Digital Learning and Teaching
Victoria

Contents

Editorial

Dr Michael Phillips and Dr Michael Henderson

Editors
Faculty of Education, Monash University

Welcome to our second edition of the DLTV journal which marks the end of the first year of our new professional association. Our membership base has continued to grow and is wide ranging. DLTV members now include a diverse variety of experience: "from early years to careers" and "pre-service to Principals". In addition to teachers working in education settings, DLTV also has strong connections with leaders from other contexts including enterprise and government. With such a broad membership base, DLTV has been working hard to make strong and meaningful connections for all members and interest groups.

Connection has been a strong theme in many conferences and publications in our field. Increased attention on "personal learning networks" (PLNs), "learning communities" and "massive open online courses" (MOOCs) have highlighted the value of teachers and students being connected in ways that simply were not possible a decade ago. In turn, researchers are now beginning to pay attention the ways in which these new connections might shape learning for teachers and students alike.

This edition of the DLTV journal celebrates our connections locally, nationally and internationally. In doing so, we hope to provide members with insights into local practices and opportunities for your own professional development in 2015. This might take the form of trialling some of the new classroom based apps reviewed in Rebecca Davies' "App Smash" article or sinking your teeth into data-logging with Suzanne Kenneally. Also, don't forget that in 2015 there will be many face-to-face and online professional learning opportunities, some of which have been listed in Mark Richardson's article.

All teachers in Australia are aware of the new National Curriculum and the challenges and opportunities involved in its implementation. DLTV is lucky to have a number of people who have been closely involved in shaping the Digital Technologies curriculum and Nick Reynolds provides you all with an update on the developments in this area. Paula Christopherson from the VCAA also provides some fantastic insights into the development of the new National Curriculum and if you are teaching VCE IT in 2015, her article is a must read.

We were thrilled with the success of the inaugural DLTV Conference in July. Under the guidance of Mel Cashen, the conference allowed Victorian teachers to share their passions and proficiency and make invaluable connections that have already enhanced Victorian teachers' use of digital technologies. In addition to Mel's article in this edition which introduces her highlights from the conference, we are delighted to also be able to bring you two papers from this event: Dan Donahoo's "Institute of the Modern Learner" and Justin Bokor and Eleanore Bridier's "Fuelling the Desire to Learn".

In addition to the DLTV conference, it was wonderful to see a large Victorian representation at the ACEC2014 conference in Adelaide. Over four days in October we were treated to dozens of outstanding examples of innovative and thoughtful implementation of digital technologies in a range of contexts. It was fabulous to see so many Victorian teachers presenting their expertise on a national stage. For those DLTV members who were not able to make it to Adelaide, we have two great papers from this conference to share with you in this edition: "Students who are new to programming: What ideas to they have" by Roland Gesthuizen and Paul Chandler; "Evaluating a 1-to-1 iPad Project: Beyond rose coloured glasses" by Brendon Willocks and Petrea Redmond.

Internationally, DLTV is affiliated with the International Society for Technology in Education (ISTE). In this edition of the DLTV journal we present two ISTE articles, one examining the 'maker' movement and the other an interview with Sal Khan from the Khan Academy. We hope that these two articles provide you with a glimpse of some of the ideas and issues being discussed in international contexts.

We are also very excited to announce a new DLTV Journal connection. Jo Bird has kindly agreed to accept our invitation to be our first Associate Editor (Early Years). In this role, Jo will be focusing on examples of digital technology use in Early Years settings and we would like to encourage any Early Years educators who are interested in contributing to the Journal to contact Jo at publications@dltv.vic.edu.au.

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. An example of Jo's work can be found in this edition in her article co-authored with Susan Edwards.

Finally, we would like to wish all members a safe, relaxing and enjoyable holiday break. If you are looking for book to read over the summer, you might like to consider danah boyd's "It's complicated". Before you rush out to buy your copy, you should read Aaron Davis' review in which he argues danah's book offers a valuable starting point for a conversation in which all educators can consider the most important connections they have – those with their students.

From the President

Dr Donna Gronn

As we come to the end of a huge first year at DLTV, I would personally like to thank so many people. You, the members, who have come along with us for the ride. 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.

The Volunteer Committee of Management, especially the Executive who are so willing to give of themselves to create, develop and support the various initiatives and to advocate for and support our educators across Victoria. Your time and commitment is greatly valued.

The fabulous team we have in the DLTV office. A huge thank you to them all for the work they do in conjunction with the Committee of Management always with our members in mind.

2014 Awards

2014 has been a year of establishment and we are proud to say has also produced some awards for DLTV from the Australian Professional Teachers Association (APTA) from whom we received an *Innovative Association Award* and our newest life member Paula Christophersen received the highest individual APTA honor of the *Dorothy Hoddinott Medal for Outstanding Lifetime Achievement.*

APTA Awards

The Innovative Association Award 2014

Digital Learning and Teaching Victoria (DLTV) is the recipient of The Innovative Association Award 2014. DLTV was awarded with this prestigious Australian Professional Teacher's Association (APTA) Award on Saturday, November 22, accepted on behalf of DLTV by Dr Donna Gronn, DLTV President.

This Award is also a reflection of the innovation of our Members, with whom we share this accolade.

Dorothy Hoddinott Medal for Outstanding Lifetime Achievement for 2014

Paula Christophersen has been 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.

Paula's outstanding achievements over the years have now been nationally recognised. She has been awarded The Dorothy Hoddinott Medal for Outstanding Lifetime Achievement for 2014, and deservedly so. She has given tirelessly of herself to inspire teachers into 21st Century teaching.

Thank you Paula, for your continued contribution to the teaching profession, being innovative, accessible and for your leadership over many outstanding years.

DLTV Awards

The 2014 DLTV Awards have been announced and will be awarded at our conference in 2015. Congratulations to **Celia Coffa**, our 2014 DLTV Educator of the Year Award and **Dr Therese Keane**, our 2014 DLTV Outstanding Leader of the Year Award.

Celia Coffa - 2014 DLTV/ACCE Educator of the Year Award.

Celia is a well known and leading member of the Educational Technology community and a dedicated primary teacher who practices ideas she learns from her PLN and Edtech community into her classroom. She has been a driving force in the uptake of technology at her own school and other Catholic schools through her role as ICON coach.

Celia has brought out the best in her students, both in their academic and social-emotional learning via engaging information technology projects. Celia enjoys hearing what others have to say, takes on board new ideas and adds value to learning when she makes it fit for her students.

Dr Therese Keane - 2014 DLTV/ACCE Outstanding Leader of the Year Award.

Therese is a well-recognised and outstanding educator and leader in the field of ICT. Her recognised expertise in the field, diversity of ICT interests and her own proven ability to enthuse fellow leaders and educators contributes to her state, national and international reputation.

Therese always generously shares her expertise with ICT and IT teachers, amid her busy schedule at Swinburne University of Technology, through her extensive writings and professional development programs. She professionally contributes to the advancement of ICT education at state, national and international levels.

Resources

Digital Technologies Curriculum

DLTV is creating resources for the new Digi Tech Curriculum. The first of these resources – 2 sets of info graphics and videos defining some terms in the Digi Tech Curriculum can be accessed at

http://www.dltv.vic.edu.au/resources-australian-curriculum-digital-technologies. These resources were created with the financial support of ACCE

DLTV Journal

Our DLTV Journal, which is published twice each year, is going from strength to strength with another bumper issue. The journal can be downloaded as individual PDF articles or the full document in PDF or viewed online as a flip book.

It can be accessed at:

https://dltv.vic.edu.au/publications/journals

Please submit ideas and articles to our editors at publications@dltv.vic.edu.au. In September we ran a webinar titled: So you want to present or write for Digital Learning & Teaching Victoria? This was very valuable and the recording is now on the website for anyone who is anxious about writing for a journal. You all have great stories to tell. Please share them.

Professional Learning

As well as our very successful two-day conference in July, DLTV have run a range of professional learning opportunities for teachers and leaders from early years to careers.

We already have some professional learning booked for 2015, but please contact us if you have any ideas for professional learning in 2015. We are happy to consider any options you would like to suggest and have a wide pool of educators who are willing to share their knowledge and skill with others.

Keep an eye on the DLTV Website for all upcoming DIgi Tech and VCE/VET opportunities.

Student events

We have also continued with student events with a staggering 881 students from primary and secondary schools across Victoria attending Swinburne University for the 2014 DLTV Digital Learning Showcase. We also look forward to applications for the 2015 Work IT out program in which students will have the opportunity to work alongside industry

professionals to draw upon their experience and knowledge and gain insight into the diversity of ICT careers. The program provides a more rewarding experience than traditional work experience due to the students' higher ICT skill set and the active involvement of mentors.

Industry placements offer students an opportunity to gain skills in order to be job-ready, making that transition from study to an ICT career. Both student and industry will gain an invaluable learning experience and enhance the skilled workforce of the future. Please check the DLTV website for further details.

Looking forward to 2015

2015 Year of the pre-service teacher

DLTV has designated 2015 as the year of the Pre-Service Teacher. PSTs are able to have a free membership to DLTV for 2015. This membership allows one person to access an extensive range of professional learning activities and events at membership rates as well as access to publications, digital content, learning networks, competitions, awards and much more. You must complete the membership form below before continuing. Please attach proof of status, such as a student ID.

Please go the DLTV website and take out your FREE PST Membership.

Professional Learning in 2015

Planning for 2015 is well underway. Please go the DLTV website for details of Professional Learning Opportunities for 2015.

DLTV Hosts TeachMeet Melbourne@the Pub!

Showing our continued support for the TeachMeet Melbourne and the sessions around Victoria, DLTV is hosting the first TeachMeet of 2015. The event is on Saturday, 7 February 2015 - 2:00pm to 4:00pm. Please go to the TeachMeet Melbourne Wiki to register to attend or present and for venue details.

I look forward to meeting more members in 2015 and to hearing from you as to how we can all assist each other to advocate for digital technologies across all facets of the education system.

Enjoy IT
Donna

DLTV Professional Learning Highlights 2014/15:
Isn't it all on YouTube anyway?

The top ten reasons why DLTV adds value to your professional learning.

Mark Richardson
Professional Learning Manager - DLTV

In the age of the connected educator, why does DLTV even need to offer professional learning? Surely, if you want to find out how to use an app, see some innovative classroom programs in action or read some educational research can't you find it all there on the web? If you want to share your practice, don't you just blog about it? If you have a query won't your Twitter followers know the answer? The answer is obviously yes to all of these. However, it is only a partial answer as to what meets the professional learning needs of an educator. DLTV is all about value adding to your professional learning. It's about adding a vibrant, informed, local layer to all those benefits of using social networking as a professional learning tool.

What then are the top ten advantages of adding DLTV professional learning events to your current social networking and Personal Learning Network?

1 Be part of a vibrant learning community.

DLTV is the Subject Matter Expert for all those teaching IT in all Victorian schools. Access the information, professional learning support and resources that you or your school needs to implement digital teaching and learning from P-12. The DLTV office staff are always available to answer any requests by members. Just ring or email us on 9349 3733 or office@dltv.vic.edu.au. The DLTV Committee of Management has a wide membership who work in schools, universities and the offices of DEECD, CEO and AISV. If the office can't assist you with your enquiry then the DLTV CoM can! As a valued member, DLTV is there to answer your queries and advocate for your needs in digital teaching and learning.

DLTV has a membership category to suit your needs, Individual, Smaller School, Larger School, Institutional / Corporate, Casual Relief Teacher, Retired Teacher and

Technician. DLTV has named 2015 The Year of the Pre-Service Teacher, membership is free for this category and we have three exciting Pre-Service Conferences planned in 2015.

See http://www.dltv.vic.edu.au/membership for the membership category to suit you.

2 Learn and interact in a comprehensive program of 50 professional learning events in 2015.

The 2015 PL program will meet the needs of all DLTV members and their schools. Copies of the two page DLTV PL 2015 planner has already been sent to all members and schools. [The 2015 PL Planner is also published in this journal]. These events for 2015, complete with their abstracts, are currently being placed on the DLTV website. Bookings for all term one events will be open as soon as these events are placed online. For events later in the year you can register your interest now by emailing us at office@dltv.vic.edu.au. This comprehensive PL program has been published before the start of the 2015 school year, so that teachers and schools can plan their professional learning activities well in advance and also put allocations in their PL budgets before the new year starts. If you haven't planned out the DLTV professional learning events you will attend next year, do so now!

Don't forget the Conference either. It will most likely be mid year [dates and venue announced soon] with registration fees being similar to those of 2014.

3 Access the content, activities and strategies that you will need to lead curriculum implementation and how to teach the Digital Technologies curriculum.

[Prep to 10 teachers].

Develop an action plan for your classroom and school that will lead the implementation of this new curriculum in a supported and scaffolded way. Digital Technologies can be taught in Victoria schools from 2015, with full implementation to occur in all schools by the start of the 2017 school year. Don't leave DigiTech implementation at your school to the last minute! Get on board in 2015 and implement DigiTech at your school in a structured and planned way. DLTV has planned three distinct models of Digital Technologies Professional Learning in 2015. There will be a model to suit you and your school's needs.

The first is The DigiTech Ready Certificate Level 1, a 20 hour blended learning module for those who have the responsibility of leading curriculum change in their schools. The module has an action learning focus spread over a term. It has asynchronous and synchonous online sessions combined with two days of face to face sessions. The DigiTech Ready Certificate Level 1 will equip participants with all the skills and support to not only start teaching Digital Technologies in their schools, but will also provide them with resources so that they can support colleagues as they start teaching Digital Technologies too.

The second model is the DigiTech Ready Bootcamp module. This is a one day face to face event crammed full of DigiTech activities for primary and secondary teachers. Participants will be able to start teaching aspects of Digital Technologies as soon as they get back to their classroom!

The third model is DigiTech Ready Leadership module. This is a face to face, one day seminar for school leaders with responsibility for whole school curriculum and infrastructure planning. DLTV will also be support Digital Technologies curriculum implementation by the continuing development of classroom resources, [infographics and videos], by DLTV in 2015.

4 If you teach VCE IT or VCE VET ICT or IDM, get the direction, support, and resources you need, when you need it

If you are a teacher of these important year 11 and 12 subjects, you will already know how important DLTV professional learning is! In 2015 DLTV will continue to organise VCE IT and VCE VET ICT or IDM forums at the beginning and of the year, a dedicated Annual Conference stream and DLTV practice exams. With a new Study Design for VCE IT commencing in 2016, DLTV will actively be assisting teachers in preparing for this new content and approaches in 2015. Not only will this be covered in the forums and the conference streams, but DLTV will also be preparing a comprehensive set of resources for teachers and schools to purchase.

5 Choose the professional learning delivery mode that suits you.

DLTV offers a wide variety of modes of delivery for professional learning. These include face to face workshops, webinars, school study tours, regional conferences, videoconferencing, blended learning modules, as well as the Annual Conference.

6 Choose the professional learning session time that suits you.

Professional learning sessions are being offered variety of times, so to better suit the needs is members. There are face to face sessions and conferences being offered during term time, but also events in school holidays and on Saturdays. Online sessions are always later afternoon after teaching programs finish.

7 Be part of a collegiate group.

DLTV School and Corporate / Institutional memberships have changed for 2015, so that they now include all those employed in those organisations. With one school membership now all staff can attend DLTV at member rates. With a member discount, schools with be able to send more teachers to more events. With teams of educators attending from the one school institution, there is real collegiality and sharing. This is a highly effective way of making professional learning "stick" in your workplace!

8 Build or add to your own Personal Learning Network through people you meet and interact with at DLTV events.

In the 21st century we all need PLNs. An online global network with something like Twitter is great, but so is a local face to face network! At every DLTV professional learning event you will meet like-minded educators to discuss, share and network with. These relationships will add to the depth and breadth of your PLN immensely and you will continue the conversations long after the event. DLTV is also looking at ways of establishing online forums to continue the learning after events that it runs in 2015.

9 Remember the V in DLTV stands for Victoria!

While the DLTV office is located in Carlton, which is the venue for many of our planned face to face events, it doesn't mean that we don't value members in outer suburbs, regional cities and rural areas. Over one third of our planned professional learning events for 2015 are online using Adobe Connect. This means all members can access them easily. However, we know that members like face to face sessions as well.

We are running three Regional Conferences in Geelong, Bendigo and Warrnambool in 2015. This means that teachers in the Central / North West and South West Regions will have their own regional conferences. DLTV has developed partnerships with schools and universities in these regions to organise these events. These events will both share local practice, as well as having input from outside each region. It is planned that DLTV professional learning networks will be formed at each of these conferences to continue the networking after each event.

In the remaining two regions of Victoria, [Gippsland and the North West] DLTV will set up Professional Learning Chapters in 2015. These will be online communities that will meet synchronously using video conferencing throughout the school year. This mode of delivery will be most useful in connecting these regions, which have members spread over great distances. Sessions will be organised and moderated by a DLTV representative.

10 Be part of an organisation that can assist your school in planning its professional learning programs for 21st Century teaching and learning.

Attending DLTV professional learning events may only take you part of the way! If your school requires a customised solution to its professional learning needs in 2015 then call or email us now. DLTV can assist with planning, presenters and resources.

