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DLTV JOURNAL

The Journal of Digital Learning and Teaching Victoria

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Digital Learning and Teaching Victoria

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Contents

DLTV Journal
The Journal of Digital Learning and Teaching Victoria

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Editorial




Clark Burt, Matt Harrison, Pennie White and Roland Gesthuizen.
Journal Editorial Team

Stay safe. Stay brave. Stay connected.

The year 2020 has been unlike anything we have ever experienced with many teachers, parents and students pushed out of their comfort zone. After dodging the smoke filled haze of the summer bushfires driven by climate change, we watched together the COVID-19 pandemic sweep across our country, slamming closed the doors of our school buildings to mark the beginning of our school term in isolation.

It is remarkable that teachers could mobilise quickly to remote and flexible teaching online. For those with children at home, it was an interesting experience to work alongside them. For some it was a familiar journey with new challenges, for others it was a trial by fire. This transition to online teaching was unprecedented in both its scope and impact, and there is much we can learn about what worked, what we missed and what we gained.

Not only did the shared crisis of the pandemic make us appreciate the things we usually take for granted such as nurses and cleaners, it also highlighted the power of our technology to keep us connected to our community and support our most basic needs. It reminded us that learning doesn't just happen inside the world of a building with the word 'school' stamped upon it.

Attendance at DLTV webinars skyrocketed as teachers struggled to make sense of what was happening then get on with the job of teaching whilst inspiring others to learn. The experience has helped us to redefine our understanding of education and the essence of schooling. Technology kept our virtual classrooms open and our craft of teaching alive.

We have read articles about how school refusers and those with disabilities who had historically struggled to engage with learning are now thriving in a remote environment. We implore all educators to consider how we can continue to use technology to help our disconnected students, technology to virtually connect our classrooms, and technology to improve teacher learning and sharing. This experience could be the catalyst for improved teaching and learning experiences and greater inclusion of all students.

As we emerge from our homes over the next few months, we can reflect on this experience and use these new understandings to improve the educational outcomes for all our students and consider the kind of world we really wish to live in where social justice prevails, students are heard, differences are catered for, scientists are respected and teachers are celebrated as champions.

This issue starts with a similar message from our president and then provides insights into remote teaching and then classroom DigiTech ideas.

We welcome your contributions to the DLTV journal and thank you for being a part of DLTV.

Best of wishes.

From the President

Ben Gallagher

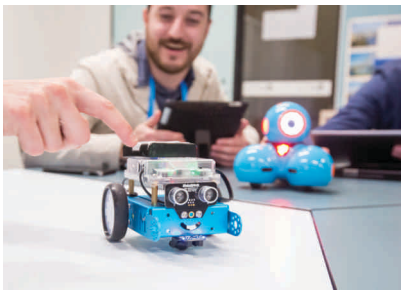
We have always known that Victorian teachers are resilient, but the past two months have demonstrated the extraordinary lengths that our profession is willing to go to ensure that every Victorian child receives a quality education. Our Digital Learning and Teaching Victoria members and friends have come together to share their collective expertise and support our broader communities. This rapid digital transformation born from circumstance has highlighted not just the need for technical competencies, but more importantly the need for collegial connection. Many educators have developed innovative resources to engage their learners, volunteered their 'free' time to upskill their colleagues, and spent hours on the phone reassuring tired and concerned parents.

Despite the success of this rapid transition serious challenges remain. Equitable access to online learning environments, particularly the issue of poor quality Internet access in our regional and rural areas, is a complex issue that our school communities have had to overcome. The illusive 'work-life' balance has become even more tenuous, as teachers working at home potentially had to support others. We have also heard from many of our members who have invested their own resources in order to ensure that their students receive a quality learning experience. This further speaks to the dedication of our members to a quality education for all.

Digital Learning and Teaching Victoria has been privileged to have been able to support our committed educators throughout this period. We unfortunately had to postpone our Australian Council for Computers in Education national conference in April, but we used this opening to pivot to finding new ways to support our teachers. We recognise that at this time our primary function is to support our members and the broader Victorian community. Professional Learning Leader Nathan Alison and our manager Kevin Daly have facilitated an impressive series of webinars which have been scheduled for the rest of Term 2 and into Term 3. These webinars have again brought to attention the wonderful breath of expertise within our membership, with topics ranging from how to a range of online tools, to ensuring that students with disabilities and differences are able to access remote learning experiences. Kevin and Nathan like many of us have found that working from home is no easy task, but I want to acknowledge their momentous efforts in leading these webinars.

Finally we wish to acknowledge that some of our membership has been personally impacted by COVID-19, which has presented numerous health and economic challenges to many individuals. You are in our thoughts. We are committed to supporting every single member of our community, so please let us know if there is something we can do to make this period easier for you and your students.

10 COMPELLING REASONS TO JOIN DLTV



1. The opportunity to attend our premier DigiCon annual conference at a discounted member rate.
2. Find new opportunities, teaching ideas and special offers through our informative fortnightly newsletter.
3. Access our expertly designed VCE resources kits and targeted VCE workshops.
4. Join our online Community of Practice, share your expertise and contribute to our popular webinars and podcasts (recordings are always available on our website).
5. We provide a strong professional presence and voice at local, national, and international forums. We achieve this through our representation on bodies such as the Council of Professional Teacher Association of Victoria (CPTAV), Australian Council for Computers in Education, International Society for Technology in Education and the Australian Computing Society.
6. Receive support and resources for your in-house professional learning and curriculum days.
7. You will receive our high quality member journal delivered to you digitally.
8. We provide access to experts in planning and implementing the Victorian and Australian Digital Technologies curriculums across all subject areas.
9. Connect to bodies such as Victorian Curriculum Assessment Authority (VCAA) Department of Education and Training Victoria (DETVic), the Australian Centre for the Moving Image, and Educational Services Australia.
10. DLTV also work closely with our industry partners including Adobe, Microsoft, Google, SMART, 2Simple Software and 3D Printing Systems to name a few, so you will have access to the latest news and can provide feedback.

Digital Learning
and Teaching Victoria

BITS AND BYTES

Correspondence, conversation starters and short thoughts from our community.
If you have something to contribute please email the editors at publications@dltv.vic.edu.au

ROBOBUS

TOUR REVIEW

By Aaron J Johnson

On Thursday the 3rd of October I was lucky enough to be given the chance to attend the RoboBus Tour, hosted by the Father Bob Maguire Foundation.

