochromatic and the cover art informal. It sat on my bedside for quite a while before I got around to opening it. But once I did start reading – Wow! It packed a punch. The primary contention of Invent to Learn is that all children should have access to a makerspace in order to develop their creativity. The first chapter, "An Insanely Brief and Incomplete History of Making", sets the scene with an entertaining historical overview of invention. As the book progresses, it becomes increasingly practical, honing in on all of the practicalities that teachers need information on in order to implement change in their programs. There are chapters on the "stuff" you need to start making and tinkering; rationales to use when persuading decision makers to give you time/space/money; extensive information on resources to suit all kinds of schools, budgets and age groups; ideas about what kinds of projects will work best; how to start changing the mindsets of teachers to help them become co-learners in projects. There are lots and lots of examples and anecdotes used throughout to bring the ideas to life and open up a world of possibilities in the reader's mind.

While reading the book, I was frequently drawn to the internet to find out how soon I could get my hands on some of the materials Martinez and Stager refer to: for my own play, for my preschool age nephews, and for my secondary school students. I have a cardboard construction kit ordered, I'm investigating robotics options for early primary students and I'm rethinking the assessment tasks I've set for my Year 7 students in Scratch and Robotics to make them more open-ended. I found the book to be incredibly empowering, as it has given me the confidence and the justification to start playing and experimenting with materials and projects with a much greater sense of freedom. I can't wait for my next faculty meeting, so I can share some of my new (even greater) enthusiasm about what we're working on with students, and how important it is to provide them with opportunities to let their imaginations loose.

This book is a must-read, in my opinion, for all technology, design and IT teachers. I'll be recommending it to my school principal, and I can see myself referring to it for several years for further information about project ideas and resources, as well as using it as a touchstone for my educational philosophy. Unlike many of the books I've bought for my professional library, this one will definitely be well used.

inventtolearn.com is the accompanying website, which keeps the lists of resources up to date – essential in an area as fast-changing as this. You can also find the complete contents description there to help you decide that *you need this book!* If you're as impressed by the book as I am, you might also be interested in knowing that Gary Stager is a keynote speaker and a design space creator at the Vivid Festival in Sydney in May 2015, and Sylvia Martinez is presenting a keynote at Edutech in Brisbane in June.

(Note that I have no commercial interest in the sales of this book, nor am I in any way affiliaited with Martinez, Stager, the Vivid Festival or Edutech. I am just really impressed!)

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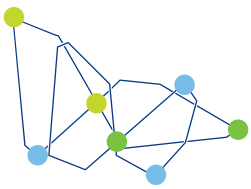

Digital Learning and Teaching
Victoria