These are the top ten reasons why you or your school should be a member of Digital Learning and Teaching Victoria in 2015. Join now and be a member from now until the end of 2015. Can you afford not to be a member? Join now http://www.dltv.vic.edu.au/membership

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https://www.dltv.vic.edu.au/events/2015-calendar-events

Digital Learning and Teaching Victoria

DIGITAL LEARNING AND TEACHING VICTORIA
Calendar of Events
www.dltv.vic.edu.au/events

PLEASE TURN OVER

2015

Jan	Feb	Mar	Apr	May	June
20 F2F104 Pre-Service Conference	**7** TM101 TeachMeet Melbourne	**3** OL105 Connecting the Dots 4 Post Primary Members	**8** F2F201 How to present for DLTV online / F2F202 How to present for DLTV face to face	**5** DT201 DigiTech Curriculum Ready 1 Level 1 Online session 1	**23** DT201 DigiTech Curriculum Ready 1 Level 1 Online session 2
23 F2F101 Leading Technologies in Secondary Schools	**10** OL101 Connecting the Dots 1 Rural and Regional Members	**5** OL106 21st Century Toolbox 2 Online Free to members	**9** F2F203 Issues in Secondary Technology Term 2	**14** ST201 Term 2 Schools Study Tour	
27 F2F102 Leading Technologies in Primary Schools	**17** OL102 Connecting the Dots 2 VCE and VCE VET Members	**12** OL107 21st Century Toolbox 3 Online Free to members	**10** F2F204 T1 Issues in Primary Technology Term 2	**26** DT201 DigiTech Curriculum Ready 1 Level 1 Day 2	

WorkITOut
Industry experience for Years 10 and 11 students. Experience an ICT career. Look out for application details.
www.dltv.vic.edu.au/students

	24 OL103 Connecting the Dots 3 Primary Members	**14** SC101 DigiTech by the Bay Conference – The Geelong College	**15** OL201 Competition PD 1 Online Free to members	

Look out for **Student Competitions**
• Tomorrow Sport • You're IT!
www.dltv.vic.edu.au/students

	26 OL104 21st Century Toolbox 1 Online Free to members	**17** ST101 Term 1 Study Tour	**21** DT201 DigiTech Curriculum Ready 1 Level 1 Day 1	
	27 F2F103 VCE Computing and VET ICT Forum	**19** OL108 21st Century Toolbox 4 Online Free to members	**22** OL202 Competition PD 2 Online Free to members	
		26 OL109 21st Century Toolbox 5 Online Free to members	**29** OL203 Competition PD 3 Online Free to members	

2015 DLTV CONFERENCE
Submit your Expressions of Interest to present
www.dltv.vic.edu.au/conference

VCE IT & VCE VET ICT
Look out for events
www.dltv.vic.edu.au/events and resources
www.dltv.vic.edu.au/resources

LOCATION BASED LEARNING
A practical hands-on session to how to use Web 2.0 Tools to enhance your next excursion.
www.dltv.vic.edu.au/events

REGIONAL CONFERENCES
• Geelong (14th March)
• Bendigo (Term 2)
• Warrnambool (Term 4)
www.dltv.vic.edu.au/events

DLTV Journal
The DLTV biannual journal provides relevant, quality articles for the professional knowledge and learning of DLTV members
www.dltv.vic.edu.au/publications
Want to contribute publications@dltv.vic.edu.au

T 03 9349 3733 **F** 03 9349 5356 **E** office@dltv.vic.edu.au
www.dltv.vic.edu.au

*This calendar of events is subject to change

Digital Learning and Teaching Victoria

DIGITAL LEARNING AND TEACHING VICTORIA
Calendar of Events
www.dltv.vic.edu.au/events

Jul

2 F2F301 Pre-Service Conference

7 DT301 DigiTech Curriculum Ready Bootcamp Series 1

9 F2F302 Issues in Secondary Technology Term 3

10 F2F303 Issues in Primary Technology Term 3

2015 DLTV CONFERENCE
Don't forget to register for the ultimate ICT in education conference in Australia!
www.dltv.vic.edu.au/conference

Aug

4 DT302 DigiTech Curriculum Ready 2 Level 1 Day 1

11 OL301 Best of DLTV Conference 2015 Session 1

13 DT303 Leadership and the DigiTech Curriculum

16 S301 VCE & VCE VET Exam Preparation

19 ST301 Schools Study Tour T3

20 OL302 Best of DLTV Conference 2015 Session 2

25 DT302 DigiTech Curriculum Ready 2 Level 1 Online session

Sept

1 OL303 Best of DLTV Conference 2015 Session 3

9 OL304 So you want to write or present for DLTV?

15 DT302 DigiTech Curriculum Ready 2 Level 1 Day 2

16 OL305 What PL is DLTV presenting in 2016?

30 DT401 DigiTech Curriculum Ready Bootcamp 2

DIGI TECH READY Certificate Series
Are you Digi Tech Ready? Join our certificate series to get ready! Book for Level 1 and Level 2 series
www.dltv.vic.edu.au/events

2015 Digital Learning Showcase
A day of activities for DLTV member school students. Digital technologies in the classroom. Learn about pathways to a career in ICT.
www.dltv.vic.edu.au/events

Oct

1 F2F401 Issues in Secondary Technology T4

2 F2F402 Issues in Primary Technology T4

13 ST 401 School Study Tour T4

15 DT402 DigiTech Curriculum Ready Level 2 Day 1

20 OL401 Best of DLTV Conference 2015 Session 4

27 DT302 DigiTech Curriculum Ready 2 Level 1 Online

Leadership & Digi Tech Forums
All schools will have to implement the Digi Tech curriculum by the end of 2016. Find out what leaders need to do to successfully implement the Digi Tech curriculum in their schools.
www.dltv.vic.edu.au/events

Hear from experts and other school leaders

T 03 9349 3733 F 03 9349 5356 E office@dltv.vic.edu.au
www.dltv.vic.edu.au

Nov

2 F2F405 Become a Connected Educator

5 DT402 DigiTech Curriculum Ready Level 2 Online

10 OL402 Best of the DLTV Conference 2015 Session 5

12 DT403 Leadership and the DigiTech Curriculum 2

26 DT402 DigiTech Curriculum Ready Level 2 Day 2

27 F2F403 VCE Computing & VET ICT Forum

Dec

4 F2F404 Pre-service Conference

10 DT402 DigiTech Curriculum Ready Level 2 Online

2015 DLTV PRE-SERVICE TEACHERS CONFERENCE
Are you ready to teach in the 21st Century classroom?
Mark it in your calendar now!
• Jan 20
• July 2
• December 4
www.dltv.vic.edu.au/events

*This calendar of events is subject to change

2015

Digital Learning and Teaching Victoria

Work IT Out
DIGITAL CAREER SEEKERS PROGRAM

What is it?
The Work IT Out Program gives students the opportunity to explore a real life experience of an ICT career and the pathways leading to get there.

How does it work?
- 150 students from Years 10 and 11 (minimum 40% girls) to workplaces throughout Victoria over 3 years
- real-life experience during a 10-15 day placement to work it out if this is their career choice
- hands-on experiences with a mentor to develop skills and knowledge
- promotion of career diversity, opportunities and benefits to students
- increasing the uptake by students in ICT related studies and careers
- building ICT skills to enhance Australia's economic growth
- promotion of career diversity, opportunities and benefits to students at a critical period in their decision making

Who benefits from Work IT Out?
Students deciding on careers Universities Parents TAFE IT industry Business Teachers Victoria

Students will share their experiences from industry placements through presentations and in the creation of digital resources.

→ **2015 Applications open on 28 November 2014.**
Submissions close on February 27, 2015. Industry placements will be during the end of Term 1 and end of Term 2 holidays. Students are required to apply through an online application at http://dltv.vic.edu.au/students specific details of applications on website.

→ **Expressions of interest**
to mentor students to office@dltv.vic.edu.au
Clearly title your email 'Work IT Out Mentor'

→ **Enquiries**
to office@dltv.vic.edu.au
or call (03) 9349 3733

State Government **Victoria**

From the VCAACorner
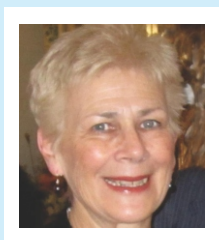
Paula Christopherson
Curriculum Manager | Digital Technologies
Victorian Curriculum and Assessment Authority

Life's never dull in education! October has been a very interesting month in the curriculum world with the release of the *Final Report of the Review of The Australian Curriculum* and the Australian Government's response. In a nutshell, the review of the Digital Technologies curriculum by the study expert, Phil Callil, former President of VITTA, was complimentary. For example, comments included it is succinctly written, clear in meaning, is future-proofed and has an 'admirable' structure. The principal Review authors (Wiltshire and Donnelly), however recommended that Digital Technologies not be mandated until Year 9.

It is important to note that this review and the Australian Government's response to it will be considered by the individual state and territory Education Ministers at their Education Council meeting on 12 December. This report does not mean that Digital Technologies has been removed from the Australian Curriculum from Foundation to Year 10.

While the Review recommendations are not necessarily favourable to Digital Technologies, the response by the Australian Government is interesting in that it 'recognises the importance of Science, Technology, Engineering and Mathematics (STEM) and strongly supports a greater balance in the Australian Curriculum to ensure sufficient focus on teaching the key concepts in these important areas of student learning.[1]'

I would urge all readers to access the *Notice to Schools* published by the VCAA on 20 October that clearly indicates that in 2015 schools can continue to use AusVELS, which will include updated versions of curriculum domains as they are finalised and approved by the Minister.

Initially it was planned for the second iteration of AusVELS to be available by the end of 2014, but now it will delayed until 2015. However, in accordance with the advice, all schools are required to fully implement the revised curriculum in 2017. If schools either want to begin their whole-school planning now or want to commence a staged implementation of the Digital Technologies curriculum in 2015, then I would strongly suggest that you use the ACARA-endorsed *Digital Technologies* curriculum as your fundamental documentation. The Digital

Technologies curriculum to be endorsed by the Victorian Minister for Education will be extremely close to ACARA's version.

VCE update

It is planned that *VCE Computing* be published on the VCAA website by the end of November. Note: only electronic forms of study designs are now available. What is different this time is that the Advice for Teachers and the relevant content of the Assessment Handbook will be amalgamated into the one document: Advice for Teachers, which will be published separately and electronically in mid April 2015. Further good news is that Computing's Advice for Teachers will be interactive, web-based, rather than an online PDF. Computing and the Mathematics Advice for Teachers will be the trend-setters for the other studies that will progressively become interactive.

Next year there will also be an implementation program, and at the moment I'm contemplating using a combination of face-to-face and video-conferencing sessions to increase the accessibility of the program to teachers. I would be very interested to hear your thoughts about the content and delivery modes for this program. What would help you prepare for the introduction of this reaccredited study design?

VCE Algorithmics will be implemented in 2015 in a small number of schools. This is such an exciting development for our discipline, and a great opportunity for those students who have talent and a great interest in the area. The study design will be published on the VCAA website by the end of November – have a look and see if you think you have any students who might be interested in doing the study in 2016. If yes, I would like to hear from you as we have a strong teaching and learning support structure for this study, and we can include you in the 'loop' during 2015.

Top activities by device

I happened across an interesting report titled *Australian Multi-Screen Report Quarter 1 2014*, that primarily investigated the

changing onscreen viewing patterns of people in different age groups. What really interested me was a section outlining people's preferences for particular types of online activities, dependent on the device. For example, the report (page 8) identifies that for all people surveyed, the top-ranked activity (out of ten) was different for each devise:

- email for desktops/laptops
- maps/directions for smartphones
- conducting a search (search engine) for tablets.

The activity of updating social media profiles also ranked quite differently dependent on the device:

- 8th for desktops/laptops
- 5th for smartphones
- 7th for tablets.

In 2014, watching online videos ranked in the top 10 for all devices, though its position was low.

Between all of the devices, the following list of activities was considered to be in the top 10 in 2013[2]:

- search
- email
- news
- weather
- maps/direction
- browsing photos, message etc
- research products/services
- update social networking profile
- buy items online
- watch online video
- travel/transports information
- banking/bill paying
- sporting news/info/results.

This list prompted me to think about what knowledge and skills we teach under the umbrella of ICT as an interdisciplinary/general capability? What curriculum connections does each of the activities have? Is it necessary to explicitly teach knowledge and skills about each so that they can be carried out efficiently and effectively? If your students use a range of devices, do they select the device for an activity or do you direct them to what might be considered the best

device? Does any discussion take place about the strengths and limitations of different devices used for different purposes?

It is proposed in AusVELS (second iteration) that ICT as a general capability, as espoused in the Australian Curriculum, will not be a separate 'item'; rather, the associated knowledge and skills will be either embedded in other learning areas, inferring that in order to reach the standards need this knowledge or skill or, schools can be discretionary in determining what skills will be used for what purpose.

Congratulations

Subject associations are as good as their members, and I think that DLTV should be proud of its achievements in 2014 – it's first year of operation. Thank you to everyone, including the office team.

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[1] Australian Government, 2014 'Review of the Australian Curriculum: Initial Australian Government Response', p10.
[2] Australian Multi-Screen Report Quarter 1 2013, pp 11-13.

MULTIMEDIA DESIGN FOR A SCIENCE E-LEARNING ACTIVITY: DESIGNING A SPARKLAB DATA-LOGGING EXPERIENCE FOR SECONDARY STUDENTS
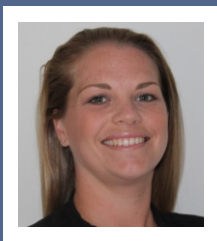
Suzanne Kenneally

Educator (KIOSC, Wantirna), M.Ed student, Monash University (Australia)

Biography

Suzanne has worked as a secondary teacher in the public sector since 2002. She is currently employed by Scoresby Secondary College to work at KIOSC as an educator. This role entails the development and implementation of workshops within the KIOSC Discovery Program. Suzanne has a particular interest in designing workshops focusing on sustainability themes and how technology and innovation can be used to create a sustainable future. Suzanne is currently working towards completing a Masters of Education with a specialization in Digital Technology.

Abstract

The aim of the project is to design a digital workbook that allows for interactive learning and data collection in the context of a KIOSC workshop. The primary goal of the workshop is that students gain an understanding of microclimates whilst developing datalogging experience. A secondary goal is that visiting teachers would be inspired to use datalogging in their own classroom. Specifications for the design are such that students can begin using the workbook with minimal technical instruction, reduce the chances of technical difficulties and allow teachers to access to student work upon return to the classroom. The experience gained in producing previous designs along with consideration of design principles and usability heuristics, led to the "Microclimates around KIOSC" being developed. The goals of the project were somewhat met in that visiting teachers reported students gained an understanding of the microclimates concept but that technological issues led to frustration and would not encourage adoption by teachers. It is evident that technological support is imperative for this to eventuate.

Introduction

For science education, technology offers new ways for students to explore scientific phenomena within and beyond the classroom. E-Learning describes learning that makes use of digital devices and supports the learner in exploring and applying new information as well as promoting new knowledge (Holmes & Gardner, 2006). Datalogging techniques have been available for some time and involve the collection of data from a given environment. This data is presented to students in digital form and can be manipulated to show variations under different conditions (Newton, 2000). The power of datalogging lies in its potential to obtain clearer less ambiguous results (Hennessy et al, 2007). However, datalogging is not commonplace in many science classrooms (Newton, 2000).

The aim of this project is to design a digital workbook (Sparklab) that allows for interactive learning and data collection. The digital workbook, along with datalogging equipment, is intended for use in a workshop covering the topic of microclimates as part of KIOSC's discovery program. Multimedia design

principles will be employed to maximize learning outcomes of students using the design. The usability of the Sparklab is imperative to encourage visiting teachers to make use of datalogging equipment in their own classrooms. The product will be built using the SPARKvue program for PC, although the creation of background images is done in Microsoft PowerPoint. The Sparklab will then be uploaded via Google Drive for use on the iPads through the SPARKvue HD app. Students will form groups to work through the Sparklab as they move around KIOSC and its immediate surrounds.

In order to discuss the design of the digital workbook, it will be useful to readers unfamiliar with the equipment to first gain clarity of the terms to be used.

Definitions and terminology:

Airlink2   A unit that provides a Bluetooth connection from iPads to various datalogging probes. Figure 1. Shows an Airlink2 with probes attached

Datalogging   Datalogging is the use of specialized probes to collect digital information from the immediate environment. The method has been made use of to prompt predictions and demonstrate scientific concepts (Henessy et al., 2007).

KIOSC   KIOSC is a trade-training centre on the grounds of Swinburne University, Wantirna, which offers a STEM-based discovery program to secondary schools in addition to VET courses. The aim of discovery program workshops is to explore innovative solutions used to address sustainability issues whilst providing students with skills that will ultimately make them more employable in the future. KIOSC educators aim to model a high level of pedagogy and technology use in their design and delivery of workshops.

Sparklab   A digital workbook created for use within the SPARKvue HD application. Embedded in the workbook are interactive areas where students can input their own responses or information from the dataloggers can be recorded. Figure 1

SPARKvue HD   An iPad application produced by PASCO scientific for use with their datalogging equipment. App Store information is shown in Figure 2.

Figure 1. iPad showing "Microclimates" Sparklab and Airlink2 with probes attached.

Figure 2. SPARKvue HD available in App Store

Previous Sparklab designs for KIOSC

Before embarking on this exploration of content design, other Sparklabs had been created for use in the context of KIOSC. As with any learning journey, it is important to learn from previous experiences. As such an evaluation of the design characteristics of the "Stretched to the Breaking Point" Sparklab follows.

"Stretched to the Breaking Point" was created to model the difference between slow and sudden movement of tectonic plates. It was used as part of a tabloid style workshop and was intended to be a quick activity for students to gain information to add to a concept map. Table 1. outlines an evaluation of "Stretched to the Breaking Point", in terms of a number of principles put forward by Mayer (2008) and Nielsen (1995). These sources have been used for this evaluation as the design at the centre of this report is required to meet certain goals encompassed by these works. Where appropriate, a sample screenshot of the Sparklab has been included.
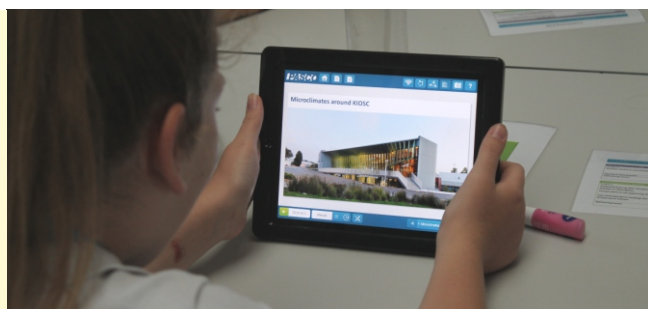
Table 1. "Stretched To The Breaking Point" Sparklab Evaluation

Source: Mayer, (2008)

Design principle	Stretched to the Breaking Point evaluation
Reducing Extraneous Processing	Many unnecessary images have been used in this design. Background images create a "noisy background and poor colour contrast", contributing to reduced readability(Johnson, 2010). Semantic chunking of the written text should be used to better effect.

Example

The instruction of how to place the putty in the clip is on the previous page. Spacial contiguity suggests the image would better be placed next to the text describing it.

Managing Essential Processing	A feature of the SparkvueHD app is that students can navigate the pages themselves allowing for segmenting of the content. However, the design in this case introduces new terms such as Newtons, later in the text. This would be best placed at the start of the design to serve as pretraining for the experiment.

Example

The instruction of how to place the putty in the clip is on the previous page. Spacial contiguity suggests the image would better be placed next to the text describing it.

Fostering Generative Processing	According to multimedia principle, students should learn content better due to the inclusion of the many pictures in this design. However, many of the background images could be described as redundant (Henderson, 2006). Text within the design is written in a conversational style, increasing personalization.

Example		The use of the realistic image and words to describe the investigation process in this case is an example of the multimedia principle. The background image however is decorational (Henderson, 2006) and could lead to cognitive overload.

Source: Nielsen, J. (1995)

Usability heuristic	Stretched to the Breaking Point evaluation
Visibility of systems status	SparkvueHD can lag between actions, which can lead to confusion for the user.
Match between system and real world	Icons used within the SparkvueHD app are dissimilar to those of commonplace applications. Instruction is therefore necessary for this function within the design or the workshop itself. An explanatory worksheet accompanies the iPad for this activity.
User control and freedom	The Sparkvue and Airlink2 systems were chosen for KIOSC due to their user friendly appearance. Unfortunately the actual system functions are not as intuitive as first thought. This Sparklab design does not counteract for these functionality issues.
Consistency and Standards	Each page of the design is not consistent in its background, layout or font size.
Error prevention	Errors that occur as a result of the users action are not obvious until it is too late. For instance, ending a run of data too soon will cause a graph to appear multiple times later in the workbook. Within the design of the pages errors, such as deleting images have not been prevented by locking the components.
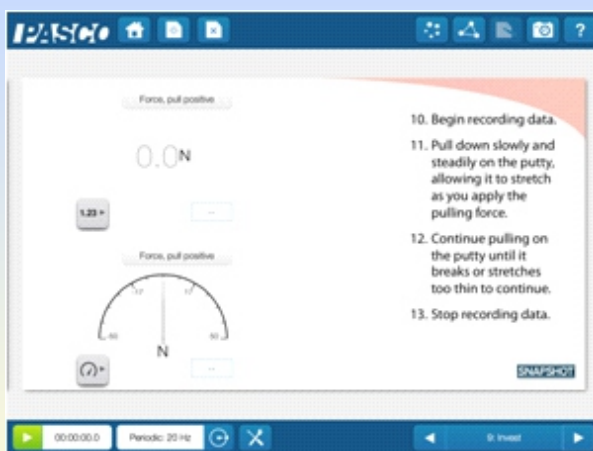
Example		Students can inadvertently change both the numerical display and gauge display on this page. This could be prevented, by locking the displays in place.