The tour took place between 2pm AEST and 3:45pm AEST, and I attended as a student-teacher representative of Monash University. The tour started with a friendly welcome outside of the aforementioned bus and, after a brief welcome from two members of the RoboBus team I was invited into their mobile STEM classroom. As I stepped into the bus the first thing I noticed was the colourful environment, which consisted of a delightful mix of bright greens, purples, oranges and yellows, alongside two rows of fairy lights and the occasional balloon. Here I was greeted by a couple more team members and my fellow tour guests, who included key benefactors and supporters of the RoboBus programme.

After a brief opportunity for introductions and mingling everyone gathered around a mounted TV display and the tour began with our presenter, Yen Slow, presenting an overview of the RoboBus programme's purpose, history, achievements, goals and aspirations. This included revealing that the programme will be working closely with five separate primary

schools and several community partners, such as the Emerald Hill library, during term four; this will include the organisation of several weekly hourlong workshops that would help to close the technological gaps for many underprivileged youths that are being affected by the "Digital Divide". The team acknowledged and gave thanks to the many partners and supporting organizations that have helped RoboBus flourish and grow into its current state; they particularly expressed their gratitude to Monash University for their assistance and support in the curation and preparation of the RoboBus technologies for implementation during their many STEM sessions and workshops.

This presentation was followed by a small speech from Father Bob Maguire himself; Father Bob spoke of his time within the military, his charity work and his unbridled passion for helping underprivileged youths receive the same educational benefits and technology access as everyone else. He also revealed the humble beginnings of the bus, which started as a travelling food hall that would welcome in and feed the poor and homeless, and explained that when he was gifted the bus out of good-will he saw it as an opportunity to help make a positive impact throughout many communities by fostering the growth and technological aptitude of the world's children.

After taking a short break for refreshments and more mingling amongst guests and team members, the tour continued with an 8-minute episode of "An Explanation" that featured the RoboBus; this episode included interviews with Father Bob and the RoboBus team, some footage of a STEM class taking place in the bus and a wonderful discussion on the acknowledgement of the original owners of Australia's land, and the important roles they play within Australia. This episode can be watched online at the following URL: https://www.youtube.com/watch?v=9Do-R31ZrMo. The tour concluded with a Q&A session, where the team answered questions and listened to suggestions the attendees had.

The tour truly highlighted the team's passion for helping others, and their drive to make a positive difference in the lives of others. Not only does this programme actively and transparently work with larger communities to make their services available, but they do so with no financial gain; all of their services are offered for free and no payments (monetary or other) are exchanged! As the team succinctly put it, their reward is seeing the attending children flourish and grow into capable and selfreliable digital learners (although the team does consider driving the bus to be equally as satisfying!)

I am grateful that I had the chance to attend this tour and gain a newfound appreciation for this truly wonderful endeavor, and highly recommend anyone with interests in STEM education to look into or even make contact with the RoboBus programme.

Digital Learning and Teaching Victoria

SPECIAL MEMBERSHIP OFFER 2020

Digital Learning and Teaching Victoria (DLTV) is a teacher-led and member-driven charity focussed on ensuring that every student receives a high quality digital education. We do this by supporting our community with professional learning, resourcing and advocacy. This includes supporting educators to deliver the Digital Technologies curriculum, as well as supporting the innovative and effective use of technology in the delivery of all curriculum areas.

SPECIAL OFFER

FOR NEW AND LAPSED MEMBERS

As part of our continuing commitment to all educators during these challenging times, DLTV is pleased to offer free individual membership for the remainder of 2020. This membership, usually priced at $159.00, is obligation free and intended to show our support for our broader teaching community.

SPECIAL OFFER

FOR OUR LOYAL EXISTING MEMBERS

We are also pleased to be able to offer our loyal **EXISTING MEMBERS** the following in recognition of their support to DLTV and their professional colleagues:

- A 25% Discount when you renew in 2021
- Two free places at our face to face workshops in 2020
- Bespoke mentoring and support with any DigiTech focussed professional learning you are providing at your school. We can help you design and run curriculum days or workshops in priority areas for your school. A popular examples is in helping your staff to develop connections between your Literacy, Numeracy and DigiTech programs.

Visit our website to take up this offer https://dltv.vic.edu.au/

Digital Learning and Teaching Victoria

STEPPING UP INTO A SPECIALIST ROLE

By Celeste Pettinella

Where do I begin? I have been in education for quite some time and never thought I would fulfil a specialist role in my career. I have been fortunate to have worked at a range of schools and taught across all year levels. I was excited to be told last year I would be a Science Specialist. Whilst, I have studied STEM Education (Science, Technology, Engineering and Mathematics) for postgraduate studies at Monash University, I looked forward to the challenge. I was internally driven to provide the best Science program for the students so I started tapping into my resources and thinking outside the box.

The burning question in mind was "How will I make the school Science program outstanding for all the students that I teach?"

To date, the program that I have delivered has been successful and a highlight in my education career. I have a better understanding of primary schools, the role for digital technologies, science discipline and how to transform areas of a classroom into creative learning spaces. It is another feather to add onto my education hat.

Once again, I have stepped up to the situation and now during the Coronavirus (COVID-19) I am teaching online from home, remotely teaching a year five class online. Stay safe and I look forward to hearing how others have changed their roles in a school.

Here is my recipe for Specialist Teaching Success:

1. Research

Do your own research and find books that are meaningful and useful. I visited libraries, looked online for books and blogs to follow. You can even explore social media channels or the STEM Australia Facebook Group or Instagram. Tell others what you are doing. Not only did family and teaching friends provide me with texts or ideas, they also shared some of their teaching ideas.

2. Connections

Build your professional connections. It really is a key into building one's educational profile. I joined associations like DLTV (Digital Learning and Teaching Victoria) and ASTA (Australian Science Teachers Association). I used my digital communications skills to contact science teachers from other schools and reconnect with friends who also taught science too.

3. Family

It is very important to find and build a professional family within your workplace that you can trust and work closely with. A specialist role can be isolating and potentially lonely. In my case, fellow year four teachers were supportive of my STEM work. With their help and social support, the helped to promote my Science work at staff meetings, promoted new topics to other teachers and helped share their notes. With the help of other specialist teachers, we built upon our work across the other year levels.

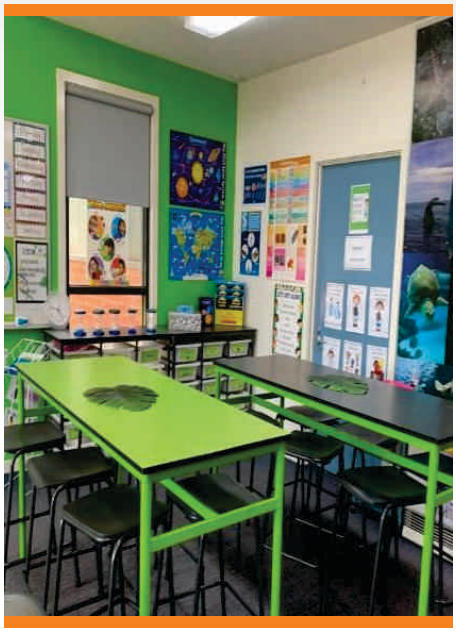
4. Build yourself first

Other educators shared their experience with coaching, mentoring and advice for professional leadership. Sandra Bishop in particular provided considerable leadership skills using Bastow text "Open-To-Learning Leadership" by engaging me in professional discussions about education. Even Roland who encouraged me to write this article provided some valuable Science texts and writing support.

My sister says anything in life just "own it" and over the years my parents have helped me to see this. Initially lacking confidence, it took me many years to believe in myself. I am a curious, agile and adaptable teacher.

5. Share your love

Debra Waters and Joan D'Abreo, worked closely to get up to speed with science education. Debra Waters explained why she closely mentoring me how to best teach it to my colleagues."Mentoring colleagues is rewarding especially when you know they're appreciative and will apply the knowledge to improve their learning and teaching. If you have the time, knowledge and resources to help others, then I think it's a great experience. If we all help each other, we'll all be happier, work more efficiently and be better able to plan and deliver our programs."



The New Normal:
Teaching Amidst Coronavirus

Emily Fintelman is a primary teacher at Spensley Street Primary School in inner Melbourne. She loves exploring the ways we can re-think education to create powerful and relevant learning for students. In particular, Emily works with her students considering how technologies can allow students to inquire, connect, create and make an impact locally and globally. You can follow her @mrsfint on Twitter and mrsfintelmanteaches.global2.vic.edu.au/

It is a difficult time for teachers. There is so much scrutiny and attention on what schools are doing right now. It feels like the whole world is watching as we scramble to build the plane while flying it. We are doing things many of us have never done before, but what has bothered me is that so much of the talk is about the methods and platforms we are using but not about what is important for learning.

Like so many teachers, I returned to school (from afar) this term with news of what (it felt like) every other school in the world was doing to tackle remote learning. I was slightly apprehensive that what we were presenting as a school might not be enough. That my friends in other schools who would be presenting three lessons a day and staying on camera for hours and hours would be doing better. That we hadn't factored in enough time for teaching.

I wasn't considering just how much time that left for learning.

We are two weeks in to our remote learning approach at my school. The amazing school I work at built a plan for remote learning where students select from a "learning menu". The menu has a list of tasks that dive deeply into a range of learning areas, including literacy, numeracy, STEM, the arts, humanities and language. There is a beautiful balance of open-ended tasks, problems worth solving, investigations, personal inquiries, games and tasks that consider timely learning opportunities like ANZAC Day, or ways to contribute to their community during isolation.

At this stage, most of the contact teachers have with students is wellbeing focused, ensuring students still feel connected to and supported by their school community in a difficult time. We are building and maintaining an emotional, social and psychological safe space amidst turmoil and uncertainty.

Teachers and staff have called and video conferenced with students, held whole class "meet ups", sharing jokes and projects and pieces of writing and smiles, and this week our small group virtual meet ups will launch.

Aside from these meet-ups, students' learning time is their own. And, boy, are they making the most of it!

I have a student who is in isolation near the coast. She is fascinated by the mutton birds she is seeing on her daily exercise. She has undertaken a personal inquiry into the characteristics and lifestyle of these birds, researching using various sources - including the primary source of her own observations - and is analysing the data she is collecting from her own research.

Another student helped a parent plant some vegetables in their garden. He is keeping a log of the growth of the vegetables by measuring them and noting the conditions they are growing in and how well they grow. He is looking into the recipes that they can cook once the vegetables are harvested.

At least ten of my students have created their own games. They are designing boards, cards and game pieces, developing stories, trialling and refining rules as they playtest on their families, developing complex gameplay scenarios and perhaps hardest of all, capturing all of this into rulebooks.

I am checking in with my students multiple times a week and I'm amazed to see what they're achieving. Instead of delivering lessons, I am listening to the learning they are already doing, and attempting to gently guide them where they can go deeper or further. I am providing prompts, questions and suggestions, extending their learning using whatever they are currently transfixed by.

So you are making a slideshow to share what you have learnt about the top ten surfers... Who is your audience? What tools can you discover in Powerpoint that will help engage your audience? Have you thought about including videos, animations, quizzes?

So you are practising a new skill you learnt... could you film an instructional video to teach others how to do it? Could you work on a script for the voiceover?

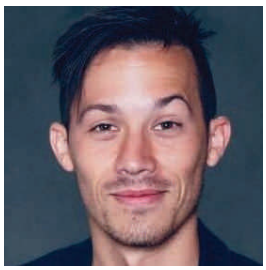
So it sounds like you really enjoyed the book you just finished. Can you create a way of making a book recommendation to share with others so they want to try that book too? Where can you share it so others can see it while we're in isolation? What information is best to include or leave out?

So your mum said you might be able to get a pet lizard if you convince her? What will help you persuade her... language, facts, emotions, costs? What information does she need to know? Try reading this book about a person with the exact same challenge. How will you present this to your mum in the most convincing way?

So much of the talk is about what students won't have access to… a carefully scheduled timetable, a teacher on hand at every second of their 6-hour school day, materials, internet and so on. But a compelling thought is that so many factors that are important for learning have not disappeared… agency, curiousity, goal setting, interesting questions, learning about things that are personally meaningful, feedback from teachers, peers and relatives, a genuine audience. They just look a little different.

Of course we don't want children to miss out on the classroom, but what if we looked at it a different way? What if, when students don't attend school, they aren't "missing out" but gaining? What if removing the school part of education just leaves more room for learning?

I'm hoping that a lot of the learning that is going on remotely will come back with us when we return to schools.



Rob Kelly is a Digital Technologies Teacher and Multimedia Learning Specialist at the Department of Education & Training, Victoria. He is a passionate advocate for public education and promotes excellence across the Digital Technologies curriculum. Rob aims to raise the digital technology skills of students and teachers and endeavours to promote the link between Student Voice and Student Agency via multimedia tools.