Recognition rather than recall	Instructions to start and end recording data appear on the page previous to that which it needs to occur. This causes students to rely heavily on first reading, processing and then recalling the instruction to be carried out.

Aesthetic and minimalist design	Although the design of some pages could be described as minimalist, those with many components or large background images diminish the visibility of essential information.

Example		In addition to the poor colour contrast between test and background (Johnson, 2010), four different elements divert the students' attention from the relevant components.

Help users recognize, diagnose and recover from errors	As mentioned previously, error messages do not appear when using the app. As such students are unable to determine an appropriate course of action to prevent their investigation being wasted.

Help and documentation	SparkvueHD contains a "Help" section but given the limited time students are using the app in this instance, a step-by-step guide accompanies the equipment.

Specifications of the current design

For the current Sparklab "Microclimates around KIOSC" a number of specifications were identified to ensure the overall success of the workshop. Design requirements are as follows:

- The design should provide students with a brief introduction to microclimates and factors that could affect microclimates. This will help them to identify reasons for the variations in the temperatures around KIOSC.

- Students will not be familiar with the SPARKvue HD and how to navigate the workbook. As such, they will need some instruction on how to do so.

- When students begin using the Sparklab, they need to have all the relevant instructions within the design to avoid having to exit the app. Exiting the app can lead to data being lost.

- As students are leaving the classroom to explore temperature variations in the KIOSC area and surrounds, students would ideally not encounter any technical problems. Should this be the case they need to be able to solve them themselves or have access to a teacher who can do so quickly.

- Given the time constraints of the workshop, data that students collect and any answers to questions they complete must be accessible to them back at school. Students will need to be instructed on how they are to save their work.

Goals for the current Sparklab design

The primary goal of the design is that students learn that variations in temperature can create microclimates within larger climatic regions. By working through the Sparklab to collect and analyse data students should achieve the following learning outcomes:

- Be able to describe what a microclimate is

- Identify conditions that may cause microclimates

- Develop use of datalogging equipment as a skill

A secondary goal is to model the effective use of datalogging equipment to teachers who attend the workshop with their students. For this to occur, usability of the Sparklab needs to be as high as possible. According to Nielsen (2012), usability refers to the methods used in the design phase to improve the "ease-of-use". Given the Sparklab is designed for use within SPARKvueHD, some elements that are unable to be altered. The content within the pages of the Sparklab therefore, must be as user friendly as possible.

Design choices- Microclimates around KIOSC

The "Microclimates around KIOSC" Sparklab was designed for use in the Microclimates workshop. Changes were made from the initial design based on the experience of running the workshop for the first time and the advice from the suppliers of the datalogging equipment. As with the previous Sparklab design, an evaluation of "Microclimates around KIOSC", based

on design principles is provided in Table 2. As mentioned earlier, these works have been chosen for evaluative purposes to ensure the design meets the goals of effective learning and usability. Unfortunately, as the design is for use within an existing application, the usability of the app itself does affect the overall outcome. Where possible counteractive measures have been undertaken in the design of the Sparklab.

Table 2. "Microclimates around KIOSC" Sparklab evaluation

Source: Mayer, (2008)

Design principles	Microclimates around KIOSC evaluation
Reducing Extraneous Processing	In comparison to the Stretched to the Breaking Point design, white space has been used much more. Coloured background images were not used, allowing text to be more readable. Text has been semantically chunked (Henderson, 2008) to highlight essential material to students according to signaling principle.
Example	The relevant information has been clearly set out using bullet points under the clear heading which is highlighted with the use of colour. Should students need to find this page again later they can do so with the navigation bar at the bottom of the screen using the coloured headings of each page.
Managing Essential Processing	The digital workbook would be better enhanced if the introductory content, investigation and summary components were segmented more obviously, perhaps with title pages. The main concepts of the workbook are explained at the beginning of the design as well as within the workshop introduction in accordance with the pre-training principle.
Example	According to modality principle, students learn better from graphics, such as in this example, than from text.
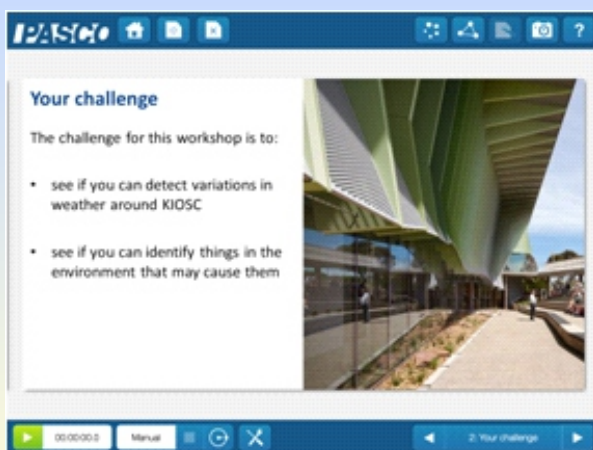
Fostering Generative Processing

Most of the images chosen for the design were realistic. The reason for this was mainly due to the availability of photographic images whereas other images would have had to be created. That said, many of the images in the design are decorative, particularly those on the synthesis and analysis pages.

Example
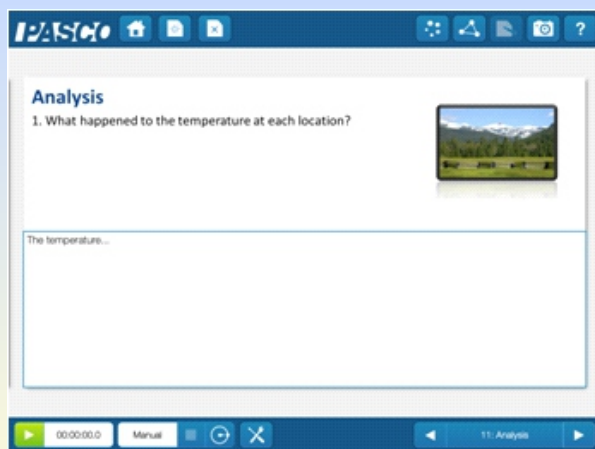
Although multimedia principle states that words and images together aid learning, the use of the image above does not relate to the text and as such could induce students to give misled responses.

Source: Nielsen, J. (1995)

Usability heuristic	Stretched to the Breaking Point evaluation
Visibility of systems status	The lag experienced when using SPARKvue HD can lead to students overcompensating and creating errors. A troubleshooting guide accompanies the equipment students are given and instructs them to be patient when this occurs.
Match between system and real world	SPARKvue HD does not use icons or words that are immediately familiar to students. As a result, as much instruction and practice is provided as possible in the introduction to the workshop before sending them into the field to collect data. Where possible the design has been simplified to make information appear more logical.
User control and freedom	The table has been edited to reduce the chance that students will need to figure out a commonly occurring situation where multiple data runs were added.
Consistency and Standards	Each page of the design uses the same colour palette and font sizes.
Flexibility and efficiency of use	When students are entering the descriptions into the table, they were initially instructed to open the text box by a series of steps. Experienced users can simply double-tap the cell they wish to input information. Instructions have been edited to include this more efficient method.
Error prevention	In an effort to prevent data run errors, the data table was edited so students are required to type the viewed temperature into the table.
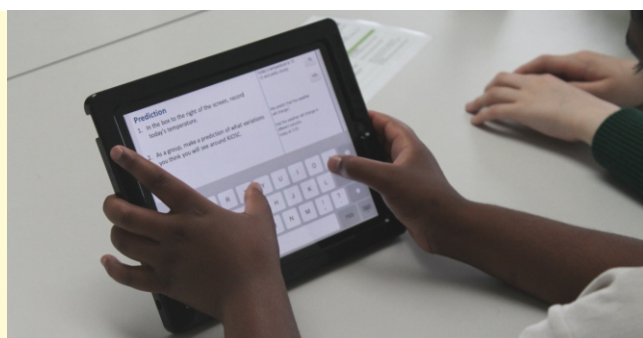
Example
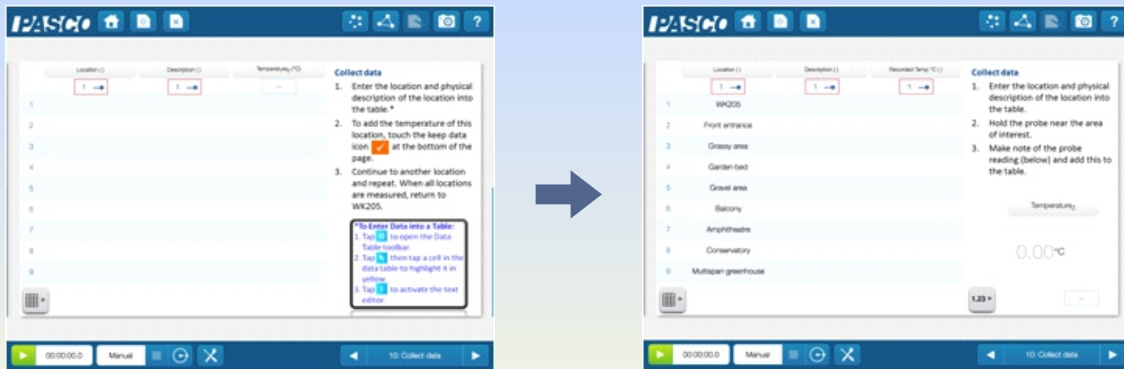
As students are visiting predetermined locations, the locations have been pre-entered into the table. In this revised version of the page the only part students need to manipulate is the table to input data. Initially they had to tap the keep data icon but if they tapped the stop icon instead, their data run would be replaced by a new run.

Recognition rather than recall   Where possible, unfamiliar icons, such as the play button, are used within the textual instructions to explain the procedure required.

Example
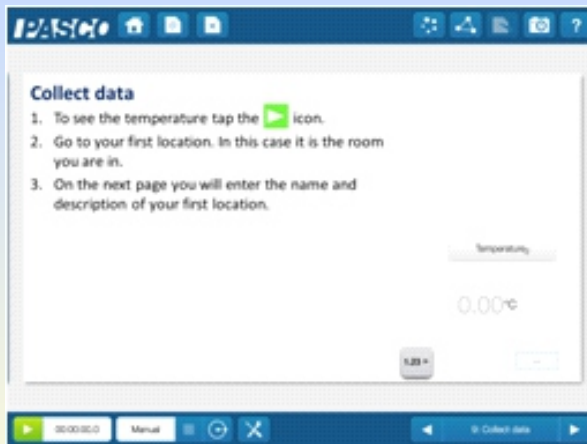
The use of a graphic in the text rather than "play" allows for recognition of the icon to manipulate. It is at this point students are required to tap the "play" icon and had these instructions been on a different page they would have had to recall the image.

Aesthetic and minimalist design   Only relevant information has been included on each page and no background images were used under text.

Example
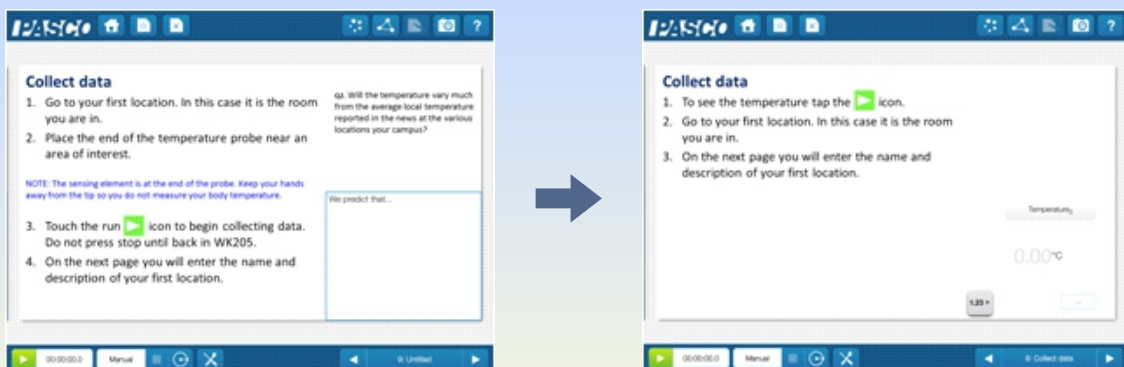
The instruction to collect data has been edited from the original, which included many different components leading to diminished visibility of relevant information. The current revision shown above only includes the information that students need to start viewing the data in the display at bottom right of screen.

Help users recognize, diagnose and recover from errors	The SPARKvue HD app itself does have a help section. Given problems that were arising seemed to be recurring, a troubleshooting guide was produced for students to carry with them as they conduct the experiment.
Help and documentation	Although the Bluetooth pairing and Save your work pages are included within the design, the processes themselves take students out of these screens. As such, a PowerPoint is displayed at the front of the room allowing students to complete the process.

Evaluation of the outcome

Given the ever-changing nature of e-learning tools, multimedia designs need to be continually improved (Holmes & Gardner, 2000). Although editing the Sparklab design can be time consuming, alterations have been made over the course of the initial weeks of the workshop being conducted. In the first instance of running the workshop, students experienced many issues in using the technology. As such, the "keep data" function was removed from the design. In its current form, students simply read the temperature reading from the digital display and then type the data into the appropriate cell of the table. Although doing this did not make full use of the technological capabilities, it allows for a smoother overall experience.

The workshop introduction entailed taking students through the workings of the Sparklab and introducing them to the topic of Microclimates. Unfortunately, it was discovered that when students have an iPad in front of them they tend to stray away from the task at hand. As such, the introduction of Microclimates was conducted before distributing the iPads. This made the first part of the design redundant as students skipped through the familiar content.

Future improvements of the design could include the introduction of audio or video instruction for the input of data in accordance with Mayer's (2008) modality principle, which states that graphics and narration increase learning. Cloud computing and BYOD (bring your own device) capabilities are also being considered given the Sparklab design is saved in KIOSC's Google Drive folder. This would allow students to have immediate access to the work they produce at KIOSC rather than having to rely on their teacher having access to specialized folders created for each class.

The goals stated at the beginning of the report have been met to a degree. Students do gain an understanding of microclimates in what could be described as a constructivist approach. Within the workshop, students are asked what they know of climates and the response temperature is usually given. The term microclimates is introduced and factors that can effect the temperature are discussed. Students then are given the means to explore the temperature variations of the locations suggested and can see for themselves the effect that vegetation and made-made structures can have on the microclimates. Using this new information they alter their existing understanding of climate. Post experiment discussion and teacher feedback have suggested that students have met the learning outcomes outlined in the goals.

The insights gleaned in the development of the "Microclimates around KIOSC" Sparklab will be valuable in the production of future KIOSC workshops. Currently in development is a workshop that will examine the physiological responses to an Oculus Rift experience in comparison to an immersive meditation experience. With such an array of technology being implemented in one workshop it is imperative that the design and usability of the upcoming datalogging interface be of the highest quality. Mayer (2008) puts forth that the design of multimedia presentations should be learner-focused and as such must consider the processing involved when students make use of e-learning tools. There is potential for any Sparklab design to allow KIOSC facilitators to hand out equipment to students and allow them to navigate investigations at their own pace. Time constraints of the KIOSC format make this difficult but visiting teachers have been encouraged to develop content of their own.

Of the second goal of encouraging teachers to use the technology back in their own classrooms it is difficult to say whether this goal has been met as yet. The feature of the workshop that was to do so was the ease of use in regards to the equipment. To date it could be suggested that the despite many changes to increase the usability of the design, students unfamiliarity of the SPARKvue HD app and Bluetooth connectivity problems have led to a less than positive experience. Collis and Moonen (2002) have outlined the 4-E model to determine a teacher's likelihood of making use of technology. Ease-of-use is included as one of the components but they found that most detrimental was the environmental factors which includes the level of technical support provided. So too, Newton (2010) concludes from his research into how teachers make use of datalogging, that those provided with technical support and time to develop adequate skills saw the potential of datalogging realized in their own classroom. Factors effecting teacher stress when using technology (technostress) have also been examined and found that lack of skill with equipment led to higher measures of stress (Al-Fudail & Mellar, 2008). In a survey conducted of the teachers who brought their classes to do the Microclimates workshop, it was reported that while the pedagogy involved in the workshop was sound, the technological difficulties experienced led to student disengagement. This result was the main reason for teachers suggesting they would not be more likely to use

datalogging in their own classes. It is apparent that success of data logging techniques in the classroom depends on the support given to teachers to become proficient themselves and technical assistance being provided. As such, it has been recommended that KIOSC provide professional development opportunities for teachers to become proficient in datalogging techniques.

Teachers visiting KIOSC have reported that datalogging equipment has lain dormant in schools for some time. Furthermore, non-science teachers may not be aware whether or not their schools have access to equipment. Given the wide range of sensors and probes available, it is possible for teachers of other areas such as Health and Physical Education to develop learning activities also. With iPad suitable datalogging equipment now available and the willingness of schools and students to adopt iPad programs, it is hoped teachers will be allowed the time and technical support to create their own e-learning experiences for their students.

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Mel Cashen, Princes Hill PS

Interactive Fiction
Adrian Camm, The Geelong College

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These options will be followed by a closing plenary of all presenters, followed by opportunities to continue the conversations.

Come away with ideas and resources to transform your classroom!

Highlights from the DLTV Conference

Mel Cashen
Conference Chair

In July, DLTV held its first Annual Conference at Swinburne University. I was fortunate enough to be the Conference Chair which meant I was part of the planning from day one, shaping the conference and bringing people on board to make it a success. The theme was creating new connections and hoped to bring together the members of the two former subject associations and build on the connections we have as educators.

The theme was intended to run as a thread through the conference and it was important to the conference committee that this was embedded in every decision we made. This was also the rationale behind the self organising aspect of the conference. Rather than asking for abstracts we put a call out for expressions of interests with no specific focus or boundaries to what presenters could do. Instead the presenters ideas were grouped into streams and they were put in contact with each other to organise how their stream would look. In some streams this was as simple as organising the order of their presentations. For others it gave the opportunity to work together to develop streamlined sessions. Some presenters decided to pair up and present together while others decided to finish the day with a panel of all the presenters in that stream. By creating a connections between the sessions and presenters it resulted in a more cohesive conference for delegates. It also gave freedom to presenters to think outside

the normal structure of a conference and allowed the development of a gaming in education playground which ran around three learning experiences. Delegates who headed to the session could participate in learning through presentation, learning through play and learning through experience. It was such an exciting area of the conference to drop by to as people were making poetry with Lego, playing Mario Bros with a Makey Makey and playing old style console games.