As the world continues to navigate through this challenging time, I wanted to share some insights with educators about Google Classroom. If your school is going down the Google Classroom route, here are a few tips to help you adapt and embrace this online learning environment.

1. When you set a task or activity for your students to complete, log-in as a test student to see what the assignments look like from the students' point-of-view. You may be surprised to find that it looks different to how you wanted it to.

2. As a Google Classroom is cloud-based, there's no more "losing" of assignments by students. You can set due-dates for tasks and even grade students work.

3. Google Classroom is a great way of encouraging peer-to-peer interaction that is documented. Helping students to understand they have a digital footprint is a great place to start teaching eSafety principles.

4. Like real-world classrooms, some students won't ask for help when they need it. They may not want to ask for help publicly. That's why it's important to ensure students have the option to ask questions privately or via g-mail.

5. Google Classroom allows you to see who's completed what–and when–at-a-glance. In real-time, you can receive work and provide feedback to students.

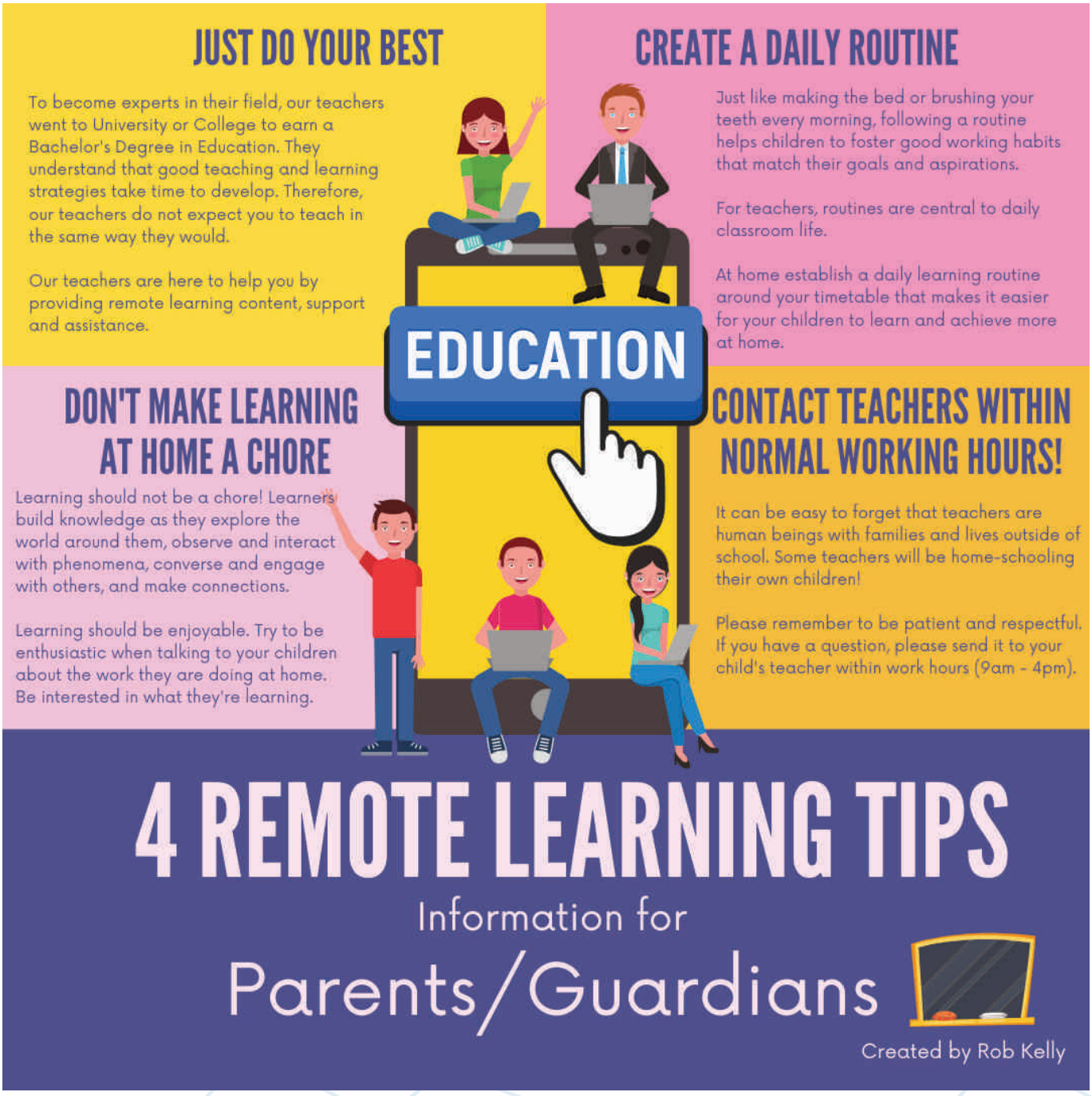
6. Google Classroom allows you to integrate Google Forms to poll students, create reader interest surveys and more. You can integrate the Google Suite in your digital classroom. If you're a secondary school teacher, one idea is to ask your students to record their academic growth over time using Google Sheets.

7. It may be tempting to use lots of adjectives and flowery language when describing an activity or task, but it's not a good idea. Keep the description of activities or tasks in your online classroom simple for students to understand.

8. Google Classroom allows you to aggregate and post commonly-accessed websites on your timeline. This helps everyone to access the same learning materials including videos, blogs, documents and links.

9. If you need help, ask for it. There are many teachers already using Google Classroom and they can be found all over the internet in lots of online communities. Check out my Twitter chat #eduLWDT and ask a question to the community.

10. Let's be honest, we could all do more to help the environment. Using Google Classroom will help us become paperless teachers; no longer relying on trees to teach.



Presenting engaging and creative online teaching & learning experiences

Adapted with permission by Tim Kitchen
https://timkitchen.net/2020/03/24/online-teaching-tips/

With online teaching and learning becoming the norm for so many teachers and students during the COVID-19 climate, it is important to be aware of what makes an engaging, creative and effective web-based teaching and learning experience.

Synchronous & Asynchronous

Online teaching usually involves a mix of synchronous and asynchronous methodologies. Synchronous online teaching is closer to traditional classroom teaching because it involves the teacher in live connection with their students whereas asynchronous teaching is a more student-centered approach where the student is self-directed to engage in learning tasks that have been provided.

Effective synchronous teaching online is however quite different to teaching face to face. It involves a skill set that develops with experience. It is more like being a live TV or radio presenter and producer then it is being a schoolteacher or university lecturer.