As the first DLTV conference it was important to share the depth of expertise and innovation we have in Victoria and the committee wanted this reflected in the keynote presentations. Therefore ensuring we had Victorian keynote presenters was essential to demonstrating why we are leading the way in education. Adrian Camm, Director of Learning and Teaching at The Geelong College opened the conference with his provoking presentation which made us doubt what we knew but at the same time make the audience feel like they could make change right now. His examples of students using their imagination to problems solve in the playground supported his notion that learning is doing. Narissa Leung opened our afternoon sessions with a narrative of her life full of curiosity. She shared her incredible experiences and inspired the delegates to set a vision for learning and make change. Khao Doh's promise of a light hearted start to the Sunday turned out to be an inspirational story of his life and how he has changed

the lives of others. The final keynote was another Victorian teacher, Britt Gow who shared the exceptional experiences she has been able to offer her students regardless of the fact they are in a small rural school.

Another moving moment was when Roland Gesthuizen used morse code to send a message to space for Maggie Iaquinto who had passed away the week before the conference. Maggie was such an important member of the IT community and much loved by VITTA and ICTEV. She had a remarkable history and the news of her passing certainly put a sombre feeling across the office and committee. It was fitting that Roland chose to send a message into space for Maggie as she was the first civilian to speak to cosmonauts on Mir. Using her computer and radio she was able to connect with over 19 cosmonauts over a number of years, using the little Russian she knew to assist her. Later she set up an amateur radio station at her school so her IT students could quiz space scientists about the technology used on-board Mir.

To complement the keynote presentations there were a number of sessions and workshops running simultaneously. Delegates had the opportunity to hear about new tools, digital pedagogies and the new digital technologies curriculum or to take the time out and speak to other delegates in the Scootle lounge. The expo was buzzing with sponsors and all of the
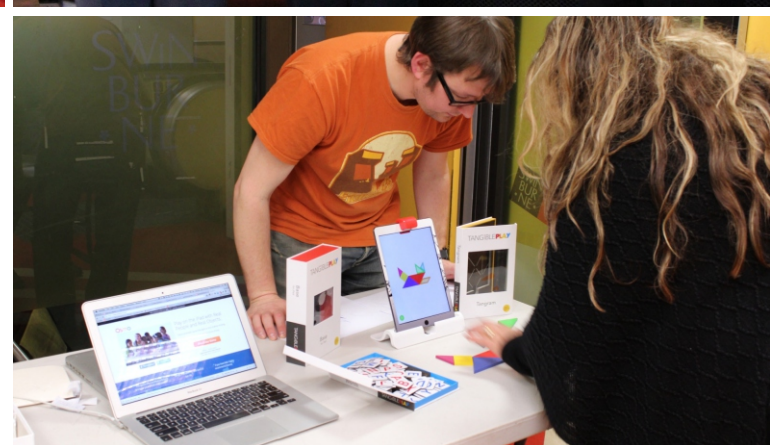
latest gadgets making delegates reach for their wishlists. As with any conference it doesn't happen without the help of sponsors and DLTV are very lucky to have sponsors who are so passionate about technology and education.

The planning for the 2015 conference has already begun and ideas are flowing to make it even better. The main structure of a variety of streams will remain and the self organisation of presenters will continue to ensure delegates get the most out of the conference. There are a number of other ideas on the table to offer other options to delegates including a series of speed sharing sessions, increasing student voice and inspirational presentations from educators so keep an eye on the DLTV website for the launch of the 2015 conference.

Preparing for the Digital Technologies Curriculum

In the last issue I discussed the new Digital Technologies curriculum and sung its praises. Since then there has been quite a bit of movement nationally about the Australian Curriculum and where Digital Technologies might actually fit. In the Review of the Australian Curriculum it was recommended that Digital Technologies be dropped and only offered from Year 9 (see DLTV's response to this recommendation in this issue). We are still waiting to hear what the Minister might do about the Review of the Australian Curriculum but in Victoria there will be no waiting.

The Digital Technologies Curriculum will be introduced into Victorian schools from 2015. This introduction will be staged and might not happen in January but it will happen.

What the curriculum looks like

I was fortunate enough to be involved in a VCAA project that looked at school readiness and how teachers might implement the new curriculum. There were eight schools involved and each school was required to develop a unit of work that addressed the Digital Technologies curriculum. The project used a draft version of the AusVELS Digital Technologies curriculum and while that is not for circulation at this point in time it is close enough in structure to the Australian Curriculum version that I can safely talk about its content for this article.

Every school in the project produced exciting and novel solutions to the requirements of the curriculum and once teachers had taken the time to read the document and think about what it actually meant, no one found it too complex or too difficult to work with. True, some of the language does require some consideration (what does 'algorithm' mean; what is 'specification'; or what about 'abstraction'?) but all of these

terms are supported in the document and through other readily available resources (in particular the DLTV website under 'resources' is very useful).

The units of work produced in the project demonstrated how successfully the new curriculum can be addressed. Some teachers were able to look at what they were already doing in their teaching and learning programs and were able to identify specific areas within those programs that addressed the Digital Technologies curriculum. Other teachers looked at their skills and knowledge in teaching IT over the years and aligned their practice to the language of the curriculum. Other teachers decided that this was an opportunity to do something completely new with their students. Each different approach was appropriate and each approach was successful. It just depended on what the school and the teachers needed and wanted at the time.

How to get started

My advice to all teachers is to read the document. I know that sounds rather simplistic (and the document is large) but taking the time to read the curriculum and to make sense of it is the best way I know of working out what to do with it. If that seems too daunting then my advice is as follows:

- **Read the Key Concepts:** They provide the underlying thinking behind the whole curriculum. Understanding these concepts will ensure that you really understand the Achievement Standards and the Content Descriptors.

- **Read the Achievement Standards:** They tell you what your students should know or be able to do by the end of the year levels covered. Remember that it is possible to be 'working towards' those Achievement Standards; you just

Dr Nick Reynolds
Melbourne Graduate School of Education, The University of Melbourne

have to work out what 'working towards' might look like. Understanding the Achievement Standards is essential in terms of developing appropriate assessment strategies and for reporting.

- **Read the Content Descriptors:** These provide the practical advice about specific content, through that they address the Key Concepts and the Achievement Standards.

- **Look at the Elaborations:** These are examples of what the Content Descriptors might look like in practice. They can be very useful in looking specific classroom practice. They aren't meant to be the curriculum itself!

When you become familiar with the above you will find plenty of resources that can assist you in understanding the language and content of this curriculum. The DLTV website has a series of infographics that should prove very useful in breaking down the language of the curriculum. You can find them under 'Resources'.

What might learning and teaching look like in the new curriculum?

Without presenting everything from the VCAA project I can draw on the kinds of things that teachers in the project did. You will see that some of the solutions fit very easily into what you might already be doing. The important thing to remember is that the focus is on Digital Technologies and the language is explicit.

The term 'data' is used frequently throughout the curriculum. Of course data are the building blocks of digital technologies but data is also information that can be represented and manipulated many ways. Young children can take photos that become data (the process of taking the photo and using it also connects to the idea of Digital Systems), that data might be in the form of a story or it might become a graph. Think about The Three Little Pigs (one example that came from the VCAA project) the data in question here was the story itself and the repetitive (and iterative) patterns contained within the story. Foundation level children in this case were required to identify the patterns and represent them in a variety of different ways using digital technologies. One activity in this unit was the dressing of Beebots in little pig costumes and programming them to run through the story. When you think about the areas being addressed in a unit like this it is easy to see that digital systems are being investigated, patterns in data are being represented and interpreted, interactions and impacts are being considered, algorithms are being used and so on.

I like to think that a unit like this could be used at any level of schooling. Imagine the complexity of solutions year 8 students might be able to produce in terms of working with a familiar

story filled with repetitive patterns. Each iteration of the story has different inputs and outputs, each requires specification, abstraction and computational thinking.

There are many teachers in Victoria who already possess the skills and knowledge to implement this new curriculum; all they need to do is become familiar with it and make sure that they are really addressing all of its components. Hopefully they will share this knowledge! There are also many teachers in Victoria who might be a little (or a lot) daunted by the prospect. One very valuable lesson I learnt from working with the teachers in this project was that it is okay to learn along with your students. This came out in a number of units where teachers knew what they wanted to achieve but felt that they didn't possess the level of competence to 'teach' their students complex programming. For a start, this isn't necessarily required!

In one example, where grade 5/6 children were making games in Scratch, the teacher used his pedagogical knowledge to support and challenge his students in finding solutions to problems. The teacher and the students watched You Tube videos on Scratch (and used the Scratch site), they talked about end products, students were encouraged to do their own research, they agreed on necessary components for the products they were building, complex story boards were created and lots of games were investigated (and played). There really was little or no 'teaching' of Scratch. Of course the teacher's knowledge increased throughout the unit and he knew enough about the program to at least go through some of its functions with his students. If he had waited until he knew everything there was to know about Scratch before commencing, then we know that the unit would never have even started.

This is an exciting time for schools in Victoria. We are breaking new ground nationally and internationally. The Digital Technologies curriculum provides a sound basis for the development of knowledge and skills necessary for our students to thrive in this complex technological world in which we live. It is not just about coding and programming computers; it is about so much more. It does require new teacher knowledge and practice but nothing contained in the curriculum is beyond the capacity of Victorian teachers. Those amongst us who seek to denigrate the professionalism and competence of teachers (especially at primary level) by insisting that this curriculum is too hard really don't know what they are talking about and are happy to throw cheap insults at a group of people who do not deserve that treatment.

Please read the curriculum and think creatively about how this exciting and timely document can support the learning of your students.

Students who are new to programming:

What ideas do they have?

Roland Gesthuizen

Department of Education
and Early Childhood Development,
Victoria

Paul D. Chandler

Australian Catholic University,
Melbourne

Abstract

The majority of students in our classroom as very computer literate, but not many have experience as programmers. So when a group of students, who have essentially no prior exposure to programming are not only presented with a unit of study on Python programming language but a series of tasks to probe their understandings of relevant programming concepts – what sense do they make of those tasks? In their responses, we see examples of student thinking which are grounded in physical and face-value understandings. There are also responses which clearly show abstract thinking, even though it might not be particularly accurate. We contend that there is opportunity for creative pedagogy by both helping the concrete thinkers move to the abstract and refining the abstract thinkers into forms which are more recognizably Computer Science. In the parlance of Science education, it is about helping students resolve misconceptions and identifying pedagogical approaches which may have stunwittingly reinforced such views.

Introduction

Conversations online

An interest in constructivism since the early 1980s has galvanised an interest in learner's understandings in a range of subject areas. This has led to a paradigm change in the teaching and learning of various school subjects, and the change in Science education practices is particularly notable (Tobin, 1993). In terms of a theory of mental and conceptual models (Cardinale, 1991), there is a 'target system', and the 'mental model' is what the user presently has in his/her head about the target system, and a 'conceptual model' is one which is invented to provide a teachable representation of a target system. The interest, therefore, has been with shifts in mental models.

In contrast, the interest of Information and Communications Technology (ICT) educators with learner understandings of the technology has been different. Yan and Fischer (2004) have observed that insufficient attention has been given to how people learn to use computers from the perspective of cognitive development. Hammond and Rogers (2007) have also observed the relative lack of research into children's understanding of computers and computing concepts – particularly when compared with the very large literature on teaching and learning with ICT. Ben-Ari (1999, 2001, 2002)

has been critical of the widespread application of minimalism, a methodology for designing manuals for software documentation and for using these manuals in training users of the software. Trained in the more behaviorist style of minimalism, he argues, when faced with an unfamiliar situation, the user will not attempt to employ or expand conceptual knowledge, but rather will attempt to find and recycle a task that was 'actively learned'. In short, Ben-Ari expresses concern with an insufficient attention to conceptual understanding.

In computer programming, the emphasis has tended to be on the conceptions that students construct whilst in the computing classroom, not the conceptions that they bring to the classroom door (Powers and Powers, 2000, p. 1), there are a small number of insightful studies and it is work which take a 'student first' approach. Hammond and Rogers (2007) considered children's perspectives on issues such as 'What is logging on?' and 'How does a mouse work?'. Young student's perspectives in explaining the 'behaviour' of a mechanical, autonomous robot were studied by van Duuren and Scaife (1996) and Levy and Mioduser (2008). Kafai (2008) explored students' conceptions of a computer virus. Papastergiou (2005) investigated high-school students' conceptions of the internet.

The authors of this paper are both Science teachers as well as ICT teachers, invested in the conceptual change model of teaching, and to some extent side with Ben-Ari (1999), troubled by the more minimalist approach which seems to often permeate ICT education, and seeking a more conceptual basis for our work – an approach which gives greater respect to the thinking that students bring to the computer classroom. Our earlier forays into this territory (Chandler, 2010; Chandler and Gesthuizen, 2010) considered 'common place' computing activities. In this investigation, our focus was on the more specialised work of teaching programming.

Focus for investigation

Roy Pea's (1986) work *Language-independent conceptual "bugs" in novice programming* is unquestionably the early and seminal work in the field. Google Scholar indicates that it has been widely quoted, but similar studies (e.g. Fleury, 2000; Pane, Ratanamahatana, & Myers, 2001; Spohrer & Soloway, 1986) are either relatively few in number or not readily locatable. Amongst them, the focus has not been at the upper secondary level nor in relation to more recent programming languages such as Python. Pea's investigation identified the following three misconceptions in the work of novice programmers:

- Parallelism - the assumption that different lines in a program can be active at the same time

- Intentionality - the attribution of forsightedness to the program

- Egocentrism - the assumption that there is more of the programmer's meaning for what he or she wants to accomplish than is actually present in the code

The focus of the investigation is, in the context of programming in Python, exploring the ideas about computing that students present to a teacher about what is happening inside a computing device. Therefore, to contribute to an extension or confirmation of Pea's work with respect to the specific contact of teaching of programming through Python to Australian upper secondary students.

Methodology

Participants

The participants were students from the second author's information technology classes in a secondary school in the city of Melbourne, Australia. Whilst there were three classes in total involved, they were small classes and the total number of participants was 29. Both genders were represented and participant ages spanned from 15 to 17. Students had a broadly different exposure to computing varying from no contact, some limited programming with Scratch to some more intensive programming experience with the Python[1] programming language through the GROK[2] Programming Challenge. All had some experience using computer applications such as word processing and spreadsheets. Each had their own personal netbook computer.

Probes for understanding

Following the value of Science educators to use visual representations to help students represent abstractions (Tytler, Haslam, Prain and Hubber, 2009), and similar work in ICT education (Kafai, 2008), our earlier investigations (Chandler, 2010; Chandler & Gesthuizen, 2010) took a similar approach. We designed some simple questions to prompt students to draw representations of how variables 'work'. Only results for one question is considered in this paper:

Figure 1: Sample Question

Here are two variables in a Python program:

X = 16
Y = "Cat"

If you could "draw" what this looks like when this information is stored 'inside' a computer, what would your drawing look like? You can annotate your drawing to add some notes that describe the different parts of your drawing. Use your imagination and ideas about what could be happening inside a computer and how these variables might be stored.

[1] http://python.org
[2] https://groklearning.com/challenge/

Data collection

Students were presented with this questionnaire to answer independently on paper. Their teacher (the first author) provided considerable encouragement to record and submit an answer but not provide any clues or hints about what should be answered. No information technology or programming instruction was given to support or scaffold their answers. Submissions were codified to remove any identifying information then digitally scanned for further analysis.

Data analysis

Whilst Pea's (1986) research was available as an interpretive framework, we took an approach more aligned with grounded theory (Glaser and Strauss, 1967). Both researchers independently read over the responses. Initial classifications that we made were then discussed, and then we worked together to sort the responses into broad groupings. Our interpretations were then compared with Pea's work.

Results and Discussion

The responses were group into four broad classifications, which are explained below, which is organised as an approximate taxonomy ranging from least abstract to most abstract.

No representation

Two students responded with no answer. They indicated that that had absolutely no idea, even when pressed to use their imagination and despite considerable encouragement to submit an idea what may be happening.

Exterior view of the computer

Some responses indicated a recognition of the computer as a "system". The diagrams sometimes labelled the parts and indicated that information is entered and stored and perhaps manipulated inside the computer.

Figures 2 and 3: Student Responses indicating 'exterior view'
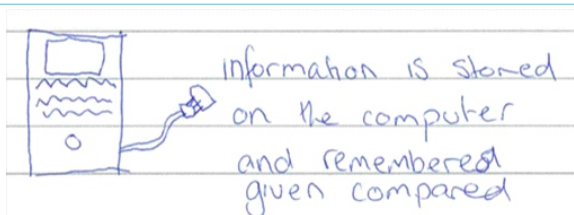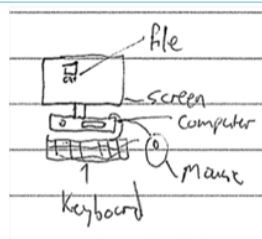
Naive symbolic understanding

Some responses suggest a notion of the "inside" of the computer as symbolic. One student describe a Turtle device connected to a computer full of chips that contains binary numbers. There is some sense of Pea's notion of egocentrism (more meaning attributed than is actually specified) as it is otherwise unclear how the idea of the turtle arose.

Figure 4: Student Responses indicating 'symbolic understanding'
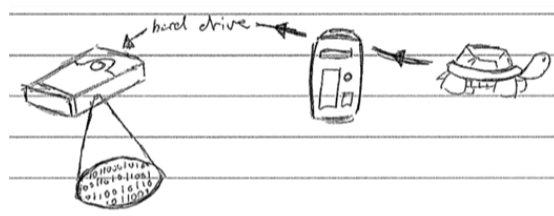
More detailed presentations of the "inside"

When examining the responses that explored what was probably happening at a 'deeper' level, there were four broadly different ways of visualising how information could be represented inside a computer. They varied from the fantastical notion of abstract animals, information dynamically flowing from boxes through different paths, static binary code and physical reality of dots of data or magnetic field lines. We will here consider each in turn.

Data 'flow'

Some students submitted a model that illustrated the flow of information along pipes to different boxes or spaces.