So don't worry if you are struggling in this new form of pedagogy, most educators will be. Even those of us who were early adopters find it a challenge to produce the perfect online lesson. Most students, parents and colleagues will be patient and supportive to teachers who are having a go and doing their best with the technologies that are available to them.

This article provides some tips and tricks to help educators develop their synchronous & asynchronous online communication skills and make the teaching as engaging, creative and effective as possible.

Help is closer than you may think

Learning online is not a new concept for many students. The online world of YouTube and interactive gaming is a big part of many of their lives. This is not a new world for them so don't be scared to ask them for help if you are feeling overwhelmed. You may even find it helpful to set up a roster of key students who are provided with hosting rights. They can then manage the technology while you focus on the pedagogy.

What online teaching platform is best?

There are many web-based communication platforms that teachers are using globally to conduct online lessons. Many school systems and universities have purchased specific online collaboration and conferencing tools such, MS Teams, Zoom, GoToWebinar, BlueJeans, Blackboard Collaborate and Adobe Connect. Some systems are designed for education and training and others are designed as video conferencing tools for small and large businesses. Some are part of an establish Learning Management System, others are stand alone.

There are free (or initially free) versions of the above solutions and other example such as Google Hangouts, Skype and GoToMeeting.

Whichever system you use, make sure it has at least the following features:

- video & audio streaming,
- live chatting
- the ability to share screens
- a way of uploading and playing video content (beyond sharing a screen)
- a way of seeing the names of the participants
- a way of muting or disabling participants web-cam

Preparing for an online synchronous lesson

There are similarities between an effective online teaching experience, a live TV production and a talk-back radio show. One is that they all require preparation to be effective.

Here are some preparation tips:

- Contact your students in advance via email to ensure they know how to access the site and when the sessions are taking place. Keeping to the usual school/university timetable is advisable to help maintain a normal routine for everyone.
- Provide your class with some video content or reading to digest in advance of the session. Follow a *flipped learning* model of teaching so that your time with the students is not all about content delivery and the time you do have with the class online can be spent enhancing what the students have already discovered. This is a good mix of asynchronous & synchronous online teaching.
- Prepare a series of short video resources in advance of each session to help breakup the content delivery. These can be created with simple to use video editing tools like the free Spark Video or Adobe Premiere Rush. This means less talking for you and hopefully more interest for your students. Again a nice mix of asynchronous & synchronous online teaching
- Have some polls/quizzes prepared in advance or run them via the chat feature throughout the session to help encourage the engagement.
- Create a slide deck with PowerPoint, Keynote or Acrobat that you can use to guide the students through the main teaching points. If your online portal is able to upload PDF and Video content then it becomes a better presentations experience then always sharing a screen, especially if you or your students are running on low Internet bandwidth.
- Turn off notifications on your devices and remove any other potential distractions
- Ask your family members if they could try and avoid Internet based activities that take up a lot of bandwidth like streaming videos.
- If possible, use an Ethernet cable to directly plug your computer into the Internet network. Direct cable connection will usually provide a more reliable and faster connection to the Internet than WiFi. Most modern homes have network points built into key rooms in the house

Use of the webcam & microphone

If you are in a quiet room, you can probably get away with just using the computer's internal mic. However, in most cases it is best to use a headset with mic. The closer the mic is to the teacher's mouth, the clearer the audio will be. I have found the Apple headphones that come with most iPhones to be as good (if not better) than some expensive USB mics that I have tested. However, I haven't tested them on a Windows based laptop. Bluetooth headphones & mics are generally fine but I recommend the plug in version for sustained quality and reliability.

It's often good to start a session by encouraging the students to open up their webcams but not their microphones. Having more than one person speaking at once is never a great experience, but seeing everyone (if the system allows) can be a fun way to start. It also helps establish a feeling of community which many of the students and yourself may be craving. If your system allows you to see the whole class, take a quick screen grab of the screen and use it later to take the roll, rather than using up valuable synchronous time with mundane admin tasks. If you can't see the whole class, screen grab the list of attendees within your system.

When it is time to start a synchronous teaching session, encourage the students to mute their cameras as well as their

mics. This will save Internet bandwidth as well as avoid unnecessary distractions for you and the students. The student can do most of their interactions via the chat feature. Occasionally, encourage the students to un-mute their webcams so that they can all be seen. This helps you to know that they are all still on-task and engaged. Take a note of the students who are not responding and chase them up via email later to check on them. They may be totally disengaged in the process or they may not have access to a webcam.

Some students will rely on seeing their teacher's mouth in order to read their lips. So, when you are on camera, think about the framing and fill the screen with a centered mid-shot. Body language, especially hand gestures can also help a student understand content better, so make sure the students can see your head, shoulders, torso and arms. And ensure the top of your head is at the top of the frame.

Look at your webcam most of the time when you are presenting. Treat the camera as someone you are talking to. Eye contact is a powerful communication technique.

Ensure that there is plenty of light (natural light is best) behind or to the side of the webcam. Try to avoid pointing the camera into a light source such as a window with open curtains or blinds during the day. This will help to provide the best possible image quality. Also have a think about the background and make sure it is not distracting. Some systems like MS Teams provide a feature that blurs out the background.

Monitor your session

During most sessions, you will log into the system as the host. This usually provides you with access to extra features and a different screen layout to the guests. Also, when you share your screen, you generally lose access to the chat and other features.

If you can, it is wise to log in as a guest on a second device like your smart phone, tablet or second laptop (if you have one). This way you can monitor what your students are seeing and keep an eye on the chat. It is easy to forget that you are sharing your screen when you don't want to. By having a monitor next to your main screen, you can see at a glance what you are presenting.

Having a second monitoring device also allows you to test that your audio is working. However, there will be a slight delay in your audio so, once tested, keep the volume of your second device down to zero to avoid any potential annoying audio feedback issues.

Flow of the synchronous lesson

Introduce each session with an interaction activity such as a quiz via the chat feature or a set of poll questions (if available). This will help the students to realise it is two-way communication experience rather than a podcast, YouTube or TV presentation.

Provide a slide early in the session that outlines the aim and the planned objectives so that everyone is aware of what is expected.

When verbally presenting the main content, mix it with a variety of images, animations and video content. Do some research and have a look at how live TV presenters share content and learn from the way they mix audio content with visual content.

Keep an eye on the chat when possible and encourage students to ask questions and make comments throughout the session. Put down some ground rules about appropriate chatting etiquette such as never put anyone down and keep the discussions relevant and on-task. Assign one of the students to monitor the chat when you are presenting and allow breaks so that they can share any questions or feedback that you may have missed. You may find that some of your usually more quiet and shy students are more confident in taking part in discussions via a chat pod.

Encourage students to also email questions, especially if they are embarrassed to use the chat feature. Assure the students that you are happy to connect with them via email if they need any individualised assistance.

After every 10 minutes or so, ask your students to give you feedback via the chat feature. This is a great way to monitor engagement.

Recordings

You don't need to record the whole lesson, students are more likely to watch back short video segments. Make sure you record important teaching moments so that students who may miss the live session can still catch up and students who were at the live session can re-look at content at their leisure.

Use you school learning management system (LMS) as the portal to archive all the links to the recordings. If your school does not have an LMS, create a Spark Page or a Google Site that can be dedicated to storing the key resources for each subject/topic.

The more sessions you run, the easier they become. I encourage your to practice a few times before going live and look back at the recordings of your practice sessions.`

When this crisis is over

The COVID-19 crisis is forcing a lot of change for a lot of educators and students. For a number of teachers, this may be

the first time they have used video and online technologies as a major communication tool. Many will be going through a steep learning curve in a short space of time.

At some point, schools and universities will be back to a mainly face to face operation but the new skills developed during this time can continue to be used in a blended learning mode, which will benefit future learning and teaching experiences and help prepare students for a future workplace where online communication is vital in many industries.

Let's look at the positives and use this experience as a time to develop new digital literacy, communication and creativity skills among ourselves, our peers and our students.

Summary of tips

- *If possible, plug into your Internet network rather than rely of WiFi*
- *Think of your synchronous lessons as a live radio or TV broadcast*
- *Don't stress when things go wrong, in most cases the students will be patient and supportive*
- *If in doubt, ask a student to help manage the technology for you. Ask a key student hosting rights to help moderate your live sessions.*
- *Make sure your students know the log in process and the time of your live sessions.*
- *Keeping to the usual timetable is recommended*
- *Provide video or other resources in advance for students to digest prior to the session. Follow a Flipped Learning model.*
- *Use lots of video content. Make up your own videos and get student to do likewise to share their learning*
- *Break up the session with chat responses, quizzes and polls*
- *Prepare slides with images and key text to progress through the session*
- *Avoid distractions like your phone and other family members*
- *Use a head-set, keep the mic close to your mouth but not covering your mouth.*
- *Open webcams at the start of a session but not mics.*
- *Mute all but the presenter's webcam during important teaching times*
- *One person speaking at a time*
- *Make sure student can see your mouth & arms*
- *Place your head at the top of the frame and look at the camera when talking*
- *Light should be behind or to the side of the camera, not behind you*
- *Monitor the session with a second device if possible that is signed in as a guest*
- *Give students opportunities to share with you via email after the session. Not all students will want to use the live chat feature.*
- *Record key parts of the session, not the whole event and store the recordings & other resources on your LMS or equivalent for easy access.*
- *Practice makes perfect*

Extra resources

During the COVID-19 crisis, I am running free weekly webinars with a focus on developing creative online teaching experiences for students. Whatch me in action to see how I conduct an online session and encourage your colleagues to join.

Adobe Connect users – click here for a user guide I recently made for teachers who use Adobe Connect which is currently free for 90 days during this COVID-19 climate.

Adobe EduTips – click here to access a growing set of resources which are focused on how to use Adobe Creative Cloud apps to enhance both face to face and online teaching and learning.

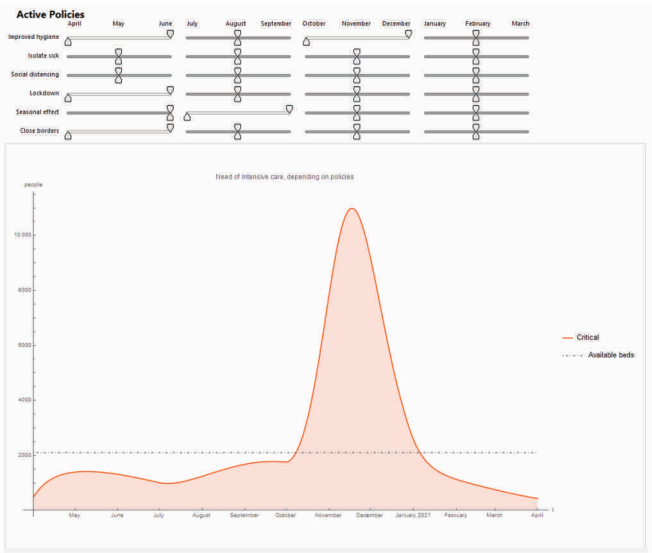
The Adobe Distance Learning Resources – The Adobe Education Team have assembled these resources and learning opportunities to help educators engage remote students through online learning.

Pandemic Simulations in a Nutshell

Digitech educators find inspiration by tinkering with public data and off-the shelf tools to understand COVID-19 pandemic dynamics.

By Roland Gesthuizen and Gary Bass (Virtual School Victoria)

Rarely is anything 'certain' before an event occurs. It is only through experience and the human ability to recognise patterns can informed guesses, wishful thinking or evidence based predictions be made. Some methods are more accurate, and more reliable. While 'Paul the Octopus' gained notoriety for accurately predicting the outcomes of the 2008 World Cup and repeated that performance by correctly choosing for the 2010 world cup.



Mathematical models are the means of codifying data and making predictions based on 'rules' which are coded assumptions. A better model gives better predictions. While the onion cutting exploits of Haley Hermann aka. 'The Onion Oracle' in southern Queensland have been held up as more accurate than the Bureau of Meteorology supercomputer on long range rain forecasting. Only one can be explained, only one method has the logic open for anyone to verify. there are no unique 'special abilities' required of BOM forecasters. Many would argue understanding the hieroglyphics of advanced mathematics may qualify as a 'superpower'.

This article will take the evidence based pathway to explore the developments of a 'new' model for COVID-19. No prior data existed before December 2019. All estimates have been made, modified and re-calculated in the months since the first bits of data emerged from Wuhan. The simulators included contain advanced modelling tools which allow new assumptions to be added, and initial settings to be modified.