Figures 5 and 6: Student Responses indicating 'data flow'
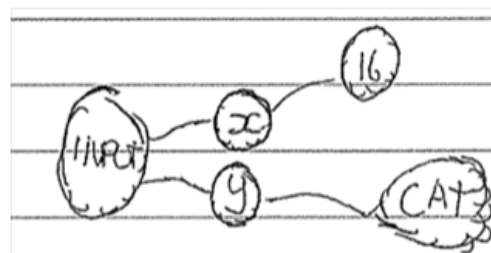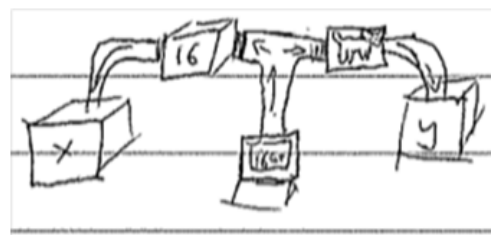
This is reminiscent of the "plumbing diagrams" used by Brian Harvey (1997) to develop understandings of variables such as:
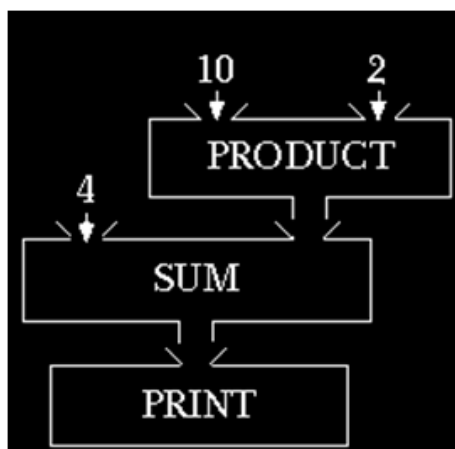
Notions of "flow" also connect with high-level mathematical thinking such as cellular automata (extensions, really, of Conways 'game of life'), which have been modelled to represent low-level digital structures such as logic gates (Schiff, 2005, pp. 97-100). It is important to note, though, that students had not been exposed to "plumbing diagrams" in their classes, so their use of this abstract representation is entirely of their own making. It is possible that these responses embody some degree of Pea's misconception of parallelism (elements of the program being active at the same time), but even so, it can be argued that this 'data flow idea' is the principle objective of the programming teacher: that values must be stored in a 'container' somewhere that they must be combined with other values in order for computation to take place.

The response is therefore very important as it suggests that those students who constructed diagrams which successfully reinterpret information derived from their teacher and other sources and developed a representation which is highly productive, close to the canonical representation of the field and allied with high-level mathematical thinking. If this was the mental model (or interim mental model) of most students in a programming class, a teacher would have reason to be very happy.

Mathematical

What can be seen from the response below is that students draw upon their prior experience strongly when they interpret the question. For instance, one student produced a response with cartesian coordinates has taken note of the symbols "X" and "Y" in the question and connects that with certain types of mathematical work. Likewise, other students who have produced something which looks like a mathematical equation; one of those students has possibly seen the same symbols and connected that with other elements of mathematical experience.

Some degree of Pea's notions of parallelism and intentionality is probably present in these responses.
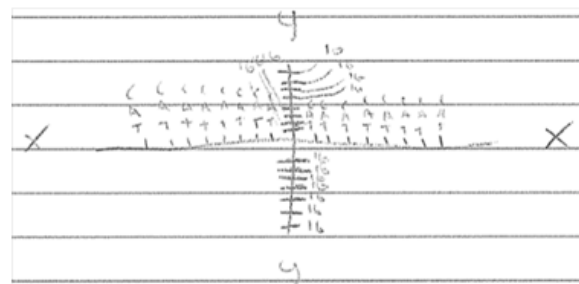
Fantasy

Imagination and fantasy elements are well represented amongst some contributions. The student who has seen Y='Cat' and has envisaged miniature felines certainly has some 'fantasy representation' but moreover has not seen the letters between the quotation marks as simply a sequence of characters but as a real-life object which needs to be modeled in some way.

The fantasy models represented ranged from a smiling young cat with a bow tie and another drawn using ASSCI characters. Another drew a small army of marching cats and two tried to physically draw a small cat, hard-wired into the computer circuitry. This support the conceptual understanding that the cat is both inside the computer and an integral part of the circuitry or perhaps the code.

This representation is clearly influenced by prior learning that information in a computer is not stored as native words, decimal numbers or physical objects, rather it is directly converted, codified and stored as a binary number. There was perhaps some doubt with how the computer can tell different 'boundaries' to delineate between the different tokens represented in this binary sequence or where this code would be physically located.

A physical reality

Two students provided an interesting and conceptualisation of how data is stored inside a computer. After a considerable period of time struggling with a suitable answer, one settled on a series of deliberate dots on a surface to represent the information inside, perhaps on a chip. Another tried to represent this not as a series of dots but as a set of magnetic field lines along a surface.

Figures 15, 16: Student Responses indicating 'physical understanding'

This anthropomorphic representation may draw on a wider culture such as the Internet, books or television shows such as "Nian cat" or "Cyberchase". "Nian cat" is a YouTube animation and internet meme including a mildly irritating music and flying computer cat. Videos and images of this computer cat are popular and shared between students. The Cyberchase animated cartoon series presents what is occurring within a computer as a kind of miniaturized version of the real world.

It would be drawing a long bow to suggest that that students would believe that a computer would contain an actual miniature model of a cat from the real world, but what is clear is that is that they have interpreted Y='Cat' to be actually indicative of a feline rather than a string of characters. Therefore, their parsing of the line of code is more based on 'common reading' of the sentence than a computer-science based one and, whilst 'cats in the computer' is probably not actually sensible to them, they do not really have any idea of a representation which makes any more sense than that. This reading of the program probably embeds some elements of Pea's notions of intentionality and egocentrism.

Unstructured code

Several students tried to represent the data as binary numbers in different ways. One tried to connect the data to each variable, another represented the huge iteration of zeros and ones. A third tried to illustrate that the stored data could be 'visualised' this way if you examined the could hold a magnifying glass to a computer chip. It is interesting to note that there was some confusion about how this information is grouped as discrete variables or a wall of data with no discrete boundaries.

These representations may have been influenced by some prior reading or learning about how information is stored on a DVD, compact disk or magnetic tape. The students may have attempted to map this visualisation into their model of how a computer works or looks inside. Whilst this is perhaps the most technically interesting answer at a physical level for information storage, it is worth noting that these students did

not ground their representation in the more symbolic and abstract ideas.

In summary, there are not many visual representations which seem to be very viable in terms of explaining the lines of code presented. Whilst not wanting to stray into Pea's misconception of intentionality (the attribution of forsightedness to a program) the majority of representations which are 'static' rather than part of a 'process'. In contrast, to the computer scientist, a computer is a 'busy place', shunting data from one place to another at a fantastical speed. As represented in the order of the discussion above, the classification which we are on a surer footing, though, is abstraction compared with physicality, and it is from this basis that conclusions and recommendations proceed.

Conclusion

In the small amount of data collected, we have seen examples which fit in a range of positions that can be located upon a spectrum which extend from a 'macroscopic, physical' understanding on one extreme though to a 'microscopic, physical' understanding on the other, and with various forms of abstract thinking somewhere between. This is presented in Table 1.

Table 1: Spectrum of computer understandings		
Macroscopic, physical	Abstract	Microscopic, physical
External hardware model with physical devices	For instance - naïve symbolic - mathematical - data flow - binary number - fantasy	Internal physical model with data storage elements

The computer programmer typically works in an abstract space, dealing with data, data structures and algorithms. At one end of the above spectrum is the physical infrastructure which makes all of this possible, such as the motherboard circuitry and the design of storage devices is broadly the domain of electronics engineering, but is rarely open to view because it is either hidden in a case or microscopic in size. At the other end of the spectrum is the physical reality of a computer which the user 'sees' and interacts with directly, the province of user-interface design. Data structures occupy the 'middle ground' between these two extremes, but unlike them is entirely an abstract conception. Where students are able to think abstractly, some elements of Pea's misconceptions can be inferred. Consistent with our earlier work (Chandler & Gesthuizen, 2010), the challenge seems to be in fostering student thinking at an abstract level at all. An extremely small number of students could be said to be thinking at an adequately abstract level where a deeper understanding of misconceptions could provide direction for productive future teaching and learning.

Given the small extent of this study, there is considerable scope to repeat this activity and compare the results with a larger

cohort of students, different ages or amongst adults such as teachers or parents. A larger sample would allow a more careful exploration of the extent to which abstract (compared with physical) conceptions are indeed prevalent and to provide a more careful of the account of the range of mental models.

We came to this investigation as educators immersed in Science education, and that discipline has taught us that it is valuable for teachers to understand the conceptual understandings that students bring to the classroom, viewing these as mental models that are neither right nor wrong. Rather they should probably be viewed as alternative conceptual understandings that students have constructed from prior experiences. As Pea (1984) encouraged us to ask the question "How do inadequate mental models get transformed to better ones?", it is this perspective that we do not find widely represented in current ICT education, which seems to be more informed by minimalism.

What this brief study has suggested is that the first step towards that is to find ways to encourage thinking at an adequately abstract level. What confronts us is that there is, in a sense, a 'right' or 'wrong' to naïve understandings because an explanation based on physical realities (at either end of the spectrum) will always be inadequate. It is one thing to suggest that teachers should be aware of the various perceptions so that they can be better placed to diagnose and design activities that challenge this understanding and stimulate learning. But in order for that dictum to be meaningful, we must not only seek a more conceptual basis for our work but to firstly reveal the abstract 'space' that either implements, or is implemented by, the physical reality.

Paul and Roland are keen to work with other teachers interest to investigate students' conceptual ideas of programming and computers more generally; if this is you, please drop them a line at Paul.Chandler@acu.edu.au or gesthuizen.roland.j@edumail.vic.gov.au

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Evaluating a 1-to-1 iPad Project: Beyond Rose Coloured Glasses
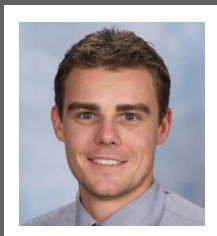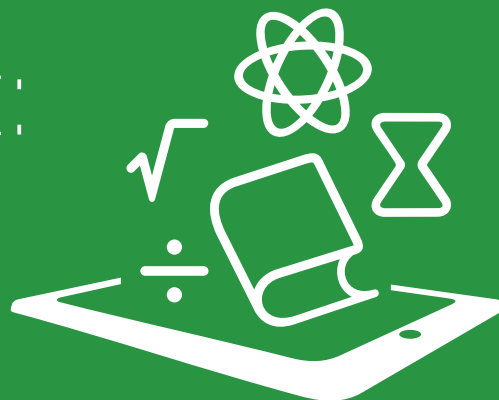
Brendon Willocks
St Mary's College, Toowoomba

Petrea Redmond
University of Southern Queensland, Toowoombas

Abstract

Today's digital world calls for contemporary pedagogical practice and curriculum that aligns with the relevance of today's youth. Educators frequently use contemporary digital tools and innovative teaching and learning approaches to engage their students. A regional single sex high school implemented a 1-to-1 iPad program for the Year 8 -10 students with the aim of creating a technology rich learning environment with personalised access which would facilitate innovative teaching and learning opportunities and to promote personal learning with additional outcomes of independence, lifelong and life-wide learning for their students.

In particular, this project investigates the use of the iPad at school and home for academic purposes and also examines the parental perceptions of the use of the device for learning. Survey data indicated that the implementation of the 1-to-1 iPad project had positive outcomes including enhanced learning opportunities and motivation for learning. However, during the initial phase of implementation, both parents and students had concerns regarding possible off–task behaviours of students when using the iPads.

Internationally education systems have invested significant financial and human resources to equip classrooms with computer technologies to enhance productivity and efficiencies, improve learning and teaching, and develop digital skills in students (Bebell & Kay, 2010). Critics of this investment commented that technologies in schools have had less than wide ranging and consistent positive impacts on learning and have been "oversold and underused" (Cuban, 2001). Since the late 1980s schools have been investing in hardware to reduce the student to computer ratio (Bebell & Kay, 2010; Fleischer, 2012). While they have achieved some success in this goal, "student-to-computer ratios have not yet reached a stage at which the technology is ubiquitous" (Bebell & Kay, 2010, p. 5). The concept of ubiquitous computing was first introduced by Weiser (1991) and he commented that "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (p. 94). Papert (1996) and others have suggested that "the full effects of computers in school cannot be fully realized until the technology is no longer a shared resource" (Bebell & Kay, 2010, p. 6). With the introduction of mobile devices and 1-to-1 projects, schools are trying to resolve the issue of having personal devices rather than shared computing resources while still considering equity of access.

1-1 Computing

As access to computing devices became more widespread, it was "possible for students and teachers in schools to transition from occasional, supplementally use of computers for instruction to more frequent, integral use of technology" (Penuel, 2006, p. 332). Many schools have implemented 1-to-1 projects which enabled 24/7 access to digital devices and the Internet (Fleischer, 2012; Penuel, 2006) at school and home making the access personal rather than shared. "Ubiquitous, 24/7 access to computers makes it possible for students to access a wider array of resources to support their learning, to communicate with peers and their teachers, to become fluent in their use of technology tools of the 21st century workplace" (Penuel, 2006, p. 332).

1-to-1 projects provide "increased access and resources when technology is no longer shared" (Bebell & Kay, 2010, p. 46) and facilitates more time on task for student learning. There are four key features of 1-to-1 computing: Students are provided with (1) a portable device with software; (2) wireless Internet access; (3) used to complete academic tasks; and (4) the student has 24/7 access to the same device (Fleischer, 2012; Penuel, 2006).

There are a number of positive outcomes reported previously in 1-to-1 computing studies (Bebell & Kay, 2010; Fleischer, 2012; Lowther, Inan, Ross, & Strahl, 2012; Penuel, 2006; Schmidt & Ho, 2013) including:

1. Improved academic achievement;
2. Increased equity of access to digital resources;
3. Increased student-centred learning and enhanced student autonomy;
4. Increased student engagement;
5. Enhanced student motivation;
6. Higher motivation; and
7. Decreased disciplinary problems.

Teachers in Beball and Kay's (2010) study reported "widespread adoption of new and novel approaches across their traditional curriculum, which were then subsequently reported by teachers and administration to increase student motivation and engagement" (p. 16). Teachers use of technology for 'behind the scenes' increased and most teachers found they 'fundamentally changed' their teaching practices. Having said that, teachers also reported that "even after a couple of years we still fell like were just getting accustomed to teaching in a 1-to-1 setting" (Bebell & Kay, 2010, p. 21). In addition to new approaches, the access to 1-to-1 devices also increased the just-in-time teaching and enhanced the

responses to teachable moments (Fleischer, 2012). Students were willing and interested to experience a 'radical shift' in their approaches to learning, however, not all teachers changed their pedagogical approach to embed the devices into the teaching and learning opportunities in their classrooms (Bebell & Kay, 2010).

Challenges for 1-to-1 Projects

Research provides little discussion about the problems associated with 1-to-1 projects (Fleischer, 2012). In their study of mass deployment of iPads, Schmidt and Ho (2013) suggested that the success of any technology integration for the improvement of learning and teaching has had a "hit-and-miss track record" and that it is "fraught with challenges"(p. 2).

When discussing mass deployment of digital devices, challenges identified by Schmidt and Ho (2013) were of a management nature and included activities such as the time involved in setting up the devices, installation, configuration, deployment of apps, making backups, and overall care and maintenance of the devices. The identification of suitable applications can be difficult given the large range available. Unlike other computing devices such as desktop and laptop computers where teachers can use monitoring software, "[t]o date, there is an inability to control activities performed on the iPad" (Henderson & Yeow, 2012, p. 81). Monitoring activity makes it possible for teachers to check what students are doing and redirect them to productive learning activities when necessary.

The limited research available reveals varied and frequent off-task behaviours with students on 1-to-1 devices during class time and finding research on off-task behaviour during homework time is even more problematic. A study completed by Donovan et al., (2010) discloses that "[s]tudent disengagement in learning, or off-task behaviour, is less researched and less documented, perhaps because the range of student off-task behaviours is extensive" (p. 426). Examples of off-task activities related to ICT use include cognitive disengagement from the current teaching and learning activities, completing non-related activities, and using the device for "purposes other than intended or specified for the learning activity" (Donovan et al., 2010, p. 426). They go on to indicate that the result of their study of 1-to-1 computing in the middle school does "not support the notion that increased access to technology leads to increased engagement in the K – 12 setting" (p. 437).

Context

This study was set in a regional Catholic community for the education of students from years 5-12. The participants of this study were students and their parents from Years 8 – 10. The

school provides each child from Years 8 – 10 with an iPad as a learning tool, and the current Years 11 and 12 students were provided with a laptop. The current Year 10 cohort was part of a laptop 1-to-1 program when in Year 9. The key educational role of the iPad was to provide access to digital information and communication tools any place, anytime.

A number of apps were recommended by the school, e.g. Keynote, iMovie, Pages, PDF Expert, and Explain Everything. Students were expected to set up their own iTunes account and install the apps from the App Store at school or at home. After the first two weeks, the students were only able to download from the App Store at school before and after school.

All teachers were provided with a laptop and an iPad, and each classroom had wireless Internet, a tethered and wireless projection device, and speakers. Teachers had training for the iPad initially looking at how to use the device and then exploring the use of the iPad for learning and teaching purposes. Students and parents were involved in information sessions addressing functionality of the iPad, safety, care, consequences if iPad was misused or lost, and cybersafety.

Methodology

An online survey was made available to all Year 8 – 10 students and their parents. The purpose of the survey was to explore the perspectives of parents and students in terms of the educational use of the iPad and also to gain data for the enhancement and ongoing development of the project. The survey was conducted within the first 15 weeks of initial iPad implementation.

The student survey included 29 closed questions about the student use of the iPad and an open ended question at the end of the survey. The closed questions included items about problems with the technology, length of time using the tool, purpose for using the tool, and Apps used on the tool.

The parent survey included 10 closed questions and a section for additional parent comments. The questions included items about how their child was using the iPad and the impact it had on home and school. The comment section was widely used by the parent participants.

Results and Discussion

The self-reported results from parents and students indicated promising educational outcomes, particularly in terms of the students' use of the iPads as a learning tool and the belief of parents and students in the positive impact it had on student attitudes and motivation. This aligns with Koh et als., (2011) 1-to-1 study that found overwhelming positive reactions from

students and Warschauer (2007) established that the students enjoyed the fact that 1-to-1 access allowed them to control their own learning.

In the students' response to the question: Do you use your iPad primarily as an educational tool? Only 2% of students indicated that the iPad was NOT primarily used as an educational tool; 37% answered yes; and 61% indicated mostly. One survey question asked how much of your time on the iPad at home is spent on homework, 3% of the student respondents reported that 100% of the time was for homework tasks, 41% said that 75% of their iPad time was for homework tasks, 39% said 50% of their time on the iPad was spent completing homework or assessment and 17% suggested that 25% of their time on the iPad was for homework purposes. Given this was a self-report survey, it is possible that students provided the answer they believed that their school and parents wanted to hear.

Home use of the iPad was largely to complete homework or assessment related activities. Grimes and Tawchauer (2008) research on 1-to-1 laptops also found that 75% of laptop use at home was to write and revise school assignments. Students reported that the use of the device both at school and at home was largely for educational purposes. However, from a parent perspective, 59% of parents noted no real change in their child's study habits, 23% perceived their child had an increase in time spent on homework, 14% felt it had decreased and 4% were unsure.

The survey also indicated that because students have an iPad they have engaged in collaborative eLearning and peer teaching with students they would not normally have worked with previously. A number of students made specific comments about enhanced email access. When asked if they used their school email more having an iPad, 70% responded yes, 14% indicated no, and 16% felt they used it the same as before.

The majority of the students felt that they could achieve more with the iPad. Students also responded positively about the use of the iPad to be more organised for school with 79% of the students indicating that the iPad assisted with their organisation, 7% indicated it did not assist and 14% indicated no change to their organisation.