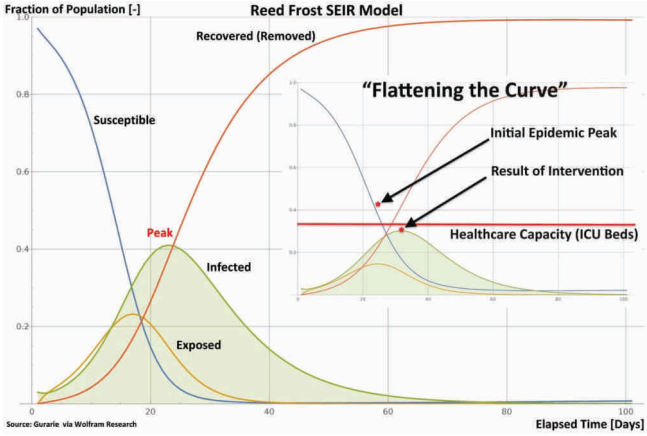
Exploring the data to build new visualizations, tinkering with a simulator or coding one of our own can help us to understand the impact of our policy decisions, test our assumptions and importantly, inspire us to continue our learning journey to new understandings.

Even a basic "epidemic flight simulator" can teach us much about how the larger models work and answer questions about the past few months, next few months and beyond.

Understanding Epidemiological Models

S-shaped curves feature often in media reports about COVID-19. These epidemiological curves are valuable tools for unpacking the pandemic dynamics. The SEIR Model that generates these curves provides a good fit for this disease. Within this model are four differential equations that can help track the eveloption of a pandemic over time.

https://lens.monash.edu/2020/04/16/1380098/covid-19-understanding-and- misunderstanding-epidemiology-models



Integrating your data with the web

The pandemic formula is graduated unpacked in detail with this simple but powerful series of simulations by epidemiologist Marcel Salathé & Nicky Case (art/code) on their website. "What happens next" goes the extra yard to connect science with policy and the impact of various interventions.

https://ncase.me/covid-19/

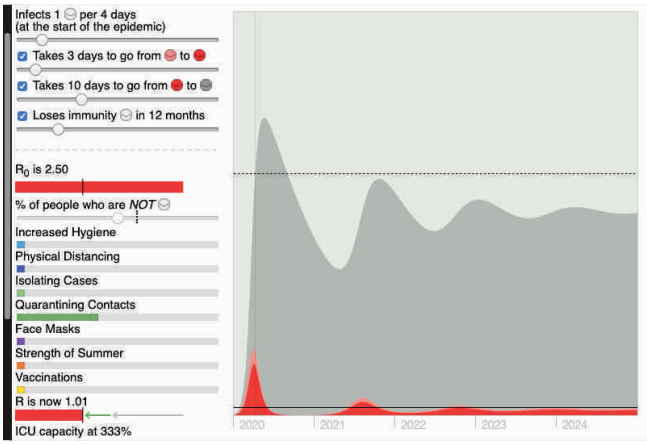
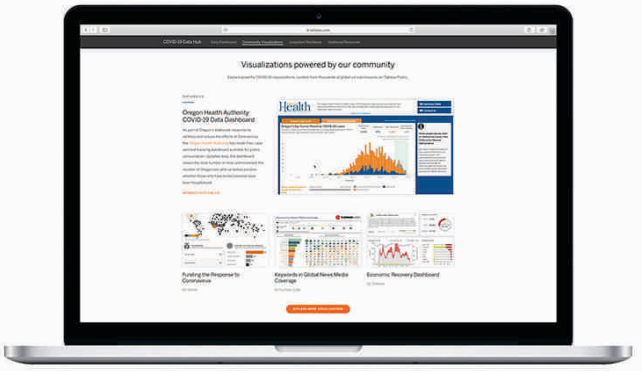


Tableau COVID-19 Data Hub

Case data is at the heart of how we are currently tracking the COVID-19 pandemic and seeing and measuring the impact of this virus in the world. Tableau has made available a free dashboard and data resource along with a gallery of interactive visualisations to help data-driven decisions in the context of the coronavirus outbreak.

https://www.tableau.com/covid-19-coronavirus-data-resources

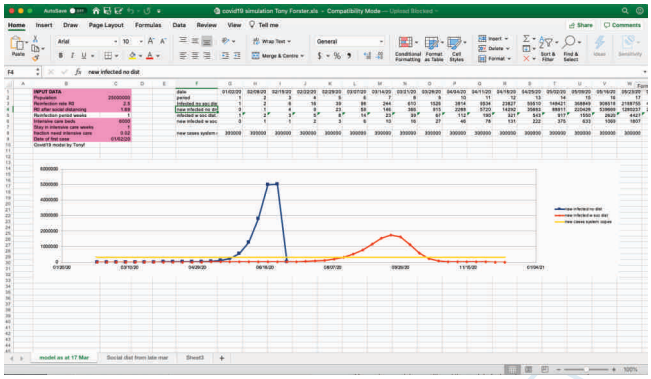


Spreadsheet Simulations

Tony Forsrter <forster@ozonline.com.au> quickly created on a spreadsheet this pandemic simulator.

In the 2000's Tony did some wonderful work with Bernard Holkner, Bill Kerr and Roland with an ASISTM Game Programming Cluster that used Gamemaker and Scratch to code various simulations to teach basic science ideas in a way that students could understand, change and explore.

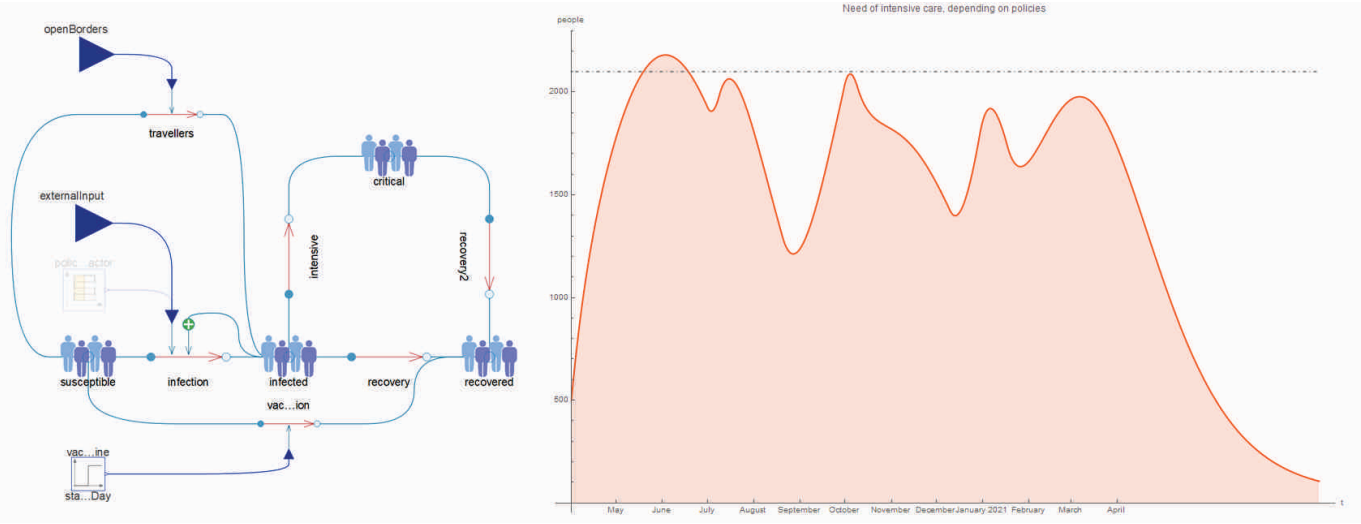
https://www.evernote.com/l/AB_YQjViUTBNXJuVqkP36ulY0jhv9ppFpbo