When asked how the students used the iPads, most of the usage was for Internet access and eBook reading, see Figure 1 below. Warschauer (2007) and Oliver and Corn (Oliver & Corn, 2008) also found high use of Internet search and increase in research skills as a result of the implementation of 1-to-1 devices.
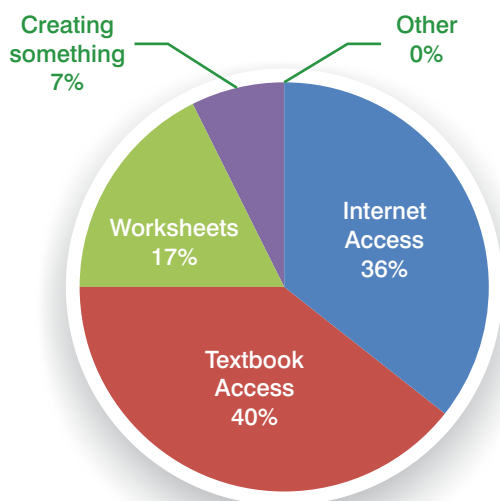
Figure 1: The major use of the iPad at school

When inquiring about which subject the students mostly used the iPad (excluding IT subjects) English had the highest level of use, closely followed by Maths. Figure 2 shows the breakdown of disciplines. Other subject areas did not have high levels of iPad usage. In contrast, Beball and Kay's (2010) study found that students were less likely to use a 1-to-1 device in Math and Science when compared to Social Science and English. They also found that "there was no single subject area or grade level where technology uses were found to be universally more widespread or universally unused" (p. 49). Although, Fleischer (2012) suggested that the use of laptops in curriculum areas varied across disciplines. He also recommended that " it would also be fruitful to investigate the connection between leisure-time based learning and academic interest" (p. 199).
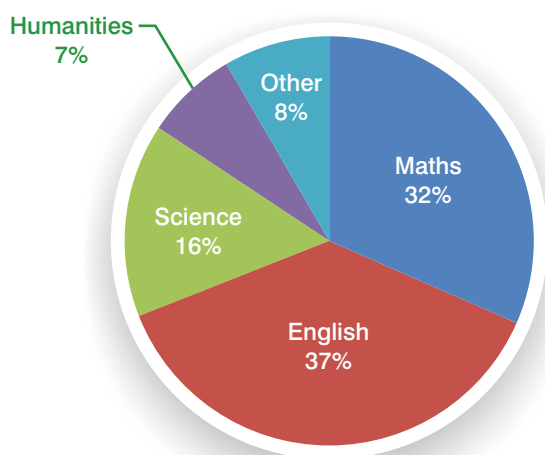
Figure 2: Use of the iPad across disciplines

Within the open ended comment section students had a very positive perception on the use of iPads for learning. This is demonstrated by comments such as: "Lets me do more at home"; and "I believe that it has helped me concentrate in class because it is something I enjoy doing (technology) and I believe I have more of an opportunity of doing stuff". Other comments indicated that the students believed that the iPads were easy to use and the portability was a significant benefit when compared to carrying around heavy text books. This aligns with Lowther, Inan, Ross and Strahl's (2012) 1-to-1 laptop study, which reported "that the use of laptops improved their learning and study skills and made them more interested in learning" (p. 25).

The majority of the parent comments were of a positive nature including the perspective that access to the iPad was responsible for increased positive attitudes towards school. It appeared that parents who set ground rules (e.g. no use at bedtime, use for social/gaming activities after homework); and those that have some IT knowledge appeared to have made more positive comments. The following is a sample of the types of positive responses made by parents: "I think having an iPad has provided more opportunity for my son to learn, especially when completing assessment and some teachers are using it for innovative learning...Overall, though I believe the positives outweigh the negatives"; "It has been a very positive impact and has made homework much more engaging"; and "There is a very noticeable improvement in his attitude towards school work and organisation of work".

Three disadvantages were presented within the student comments. Firstly, the ease with which students could get distracted by games and social activities. Illustrated by comments such as "It is a distraction in class with a very high temptation to play games"; and students "are playing too many games and are getting me distracted and I am not doing as well as I used to be". Secondly, the preference was to use handwriting or a laptop/computer to create text based items when compared to the iPad. Thirdly, they were disappointed that the school had locked the App Store during class time.

Parents, however, were concerned about the teachers directed use of the iPad with one parent commenting, "Some teachers are using the iPad extensively and some not at all". Interestingly, a number of parents were concerned about traditional reading and writing skills, preferring to purchase text books rather than use the iPad as an e-reader.

The parents' key issue centred on the non-educational use of the iPad, especially for social networking and games, which were also identified by the students as a disadvantage of the device. Many parents would have liked control over what occurs on the iPad and to remove games, Facebook, or include filtering or monitoring software. Since the initial survey,

the school has found that additional parental education, in the form of tips sent out to parents, reduced this concern for parents.

There is very little research discussing the disadvantages of 1-to-1 devices and student off-task behaviours. The parent and student comments in this study align with the findings of Donovan, Green and Hartley (2010). Off-taskbehaviour during class and homework time is not a recent occurrence, students have often been distracted or disengaged in class in the past. The 1-to-1 devices provide an alternative to passing notes, staring out the window, doodling, and other non-engaged behaviours that students have demonstrated previously. Donovan et al's (2010) study suggests that student off-task behaviour "may be interpreted as being contradictory to existing beliefs on the relationship between computer access and student motivation and engagement" (p. 439).

Like the parents, Banister, Miller and Herman (2010) commented that it would be useful to have the ability to track and manage content and activity on mobile devices. In their research with pre-service teachers, Schmidt and Ho (2013) suggested that the ability to gather analytics to track device usability would assist in identifying if and when students are distracted and using the device for off-task activities. Analytic data on student usage may also enable educators to support their students in a more informed way.

83% of the parents provided rules or guidelines for the iPad use at home use. 64% felt the iPad had a positive effect on their son's education, 8% perceived a negative effect and 29% responded no real change in their child's educational outcomes. The following quotes are representative of the parents comments: "I realise now I need to set some rules at home"; and "I would have preferred parental control mechanism or an ability to monitor what the iPad is being used for so I could better guide".

Implications

The use of mobile 1-to-1 devices enable learners to interact with content, learning resources, peers and their teachers in different ways than was traditionally available. This paper reports on a 1-to-1 project during phase one of the project implementation. When schools deliberately implement a 1-to-1 project, a number of implications need to be considered:

Firstly, the data indicated from both a student and parent viewpoint that they have positive perceptions about the use of the iPad as an educational device. This aligns with the research of Lowther et al., (2012) who also found positive attitudes and increased motivation with the use of a 1-to-1 device. Bebell and Kay (2010) also reported that the "consensus of the participants was overwhelmingly positive towards these

educational opportunities afforded through increased educational technology" (p.47). These outcomes and positivity may be attributed to the training and Internet access provided by the school, affordability, light weight, immediacy of response and the low cost of applications for the device.

Secondly, this project affirmed the importance of parental involvement. Fleischer (2012) also reported on the importance of parents when implementing 1-to-1 projects. In this case there were benefits in having parental training in the use of the device, in exploring ground rules for suitable use of the device at home, and to support parents in their involvement in their son's education. Interestingly, for some families, especially where ground rules were not explored, parents felt they had less control over what the students do with the device.

Thirdly, parents and students both reported concerns about off-task behaviours or the increased opportunity for distraction, particularly in the areas of gaming or social networking. This was of concern both at home and in class. Off-task behaviours at home or in class not new however something to consider is whether the off-task behaviours of students while on iPads may have limited negative impact on the learning of other students when compared to non-iPad off-task behaviours. Henderson and Yeow's (2012) study also found "that distraction is an issue with the iPad" (p. 85) as it is with other technologies used in classrooms. The school in this study and the one in Henderson and Yeow's (2012) study indicated that it is important that "expectations are clearly laid out in terms of behaviour around the iPad and school work" (p. 85) for use at home and at school. In this study many parents recognised that at home they need to implement an acceptable behaviour or acceptable use policy.

Conclusion

This study revealed that the implementation of a 1-to-1 project resulted in a positive experience and enhanced educational opportunities. The size, portability, connectivity, and intuitive nature of the device enhanced the experience for the students. A key learning from this study is that it is necessary to set guidelines both at school and home to reduce the risk of distraction.

A limitation of this study was that the data was limited to one school in one regional centre in Australia. This limits the ability to generalise beyond the initial context. A second limitation is that the data was collected through a single self-report survey. Data collected through self-rating is subjective and may not be reliable with the participants providing the answers they believe the school would like to hear rather than the actual impact of the device. Another disadvantage is that there is no data from the teachers and it may have been useful to gain their perspective on this important matter. Future research

may include some observation in classrooms to explore the range of off-task behaviours, in addition to collecting teacher perspectives.

This study indicated positive educational outcomes from the 1-to-1 iPad project. Although there are some obstacles to overcome before it reaches the potential to transform learning and teaching. The challenge for educators is to meet the educational needs of our digital students in an environment where the tools themselves change quickly and the IT skills of students develop faster than that of the teachers. The 1-to-1 project provide students with access to a personal device for use at home and school rather than access to a shared device.

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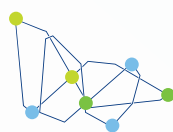
MAKE ROOM FOR MAKERS:
MOVEMENT ENGAGES
STUDENTS, ENERGIZES LEARNING.

Make magazine founder Dale Dougherty certainly provided the impetus for the maker movement when he launched his publication nearly a decade ago – but the grassroots effort, albeit on a much more basic level, has existed for as long as humans have created things.

"Everyone makes at some level, but we have forgotten about it," says Dougherty. "Once we understand who the makers are, we can find them in history. People like Benjamin Franklin and Henry Ford might be considered makers. Apple founders Steve Wozniak and Steve Jobs were tinkerers and designers."

Whether we cite Franklin and Ford or Seymour Papert, who in the 1960s defined constructionism and studied how technology can provide new ways to learn, makers have been forging inroads for years.

What is new is how quickly the maker movement – the technology-influenced DIY community – has gained momentum, especially in recent years. Technology has rapidly accelerated, providing more people with access to innovative devices that enable them to create, rather than just consume.

With the technological ability to have more creators, Zach Kaplan, CEO of Inventables, an online hardware store for designers in the maker movement, says, "The key driver is that the cost of tools such as 3D printers, CNC (computer numerical control) mills, and things like an Arduino and Raspberry Pi motherboard and other core tech products have come down and are in the reach of normal consumers."

For the less tech savvy, there are literally thousands of magazines, podcasts and YouTube videos for those wanting make their own products, and, if they choose, sell them online. Nearly anything can be used – from junk to complex tech tools – because the aim is to create something meaningful and connect the physical world to the digital realm.

Owning the environment

In the education realm, ISTE member Robert Pronovost, stem coordinator for the Ravenswood City School District in East Palo Alto, California, says the maker movement is giving students more ownership of their environment.

"In a society where so much is mass-produced and locked down, the movement allows everyone to realize they don't have to take things the way they are presented to them."

Lisa Abel-Palmieri, an ISTE member and director of technology and innovation at the Ellis School, an all-girls school in Pittsburgh, Pennsylvania, says the movement is about giving kids the opportunity to explore, do hands-on learning and use hands-on media to create solutions.

"It provides hope for reigniting how we look at education in a progressive way, and assists students with the skills they need for the future in terms of experimentation and having a growth mindset where they fail fast and are able to bounce back," she explains.

Lisa Kopochinski

Abel-Palmieri says her school has gone through a shift in its curricular program in the last two years. To stay relevant, educators focus on experiential learning and partnerships, design thinking and maker education to define and solve problems.

"STEM is a huge focus," she says. "By incorporating maker education, we've seen a huge uptick in science and math course enrollment."

There's also the tinkering process, she adds, which is a great way to get younger students engaged in making. "It empowers them to learn where they are creators and experimenters. There may not be a bigger project in mind. It doesn't have to be about the technology or creating a project or solving a problem, but it is a great way to show kids they can make things."

Pronovost agrees and says the maker movement gets students re-energized about learning.

"It is truly about the integration of so many of the curricular subjects that were siloed as high-stakes assessments became more prominent. The con is that learning is not so cut and dry, as it's not easily assessable on multiple-choice assessment. Additionally, the movement has a lot more avenues for individual paths – even toward the same goal – so it can be hard to assess individual work and progress in comparison to peers."

Still, Abel-Palmieri says students can feel like they accomplish something quickly and gain competency in what they are doing while being engaged in a way different from a written assignment.

"Say a student is an artist," she explains. "In the past, they might have felt that science wasn't their thing. This engages students in new ways where they otherwise have not been engaged."

Authentic learning

Another huge advocate of the maker movement is Sylvia Martinez, author of the book "Invent to Learn" and a past ISTE member.

Martinez has worked in schools around the world to bring the power of authentic learning into classrooms, particularly in STEM subjects. She calls the movement nothing short of a global, technological and creative revolution that will change the way we produce, market and sell goods and services worldwide.

"Plus it's cool!" she says. "Want a new watch? Don't ship it across the world, just print it out! Better yet, design it yourself and then print it out. Using gee-whiz technology to make, repair or customize the things we need brings engineering, design and computer science to life. Something this epic should be on every educator's radar."

Martinez says the maker movement overlaps with the natural inclinations of children and the power of learning by doing.

"For educators, I believe that being open to the lessons of the movement holds the key to bringing the best learner-centered teaching practices back to the classroom. This is a way to dramatically change the conversation back to authentic learning."

She adds that in too many cases, science and math have been stripped of practical applications because of a false premise that practical math is only for students who don't go to college.

"This is a recipe for disaster, and I think we see the results in students who gradually lose interest in stem subjects over the years. We cannot and must not continue to pretend that success in stem subjects means memorizing the textbook."

Brian Jepson, publisher of Maker Media's book series, says making has made him wish he paid more attention to geometry in high school.

"From a personal experience, a lot of times when I am working with a CNC or a 3D printer or a modeling program, I think, 'This is why they taught geometry.' Why do I need to have these realizations in my mid-40s? Why didn't I learn this when I was a kid. I wouldn't have this incorrect attitude about the math I was taught."

Getting started

For educators wondering where and how to start implementing the maker movement, Pronovost offers these words of advice.

"Just dive in. Try giving your students a little more flexibility in a traditional project, such as a poster presentation, and rather than have them present on a topic, ask them to solve a particular problem based on your curriculum. Students may lean toward digital tools or hands-on materials. Allow that variety."

When it comes to what makes a good makerspace, practically anywhere will do.

"Our first one was in an abandoned portable classroom," recalls Pronovost. "While many of the six others I'm building this month will also go into an empty classroom, we have to be more flexible due to space at a couple of our sites. We're also considering a small trailer modeled off the school's Sparktruck."

Abel-Palmieri says to have a maker mindset in your school, you don't actually need an official makerspace.

"It can happen in existing classrooms with recycled materials. Materials don't have to be expensive. [However], to develop a makerspace before a maker mindset is there does not set you up for success. It's about creating a space in the curriculum for maker education to be a part of what they are doing."

For instance, The Ellis School has two "innovation stations" in middle and high schools where students participate in pre-selected activities every month. At the high school level, projects tie to what is happening in class. At the middle school,

students make projects that are not tied to the curriculum, such as creating an origami animal that lights up.

While the benefits of a maker education are numerous, funding remains a challenge.

"Even though our Ravenswood Makerspace Collaborative was just awarded a stem Innovation Award by the Silicon Valley Education Foundation, funding our work has been difficult," says Pronovost. "Many of the skills learned are critical-thinking skills, not rote facts. That has made it harder to get the foundations and companies we have reached out to for support to say, 'yes,' as they rightfully want a simple way to judge if their money is being invested well."

Jepson suggests jumping in simply to prove that your group can build something around it.

"Funding varies so much," he says. "One thing that seems to be common is starting out with something that is easy to get. For some people, that's a vinyl cutter that allows you to make signs or decals. Those are $3,000. One group did a Kickstarter campaign to buy a laser cutter to cut various materials."

The good news is the maker movement has been elevated to the national level. Just this past June, President Obama held the first-ever White House Maker Faire.

Dougherty told Phil Larson, senior adviser for Space and Innovation in the White House Office of Science and Technology Policy, "Making sits at the intersection of art and science, and at the crossroads of technology and design. Makers are using new tools and technologies that are democratizing production. With better tools, more people can make things because it is easier to take an idea and develop it into a physical thing."

Cool creations

Many wonderful things have been created from the maker movement. When asked what the stands out in her recollection, Abel-Palmieri says, "I would say that would be the artificial limbs using autodesk and a 3D printer. Our school worked with the Quality of Life Technology Center on developing assistive technology devices for those with disabilities."

Another team at The Ellis School created an assistive hair-tying device for a woman with Parkinson's who was unable to lift her arms to style her hair.

"This had always been important to her, so the students developed a hair prototype device that would help her pull her hair back."

For Jepson, it was seeing a 17-year-old student make a Segway clone from scratch that one could actually ride. "That was pretty amazing," he says. "I would not have expected that. Technology often separates us from the real world, whereas when you approach it as a maker, you have a lot more control

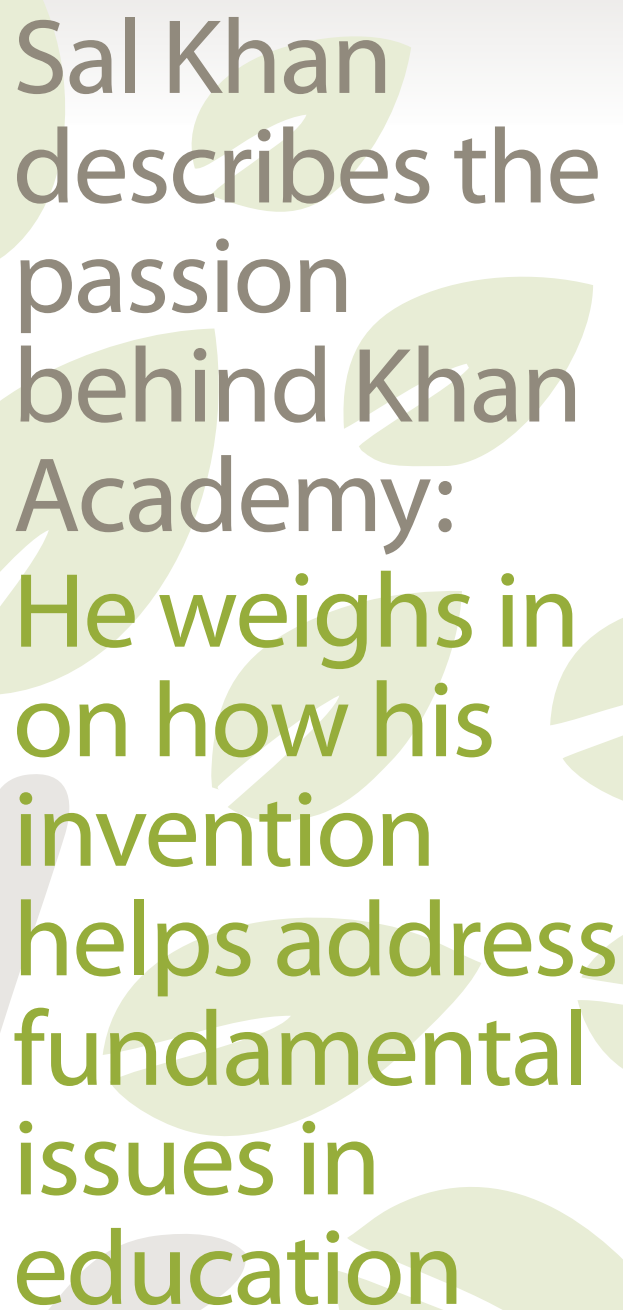and ownership to the technology. It doesn't own you anymore."

Lisa Kopochinski can be reached at lisakop@sbcglobal.net.

Introducing the maker movement

Sylvia Martinez, author of "Invent to Learn," offers these 10 tips for educators looking to introduce the maker movement into their classrooms.

1. Start with your kids. What are their interests? What would they like to make?

2. Bring in the cool. A 3D printer is cool, but there many things out there that might make your students wonder, "How did they do that?" leading to, "How can I do that?"

3. Shop. Bringing new things into the classroom can be fun and spark a lot of new making potential.

4. Check in with other maker educators. For instance, visit Twitter, #makered, k12makers.org, or blogs like John Umekubo's Creatorstudio.org or AaronVanderwerff at the Lighthouse Community Charter School.

5. See what others have shared and share your own. There is a growing list of maker education resources created by the members of the K-12FabLab Google Group.

6. Read up. Start with "Invent to Learn: Making, Tinkering, and Engineering in the Classroom," because this is exactly why we wrote the book.

7. Check local. Your local museum, library or community college may be planning or implementing a makerspace. Many are sprouting up.

8. Give it a go. The maker movement for education is like channeling MacGyver. Remember that '80s TV show where the hero's superpower was fixing the world with paperclips and twisty ties? You can do more than you think just by trying something and refining it.

9. Be brave, not a martyr. Decide what to do and then be bold. Then, take it 20 percent further.

10. Involve parents and students. The most effective allies and advocates for your cause will be students. Share your newfound insight and enthusiasm with them.

Sal Khan describes the passion behind Khan Academy:
He weighs in on how his invention helps address fundamental issues in education

al Khan is the founder of Khan Academy (khanacademy.org), a nonprofit with the mission of providing free, high-quality education for anyone, anywhere in the world.

Born and raised in New Orleans, Khan graduated from MIT in 1998 with three degrees: two bachelor's degrees in mathematics and electrical engineering/computer science, and a master's degree in electrical engineering. He began his career working in technology, and later earned his MBA at Harvard Business School. Khan then became an analyst at a Boston-based hedge fund, which later relocated to Palo Alto, California.

As a side project in 2004, Khan began tutoring his young cousin in math, communicating by phone and using an interactive notepad. By 2006, Khan was tutoring 15 family friends and cousins as a hobby. To better scale, he began writing software to give his students practice and feedback in mathematics.

To complement this software, he also began posting videos of his hand-scribbled tutorials on YouTube. Demand took off, and in 2009, when the practice problems and instructional videos were reaching tens of thousands of students per month, he quit his day job to commit himself fully to the nonprofit Khan Academy.

The Khan Academy website now provides a self-pacing, guided learning experience with more than 100,000 practice exercises and 5,000 instructional videos covering everything from basic arithmetic to college-level science and economics. It's the most used library of educational lessons on the Web, with more than 10 million unique students per month, more than 300 million lessons delivered and more than a billion completed exercises.

More than 200,000 educators around the world are also using Khan Academy to help build student mastery of topics and to free up class time for dynamic, project-based learning.

Khan has been profiled by "60 Minutes," featured on the cover of *Forbes* magazine and recognized as one of *TIME* magazine's "100 Most Influential People in the World." He is also a recipient of the National School Boards Association's Heinz Award. In late 2012, Khan released his book "The One World Schoolhouse: Education Reimagined."

Julie Phillips Randles

If you could have a different career, what would it be?

Some combination of a science fiction author, avant-garde artist and Charlie Rose.

What's the side of you the public never sees?

I sing a lot when no one is looking or listening.

How have you changed in the last five years?

I've become more optimistic. I was never really a pessimist, but, like many people, I was somewhat cynical about society's odds of addressing the really big challenges it's facing. In the last five years, through Khan Academy, I've met incredible teachers, students, parents and business leaders who are committed to improving the lives of others and having real impact. When I meet folks like that, it inspires me to think bigger and devote even more energy to aspirational goals.

I have also had two wonderful, hilarious children in the past five years, which has given me a deeper appreciation of what it means to have love and fear for someone other than oneself. I recently heard singer John Legend speak about education and, in discussing the framework we should use for making decisions that impact schools, he said, "We just have to ask, what would we do if we really loved those kids … like really 'loved' them." I don't think I could have fully appreciated the power of that idea before I was a parent.

What aspect of Khan Academy are you most passionate about?

As much as Khan Academy is known for me and my videos, I think they are the least important part of what we do. Most of our energy is focused on creating world-class, free interactive software that allows teachers to meet the individual needs of students. For example, we've spent the past year building resources with 40 leading educators, including some of the authors of the Common Core, to build tens of thousands of Common Core-aligned, interactive math exercises. As the students work through the exercises, either at their own pace or based on assignments, teachers get real-time reports on how their classroom is progressing. I believe we now have the most rigorous and comprehensive set of Common Core exercises available, and we are passionate about always keeping this free and noncommercial to empower as many teachers and students as possible.

What measurements can you point to regarding the effectiveness of Khan Academy?

Over the past few years, we collaborated with a number of schools and with SRI International to study various types of classroom use and the effects of different approaches on teaching and learning. The report was published in March, and we were encouraged to see positive association between Khan Academy use and some important outcomes like improvement in student test scores, improvement in students' confidence and reduced anxiety when it comes to math. Teachers also reported that integrating Khan Academy into their instruction increased their ability to support their students. Students' perceptions of Khan Academy were very positive, their engagement during Khan Academy sessions was high and students felt that using Khan Academy encouraged greater independence in learning.

This reinforces a lot of what we hear directly from our users, both those using Khan Academy in the classroom and students using it independently. We get hundreds of letters from people using Khan Academy who have changed their entire outlook on learning, and often how this learning journey has transformed their lives. Hearing these personal stories from both students and teachers is the "effectiveness data" that really propels and inspires us on a daily basis.

Why didn't the SRI report focus only on effectiveness?

When we first started working with schools, we had a very nascent product and only a small subset of the full Common Core curriculum. We, the schools, and the researchers fully expected our product and content to evolve tremendously during the study period. Given this, SRI felt it was more appropriate to focus the research on the different ways that our exercises platform was used. One of the things they found was that Khan Academy was rarely the only variable being changed and that the use cases were very different so, given the sites being studied, it would have been difficult, if not impossible, to isolate the impact of Khan Academy alone. SRI concluded that trying to conduct effectiveness research would have been methodologically unsound.

How can today's Khan Academy address some of the fundamental issues in education?

We hear from teachers how hard it is to reach all their students – to give enough attention to kids who are struggling while still engaging and challenging their students who are more advanced. That's why we felt it was important to give teachers a tool to let students work at their own pace and give teachers instant feedback so they can see their students' progress and, at any time throughout the year, quickly identify which students might need more attention and then assign more practice. We also hear a lot about how teachers use this data to form small groups of students to encourage peer mentoring. Khan Academy is certainly not a silver bullet, but we strive to be a valuable tool for teachers to help reach each student, at every level.

We also hear from students that it's hard to catch up if they missed something in class or have gaps from prior grades. We built our learning environment to provide students a safe, unpressured learning environment where they can fill in their gaps and practice concepts at their own pace. This is not only important to help students develop math competency, but also a sense of agency over their learning.

The SRI report also indicated that teachers use Khan Academy as a supplement to classroom instruction. How would you help teachers think about integrating Khan Academy into actual teaching practices?

Khan Academy has never been about direct or primary instruction. We view our role as a tool to empower teachers by giving them unlimited, standards-aligned exercises with instant reporting and feedback and on-demand, mini-explanations as a reference. You could think of it as a 21st century textbook. By definition, this is going to be a supplement to the great work that teachers are already doing. However, "supplemental" doesn't necessarily mean "superficial." There are many instances where teachers use Khan Academy as a tool that is meaningfully integrated into their math teaching practice. We are now seeing teachers getting students on the new Common Core-aligned, grade-level "missions" that ensure each student can focus on practicing the skills and filling their individual gaps, while giving teachers in-depth feedback to know exactly where each student stands at any time throughout the year. We've profiled and interviewed a number of teachers on our website, like Suney Park, who recently won a Presidential Teacher award, to show different ways teachers have deeply integrated Khan Academy into their classrooms.

In addition to content, Khan Academy provides educators with data from student use of lessons. Is that data being used effectively? How can the analytics that you are able to provide assist teachers and students?

We hear from teachers how hard it is to know where to focus your teaching and attention, so we enable teachers (as well as their students and parents) see a student's progress. Through Khan Academy's coach reports, teachers can quickly see how their class is doing overall or skill-by-skill, at any time throughout the year. Teachers can then quickly identify which students might need more attention and then assign more practice. And while there are thousands of teachers who use

these reports on regular basis, we are continually looking for ways to make this data even easier to interpret and more actionable for teachers.

How is Khan Academy managing the student privacy guidance that was recently released? How far will you go to work with school districts to secure student data? For example, would you be willing to sign a memorandum of understanding or a data use agreement?

We care deeply about the privacy of all our users and have always worked to create a safe learning environment for students and teachers alike. In fact, the primary reason we decided to incorporate as a nonprofit is because we wanted to provide free access to education, without ever having to do things like advertise or sell student information. We make sure we are transparent on what we do with students' information, and we get explicit permission before any personal student information is shared with anyone. There have been situations where we worked with third parties, such as SRI International, to do research, but we were very careful to ensure we got proper and explicit permission from students and parents.

So, yes, we take privacy very seriously and we'd be happy to work with school districts to ensure we are collectively protecting student information.

What misconceptions does the education community have about Khan Academy and what it contributes to learning and teaching?

One of the questions I sometimes get is whether Khan Academy is trying to replace teachers with technology. I think we all know and have personally experienced that there can never be anything that replaces what a great teacher can do. We hope that by providing teachers with a comprehensive and free learning resource, we can be one of the tools that help empower and elevate the role of the teacher in the classroom.

Another misperception that stemmed largely from the popularity of our early YouTube videos is that Khan Academy is just a video library that students passively watch, when in fact our focus and most of our usage has been students actively practicing using our interactive exercises. In addition, as I mentioned, over the past year we've brought in a team of over 40 math educators to create thousands of interactive exercises designed for the Common Core standards and to provide students with instant feedback, hints and step-by-step solutions.

The videos are only there as supplements to the instruction students get from teachers.

Can you help readers visualize how Khan Academy's new relationship with College Board for SAT test preparation is going to work?

Rather than focusing on "cramming" or teaching students how to game exams, we want to help prepare students with deep practice that will build a solid foundation in math to help them be successful not only on the SAT exam, but also in college and beyond. We are working in close collaboration with the College Board to create thousands of in-depth practice problems and instructional videos available spring of 2015 – a full year before the launch of the redesigned SAT. Students will be able to practice at their own pace using Khan Academy's personalized learning dashboard. The dashboard will recommend exercises at each student's level and show progress, points and badges as students accomplish their "SAT mission."

What's the next big thing on the horizon for Khan Academy?

We know this is a really critical time for students and teachers. This year, we're going to continue to roll out resources to help millions of students and teachers transition to the Common Core math standards. We'll also be focusing on building a world-class learning experience that helps students build the math foundation they need for the redesigned SAT by spring of 2015. And of course, we'll be continuing to make our teacher tools and reports even simpler and easier to use, and making our student learning dashboard more engaging for students.

"Sal Khan describes the passion behind Khan Academy," by Julie Phillips Randles. Originally published July 2014. Copyright © 2014, *entrsekt* magazine; ISTE (International Society for Technology in education), 1.800.336.5191 (U.S. & Canada) or 1.541.302.3777 (Int'l), iste@iste.org, iste.org. All rights reserved. ISTE members have special reprint permissions. For more resources like this, consider joining ISTE as a member.

Rebecca Davies' APP SMASH

For the last two years I have searched for the perfect apps to use in my classroom. Some promised fantastic results, but did not work as promised or were not effective in a school context. Others were incredible and earned a permanent place in my classroom. At a school-level, though, I needed apps that were easy to use, easy to teach, cross-curricular and developed the learning of all students, regardless of year level. Below are 15 apps that are used across all year levels in my P-9 school. They have become an established part of our technology repertoire because they match the above criteria and, most importantly, students love to use them. Hopefully the teachers and students in your school will love them too!

Borrowbox allows you to borrow ebooks and audiobooks from most Victorian public libraries for free. You can search through books by age categories or similar titles.

Earth Viewer: What did Earth look like 250 million years ago? This app allows you to scroll through 4.5 billion years of geographical history, with information such as a temperature map for the last 100 years.

Werdsmith: A distraction free writing app that allows you to set word count goals. It backs up to Dropbox and allows you to easily send your work to friends for feedback.
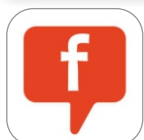
Fotobabble: This app allows you to take photos and add voiceovers. It is fantastic for excursions, reminding students of their questions and thoughts for later reflection.

Duolingo: Learn Spanish, French, German, Portuguese, Italian or English through gaming! Compete against others, earn XP and level up your language learning.

Sphere: View panoramas from around the world or take your own and add them to the community. A fantastic app for writing and geography.

Verso: Built for flipping the classroom, this app allows you to push content to your students and for students to respond through comments and quizzes.

Kodable: Learn coding through gaming! Drag and drop code to create a path for your 'fuzz' character to follow and earn rewards. Can your students collect every member of the fuzz family?

Green Screen by Do Ink: Turns any green wall (via paint, material or paper) into a green screen for special effects backgrounds. You can create reusable templates and record in high definition for high quality videos.

First The Visual Schedule: A visual timetable for students, you can create a checklist for each task and use photos to remind children how to complete the task correctly. This app includes thousands of stock images, or you can use your own.

Scribble Press: A simple book creation app with many templates to choose from. This app allows students to draw their own images to match their story and gives them 500 drawing tools to choose from.

Learnist: A 'crowd sourced collection of the world's knowledge', Learnist is a collection of curated content. Search for information already collected about almost any topic.

Study Blue allows you to enter the information you need to learn and converts it into flash cards, quizzes and review sheets. It also calculates which questions you are regularly getting correct or incorrect, so you know where to focus your study.

Trello: A collaborative organisation app, Trello allows groups to track their progress. Create checklists, assign tasks to specific people, leave comments and feedback for your group members and keep track of what is already complete.

Touchable Earth: A global citizenship app, Touchable Earth allows students to learn about cultures from around the world through videos of children's families, homes and schools.

Institute of the Modern Learner:

modelling transmedia learning environments

Abstract

This paper discusses the development and delivery of the Institute of the Modern Learner alternate reality learning environment that was delivered at the 2014 Digital Teaching & Learning Victoria Conference. It explores the way teachers can be supported to understand the use of technology as a learning tool in non-instructional environments.

The formation of The Institute & transEDU

Our hopes fell through the floor as The Messenger broke her news. Only moments before she had stood before us, her bravery so bright we need sunglasses, willing to take the risk not only of the time travel itself, but of facing our fears.

We had been concerned for some time. Things weren't right. The young people were turning away, deciding there was no meaning for them anymore. Things became stagnant. No matter what we tried, new ideas wouldn't stick to anything, and changes would fall apart before they were even finished. We feared at some point the effects of this would compound, creating a catalyst for what we now know as 'The Event.'

"I'm sorry," she said as she hung her head. "I wish I'd experienced something else."

"But, what do you mean 'the future is broken'? How can the future break?!" we implored.

And, this is how the Institute of the Modern Learner was formed. It is the story of a broken future, of a need to provide students the skills and knowledge so that they can fix what we leave behind. (In that sense, it is very *Terminator 2*).

The Institute of the Modern Learner is an alternate reality learning environment (or game) that was developed by myself, Jess McCulloch and Kynan Robinson in response to Digital Learning and Teaching Victoria's call out to develop and design without constraints when considering the 2014 conference held in July. Jess and I had previously been working on an alternate reality game (ARG) for Education Services Australia and the Chinese Teacher Training Centre at Melbourne University. We had found the experience rewarding and challenging in that in the process of scaling the story and classroom delivery Jess had originally designed we found the need to develop handbooks and resources to accompany our creation, *The Dragon Collective Trilogy* that supported teachers to understand both what it was as a resource and how they could use it.

In testing, what became obvious was that teachers who quickly understood and connected with the approach were able to iterate the resource and story themselves that made it more immersive and more deeply connected to their local environment.

In discussions with Kynan, we had also been exploring and trying to challenge an aspect of teacher professional development in terms of learning and applying modern learning approaches. By this term, modern learning

Daniel Donahoo
Project Synthesis, Melbourne

Daniel Donahoo works at Project Synthesis and a co-founder at Deeper Richer. He works at the intersection of play-based learning, technology and trust. Daniel has publishing two works Idolising Children (UNSW Press) and Adproofing Your Kids (Finch) and blogs at Huffington Post, New Media Consortium and GeekDad

approaches, I mean the experiential approaches such as inquiry and project-based learning (but, I know Kynan also would include networked learning in there). Given what we know about these learning theories and frameworks, there is a degree of disconnect if teachers learn about these styles using more traditional models of learning. The key point being, is the best way to learn about inquiry-based learning sitting in a lecture theatre listen to someone speak to powerpoint slides?

These were the three driving forces that resulted in the first prototype of the Institute of the Modern Learner:

- Space and opportunity offered by DLTV in trying to reimagine their annual conference

- Experience and learning from the design and development of a series of alternate reality games

- A desire to develop a professional learning environment that used the types of modern learning approaches we advocate as being best for our students.

We are now beginning to call out practice and work in this space transEDU to describe the bringing together of transmedia storytelling and learning environments to provoke and support modern learners.

So, exactly what is transmedia storytelling and alternate reality games.

ARGs & Transmedia in Education

The terms alternate reality and transmedia are often found together. They are very much different things. But, with strong

links and connections in terms of design and delivery of stories and learning.

The term transmedia simply describes the use of different media and platforms to create a storyworld or deliver a story experience. The roots of transmedia come from the film industry where it describes both the audience engagement with a storyworld. Stars Wars for example has a rich transmedia storyworld developed out of films, but also exists in figurines that children play with and tell their own stories on the bedroom floor, through to spin off cartoon series, comic books and computer games – all connected to and part of a bigger story universe. It is not lost on producers of the market value of this approach.

Alternate Reality Games (ARGs) are often narrative or storyworld-driven experiences that are delivered in the world in which we live, but which reflect a different reality (often one that is unreal or hyper real). It uses transmedia storytelling approaches through using different platforms where the story might start as a provocation on twitter, but then lead you to a website where you watch a video and in turn sends you to a physical location where a note on a tree continues the story further.

There is an emerging tradition of using transmedia and ARGs in educational contexts. We have ourselves been inspired by the work of companies like the Agency of Coney in the UK who have developed A Cat Escapes and other alternate reality experiences in the classroom that they call "Adventures in Learning". We've also found Lance Weiler's work through a project called LYKA to be a fascinating exploration of how transmedia can be used. And, of course we are observing teachers' across Australia look at how they can better use story

and perhaps even unwittingly, transmedia in their own practice.

The power of transmedia storytelling and especially alternate reality games is that it utilizes so many engaging forms of learning. It uses technology in different ways, it uses story and narrative through which we have learnt since we scribbled on cave walls or talked around a fire. It offers a student agency and control over their experience, while simultaneously asking them to let go a little bit and be open to surprise and possible some unexpected experiences.

Unexpected experiences are fantastic. They can occur from a live actor suddenly entering a classroom or a letter turning up for one student in class with the next clue or part of the story. They are the experiences that leave the player or student wondering, "is this really a game, or is it real?" It is what we tried to use as a hook and to drive interest in the Institute of the Modern Learner.

What was it?

The Institute of the Modern Learner first made its mark at Digital Learning & Teaching Victoria's 2014 conference during registration. Our game runners were walking randomly up to people and asking the question "Have you been contacted by the Institute?" and then handed a card. These cards were teasers with little notes written on them like "The Future is Broken" or " Attention: Be on the watch for suspicious behaviour". Aligned with this was a twitter account that began to use the #dltv14 hashtag and direct conference participants to the Institute website which told the story and offered a space for reflecting on the key question or line of inquiry that the Institute was interested in exploring at the conference, that was "How can we empower modern learners?" The aim was to capture the "wisdom in the room" and have everyone at the conference, not just the speakers sharing with each other (and the Institute) their thoughts and practice in terms of modern learning. We had several points of entry and ways people would answer the question: through a google form on the website, email, on twitter, a hardcopy survey in the Games

in Education section and some USBs that were mysteriously handed out and exchanged by conference participants. We also had further provocations with slides planted in keynote speakers presentations and posters going up around the venue.

All of this was to give people a sense that something was gong on, that there was something to be a part of – an "alternate reality" that existed because we were talking about it and because there were posters and because there were slides in the keynotes.

Over the two days, we had more than 60 responses to the inquiry question. We had hundreds of interactions online and offline. It culminated in taking over the final keynote and explaining to the audience what the Institute was – and to stay tuned.

What happens next?

What do we do from here? Well, we have been collating what we have been told and the Executive has expressed an interest in hearing directly from modern learners themselves. So, we are actively having some discussions with teachers who might be interested in joining the Institute as Thinkers and help us undertake further work. If you are interested. We'd love to hear from you.

Links
The Institute of the Modern Learner: http://instituteofthemodernlearner.com/
Adventures in Learning: http://coneyhq.org/2012/01/18/a-cat-escapes/
Lyka's Adventure: http://www.welovelyka.com/
The Dragon Collective Trilogy: http://www.nmc.org/news/transedu-alternate-reality-gaming-education

Fuelling the Desire to Learn:
Introducing MWorld

When our team at Monash University set about designing a new educational platform, we were guided by one simple principle: make learning fun. We figured that kids should look forward to discovering things about the world around them. Childhood is all about curiosity. How about giving kids somewhere safe to let it run free?

And so we created MWorld.

MWorld is an interactive world of learning like no other. Designed for children aged 8-12 and delivered in app format, it unites multimedia, enthralling gameplay and content produced by a host of academics. Developed by Monash University, MWorld showcases the wonders of science, early civilisations, the natural world, art and music, language and culture, the modern world. After two years of design and development, MWorld was launched in September 2014. This article tells the story of MWorld's origins, design principles and goals.

Origins

That MWorld exists in the first place is testament to the remarkable evolution of digital technology over the past decade. The power and versatility of computer tablets permit MWorld to deliver content through a series of self-contained titles, each of which, much in the manner of a mini-eBook, relates a four-part story prodigiously enhanced with narration, quizzes, videos and audio tracks.

MWorld stands as a bridge between the intellectual values of a pre-digital 'traditional' learning culture, with its emphasis on elementary skills such as literacy and numeracy, and those of

today, whose focus on often-breathtaking audiovisual wizardry tends to come at the expense of those same fundamentals. As reflected in repeated PISA surveys, literacy among Australian children has been declining since 2000.[1] It's an alarming trend that MWorld, with its literate, diverse and compellingly presented content, is designed to reverse.

Design Principles

MWorld's goal is a simple one: to immerse kids in a thrilling journey of discovery that lights the fires of curiosity and fuels their desire to learn. To achieve this, we decided to build MWorld around six mutually supportive intellectual pillars.

Our vision of MWorld was of a system that would, first of all, encourage self-directed learning. It would rely on storytelling to share knowledge, not lecturing. It would offer diverse, interesting content. It would make clever use of games. It would use creativity as a pedagogic tool. And holding it all together would be a presentation so captivating, so beautifully rendered and exciting, that kids would find it irresistible.

Let's consider each of these in turn.

MWorld's premise is that children are instinctive self-directed learners. That is, when offered the opportunity to choose their own path through new intellectual realms, they'll happily set off on their own journey of discovery – no coercion or wheedling necessary. But this is possible, of course, only if the content has been mapped and structured in a way that encourages such autonomy.

Material in MWorld is therefore presented in the form of an
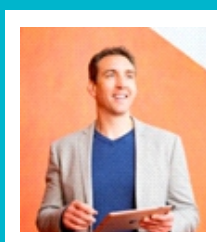
Eleonore Bridier
Engagement Marketing & Partnerships
MWorld, Monash University
eleonore.bridier@monash.edu
+613 9905 4143

Justin Bokor
Director, Innovation
MWorld, Monash University
justin.bokor@monash.edu
+613 9905 8519

inverted pyramid. Inspired in part by Benjamin Bloom's taxonomy and theory of enquiry-based learning, we've discarded the linear narratives favoured by books in favour of a hierarchical system that makes full use of digital capabilities.[2] Core concepts reside at the top level as coequals, and the child is invited to drill down and explore each in whatever order they see fit. Enquiry questions are used to stimulate curiosity and broach underlying topics. Since progress through titles flows so naturally, the child always feels that they've become part of a grand story rather than been left to flip through an arid textbook.

Coherence means everything in MWorld. It's impossible to spin a tale without it, and without a tale there can be no MWorld title. We're not hovering at a lectern burying our young audience in piles of disjointed facts. Instead, we're sitting at their side discussing a topic dear to us – whether it's Picasso, Persians or penguins – in language that's engaging and accessible. Our authors know their stuff. MWorld turns that stuff into stories.

The world is fascinating and variegated and subtle, hence so must be MWorld. No child born today will go through life without coming face-to-face with new cultures and all the different peoples, histories and literary traditions that represent them. MWorld goes far beyond the narrow focus typical of many digital learning products and invites children to explore our whole planet – past, present and future – in all its glorious diversity.

Games are integral to MWorld. Ingenious and enchanting, their conspicuous purpose is to motivate children, to grant them progressive diversionary respites from what is sometimes quite challenging material. But our games do double duty: being closely tied in with each title, they also serve to reinforce the subject matter. Although the science of learning through gamification is still evolving, in MWorld we consider it one of our most important tools for reaching out to children and connecting with them in a way that reminds them that serious learning can be fun, too.

Creating is as much a part of the learning process as reading and listening.[3] It turns the child into an active participant in his or her own education. As with games, a well-designed creative element fulfils the dual role of keeping the user's interest keen and consolidating acquired knowledge. MWorld's ludic flagship is an in-app island that children get to populate with fantastic creatures and structures as they complete subject areas. They also write stories, compose music and design vehicles. And by allowing them to share their creations with friends over our internal social network,

MWorld introduces a gentle, study-enhancing competitive dimension.[4]

All of the above would be for naught, of course, if it weren't woven together in a package that properly exploited the possibilities of tablet-based learning platforms. MWorld is saturated with multimedia content, from professionally produced videos to musical recordings to comprehensive in-title narration. Students immerse themselves in a rich world of visual and aural stimulation in which they can choose to see and hear the subject matter in action, then read, reflect on and discuss the accompanying explanation. It's an interactive learning enhancement of immense benefit to students, one that would have been technically impossible to implement barely 15 years ago.[5]

School Trial and Feedback

MWorld is engaging, lively and colourful, with content that is fascinating and of universal appeal and educational value. The vision that drives us is to harness the power of captivating content, storytelling, and beautiful design to inspire curiosity and a love of learning.

MWorld is now available for iPad in the App Store, with Android and web-based versions to follow. To find out more, please visit our website at discovermworld.com. And please don't forget to share your feedback and comments with us – we'd love to hear what you think!

Team MWorld are currently reaching out to teachers and educators across Australia to trial MWorld in classrooms. To help teachers explore MWorld with their students, we are giving teachers ten MWorld titles valued at AU$19.99 per student for free. If you are an educator and would like to get involved, please contact our Partnerships Manager, Eleonore Bridier.

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The Digital Play Framework: helping early childhood educators integrate technologies with play-based learning

Abstract

The provision of digital technologies in early childhood education is increasing. A common problem is how children learn to use technologies through play and how to use technologies to engage play. The Digital Play Framework presents a series of indicators oh how children learn to use technologies through play which can assist educators to provide targeted support to help foster children's learning.

Technologies in early childhood education settings: a common problem

Kim is an early childhood educator who has been working with pre-school aged children for twenty years. In the last five years Kim has become interested in using technologies in her kindergarten setting. This is because the children attending Kim's kindergarten are increasingly using a range of technologies in their homes and communities, including touchscreen tablets, mobile phones and gaming consoles.

The children often talk to her about these technologies and because the technologies are not readily available in her classroom the children have started creating their own 'pretend' devices to inform their play. Kim has seen children make touchscreen tablets from cardboard boxes and turn wooden blocks into gaming console controllers. Kim faces a longstanding problem that is common to many early childhood educators across Australia - how can she incorporate what she knows about young children learning through play into the provision of technologies for children in early childhood education settings?

Susan Edwards

Susan Edwards is a principal research fellow at in the Faculty of Education at the Australian Catholic University. Her research focuses on dimensions of the early childhood curriculum, including teacher uses of theory, digital technologies, play and sustainability.

Jo Bird

Jo Bird is a fulltime doctoral candidate in the Faculty of Education at the Australian Catholic University. Her research considers the use of digital technologies in early childhood settings.

Play-based learning and technologies in early childhood education. Twenty years ago researchers were concerned about the impact of technologies on young children's play in early childhood education settings. This is because early childhood education is predominately play-based and orientated towards the belief that children learn through active and exploratory-based engagement with their world. At the time, technologies were viewed as limiting the potential for children to participate in such exploratory activity and so considered 'inappropriate' for young children (Healy, 1998). This is no longer an accepted view according to recent research (Yelland, 2011), and increasingly international early childhood curriculum frameworks include children's play with technologies as an important learning outcome in the early years (Ministry of Education, 1996; National Association for the Education of Young Children, 2012). This is the situation in Australia, where the Early Years Learning Framework includes technology use as an outcome in Learning Outcome 5: Children are effective communicators (Department of Education, Employment and Workforce Relations, 2009).

More recent research focuses on understanding play-based learning and technologies in early childhood education as digital or technological play (Edwards, 2013; Stephen & Plowman, 2014). This research shows that children learn to use technologies *through* play, as well as using technologies to engage *in* play. In our research we have been interested in understanding more about how children learn to use technologies through play so that children can use them in their play. It was this interest that led us to develop the Digital Play Framework.

What is the Digital Play Framework?

The Digital Play Framework is a framework that outlines how children learn to use technologies *through* play before moving onto use technologies *in* their play. We first developed the framework when working with pre-school aged children using video-cameras (Bird, Colliver & Edwards, 2014). We noticed that the children did not immediately use the cameras in a sophisticated way. Instead, they engaged in lots of exploratory behaviour during which time they established all the different

Table 1

	Object of activity	Behaviours	Indicators	Description
Digital technologies-as-tool	Epistemic play	Exploration	Seemingly random use of the device	Seemingly random footage, images, pressing the iPad, moving or clicking the mouse.
			Locating the operating functions of the device	Locating the on/off button (video camera), shutter button (still camera), home button (iPad), keyboard (computer) or mouse (computer)
			Exploring the operating functions of the device	Exploring the on/off button (video camera), shutter button (still camera), home button (iPad), keyboard (computer) or mouse (computer)
			Following directions of the device or other people	Following the directions of the device or other people
			Seeking assistance for desired outcome	Asking adults or peers for assistance to use the device
		Problem solving	Relating actions to the response/function	Pressing the on/off button, relating turning the camera to what is in the viewfinder (video camera), pressing the shutter button, relating turning the camera to what is in the viewfinder, pressing the Home button to change Apps, scrolling through Apps (iPad), relating mouse and keyboard to actions on the screen (computer).
			Trying different actions to solve an issue	
			Intentional use of the operating functions	
		Skill acquisition	Intentional and deliberate use of functions for desired outcome	Being able to view taken footage (video camera) or images (still camera), scrolling and tilting (iPad), using mouse to move cursor, click and double click program icons (computer)
			Sharing learned actions with others	Being able to share knowledge of functions of the device with others for the purpose of teaching others (ZPD)

		Intentional and controlled footage of observable people, events and situations or manipulating the App or program for own purpose	
Ludic play	Symbolic	Deliberate use of device for pretend play	Using the device to record already established pretend play or to record re-enacted play (video and still cameras), selecting an App specifically for pretend play (iPad), selecting a program specifically for pretend play (computer)
	Innovation	Creating pretend play deliberately for use of the device	Creating a pretend play to record (video or still cameras), selecting an App specifically for pretend play (iPad), selecting a program specifically for pretend play (computer)

The Digital Play Framework (Bird & Edwards, 2014).

We used both Hutt and Vygotsky's ideas to create the Digital Play Framework because epistemic play was what the children were doing while they learned to master the functions of the camera. The children moved onto ludic play as the new 'thing they were doing' once they had mastered the camera as tool. In the Digital Play Framework were we able to list the range of behaviours Hutt described for epistemic play as exploration, problem-solving and skill-acquisition. We were also able to list the behaviours she described for ludic play as symbolic and innovative. We were then able to generate a series of indicators and an accompanying description for the behaviours according to what we had seen the children do with the video-cameras. We tested the Digital Play Framework using observations we had of children using a range of technologies, such as touchscreen tablets, laptop computers and digital cameras. We found that the indicators and descriptors worked for each of these technologies as well (Bird & Edwards, 2014).

How does the Digital Play Framework help early childhood educators?

The Digital Play Framework helps early childhood educators to understand how children learn to use technologies *through* play and then how they use technologies *in* their play. This is important in early childhood education settings because the provision of curriculum is predominately play-based. Using the Digital Play Framework educators can observe which behaviours and indicators children are engaging in as they learn to use technologies. Educators can plan to support children in the early epistemic aspects of their play with technologies. Supporting children in epistemic play with technologies helps children to master technologies as 'tools' they can then use in their ludic play. Ludic play with technologies is the play-type

that research and international curriculum documents promote as necessary for young children. This is when children use technologies in their play to create new and innovative digital and media-based representations of their world. Using the Digital Play Framework, educators such Kim can integrate technologies into play-based approaches to early childhood education because they can use what they know about children's play to foster children's learning to use technologies through and in their play.

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Common Sense That Is Not Always So Common
– A Review of Danah Boyd's It's Complicated

Aaron Davis is Curriculum Implementation Leader at Brookside P-9 College. He has a long history working to embed technology in the classroom as a means for making learning more effective and meaningful. This has included rolling out interactive whiteboards, the Ultranet and 1:1 devices. Aaron has presented at several conferences, including ICTEV13, DLTV2014 and Melbourne GAFE Summit 2014, focusing on collaboration and communication in and out of the classroom. In addition to all this, Aaron is very active online and has a passion for how being a connected educator can help continue the conversation in regards to educational change.

Voltaire once suggested that, "common sense is not so common." So to can Danah Boyd's It's Complicated: The Social Lives of Networked Teens[1] be seen as an attempt to reposition the debate about teenagers and the supposed scurvy of life in an online world. Boyd sets out to dispel many of the negative and dystopian views that so often fill the news. As she moves from one case study to another, I was left with many aha moments, particular while reading about fear and privacy. Having grown up with the practise of placing the desktop computer in a public space, it had never really occurred to me some of the deeper consequences of such actions. That is not to say that such approaches are wrong, but like every choice, everything comes with a cost. At its heart, the book puts forward many of the issues and

Aaron Davis
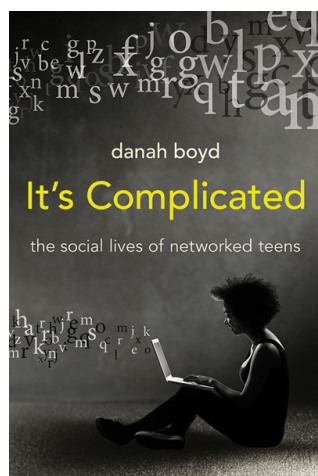Curriculum Implementation Leader at Brookside P-9 College

arguments that are too often overlooked in mainstream education.

The reality is, living in a networked world is complicated for as Boyd states, it is both the same as, but also different from yesterday. For example, many teens cling to online networks as a social space to belong and just be. Like the drive-in of yesteryear, it is the structured unstructured environment where they can just hang out. However, online spaces are also considerably different to drive-ins though, for unlike the physical world, many of the actions and consequences in a digital world leave a trace and are forever ongoing for others to see.

I entered this book not quite sure what to expect. A part of me thought that Boyd would magically provide a breadth of tools and techniques for addressing the supposed dyer state teens on social media. Yet what I was left with was a series of thoughts and reflections about my own world. Boyd shone a spotlight on such issues as the supposed equality online, as well as the media fear mongering associated with addiction and sexual predators. However, the question that I was left wondering about the most was what are the consequences of the ongoing divide now occurring in all facets of life between those whose lives are increasingly embroiled with the online world and those whose aren't - what Connaway, White, Lanclos, Browning, Le Cornu and Hood[2] have termed as digital 'visitors' and 'residents'.

It's Complicated does not provide the panacea, that magical cure for all the social ills suffered by teens today (and yesterday and tomorrow) who live in a digital world. The reason that it doesn't provide this is because it can't, such a thing does not and cannot exist. Instead the book provides what America anthropologist Clifford Geertz described as a 'thick description'.[3] A thorough account that not only provides a description of behaviour from a wide range of different points of view, but also an interpretation as to the context that produced such actions. As Boyd herself has stated,

> I wrote this book so that more people will step back, listen, and appreciate the lives of today's teenagers. I want to start a conversation so that we can think about the society that we're creating.[4]

The purpose therefore is not to provide an answer to society's ills, but instead to provoke dialogue and debate at both the micro and macro level, whether this be teachers in a staffroom or politicians producing policy.

Although Boyd's book is written for adults about teens usually in America, in many respects it is a book that uses teens to confront adults from anywhere about many of the issues that we so often leave silent. I think that challenge that we have is to discuss these matters and from there create a more reasoned approach to the matter. For as I have spoken about elsewhere, it takes a village to find a solution and hopefully together we can create a better world for everyone.

http://readingwritingresponding.blogspot.com.au/2014/04/common-sense-that-is-not-always-so.html

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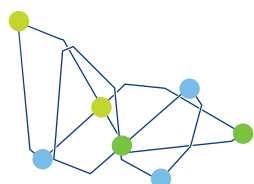
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