Wolfram Systems Modeller (WSM)

Jan Brugård has published a simulation with many simple parameters that can be run with WSM. Victorian secondary teachers and students are eligible to download WSM and Mathematica at no cost. The simulation explores simple variations in mitigation policies such as improved hygiene, social distancing, lockdown etc. and the policy effects can be immediately observed on time and number of infections and recovery. Applying policies will typically decrease the exponential growth rate.

https://www.wolfram.com/covid-19-resources/



Further Reading

1. Germany's oracle octopus, Paul, swims in front of a mock soccer World Cup trophy
   https://www.abc.net.au/news/2014-06-03/germanys-so-called-oracle-octopus-paul-swims-in/5498100?nw=0

2. Wolfram free software offer for DETVic teachers and students:
   Mathematica, Wolfram|Alpha, WSM (WolframSystemsModeller)
   https://www.education.vic.gov.au/about/programs/learningdev/vicstem/Pages/wolframsoftware.aspx

3. WSM COVID-19 simulator
   https://community.wolfram.com/groups/-/m/t/1931352

MAKING IN THE COMMUNITY

A reflection by Marcus Mulcahy

Marcus Mulcahy is a Learning Specialist (Community Engagement/Learning Technologies) at Carrum Primary School and Coordinator of the Northern Peninsula Digital Technology Teachers' Network, representing local public Primary and Secondary schools in an area 35 kilometres south east of Melbourne, Victoria. He undertook a Churchill Fellowship to find out how teachers can better equip students for the next wave of digital innovation and prepare them for the transition to more advanced digital learning at university and in the workforce. Marcus visited a diverse range of F-12 public, independent and charter schools in the United States. These schools have already encountered many of the challenges facing schools in the digital age and this series of articles includes ideas that could be adapted for the Australian context. This article focuses on the maker movement and is an extract from Mulcahy, M. (2018) 2018 Study of Innovative Digital Technology and Makerspaces in USA Schools and Communities [Report], The Winston Churchill Memorial Trust of Australia, pp. 13-19.

What is making? The contemporary maker movement is difficult to define. In its broadest sense modern making is the willingness by individuals in the general community to innovate by designing and physically making something, usually incorporating digital technology. There are no formal prerequisites to making although a wide variety of skills and knowledge can be brought to bear including traditional technologies.

Makers value the knowledge and skills found in occupations such as metal working or carpentry, bee keeping, sewing or cookery, and often combine these with robotics or electronics to create something new. The term "maker movement" has been around since about 2005 and maker conventions are now a worldwide phenomenon. At the San Francisco Maker Faire in May 2018 there were many examples of making on display, some practical, some whimsical, some that pushed the boundaries of what is possible. The Maker Faire describes itself as:

> ...an all-ages gathering of tech enthusiasts, crafters, educators, tinkerers, hobbyists, engineers, science clubs, authors, artists, students, and commercial exhibitors. All of these "makers" come to Maker Faire to show what they have made and to share what they have learned.

I saw a tiny house designed for one person which reclined for sleeping with provision for all the necessities of life. There were many entrepreneurs with start- ups promoting a range of new products and applications, for example: Turing Lab - humanoid robotics, bionic prosthetic devices; Beijing Extraordinary Creation Centre -Dancer Robot; reboot.love - open source 'print your own robot'.

Making is not a new concept and making in one form or another has always been an integral part of school education. There is nothing new in model building for history and science, or in auto shop and carpentry or metalwork classes in high schools, (particularly technical schools) or in cookery and sewing classes.

Nor has making been confined to school environments, for example there are community classes in areas like lapidary, ceramics and cooking, and agricultural shows have long been a competitive outlet for community practitioners of maker arts and crafts.

The difference now is digital technology and all that it makes possible. Interestingly, one of the possibilities for digital technology is the opportunity it affords for a deep understanding of past technologies and the ways these have influenced social and political structures and change. I came across a student project to create a working model based on a centuries old printer. By recreating this ancient printing process students came to a better understanding about why and how the advent of high speed reproduction revolutionised socio-political thought and behaviour.

I also visited public makerspaces including one located in San Francisco, California. The Exploratorium is a public museum offering a range of inquiry- based learning for children, typically up to the age of ten, and their parents. The museum workshop (where exhibits are created) was open to view by museum-goers, this transparency was intended to empower visitors by demystifying the process of making the exhibits. Included in a range of practical experiments that museum goers can try is a tinkering laboratory where learners can pick up some tools and create original objects by combining materials and technology in novel ways.

The Co-Directors of the Tinkering Studio believe that by engaging in hands-on tinkering learners develop both confidence and competence. In the Tinkering workshop I watched as a small group of learners put together circuit boards and built their understanding of the practical applications of coding.

As mentioned earlier, the Adaptive Design Association is a not-for-profit community organisation located in Manhattan, it is led by Alex Truesdell, Executive Director and founder. This organisation works with disability professionals, interns, volunteers and schools to offer bespoke solutions to problems facing children with a disability. Using mainly

cardboard, because it is lightweight but sturdy, inexpensive, very flexible and a sustainable material, the Adaptive Design Association is able to construct customised devices, including classroom chairs, tables and other aids for a relatively low cost but tailored for the individual.

As Alex says, most people will encounter a disability at some point in their lives and needs are highly individual. If a way can be found to eliminate a specific barrier in the local environment then a person may succeed, notwithstanding they may have a disability under other conditions. For example, some interns were adapting a motorised car to enable a child at a local pre-school to participate in playground activities with the other children. In another project an occupational therapist had designed a portable device so that a child in a wheelchair could transfer out without assistance. Another child had parents who could afford around the clock caregivers and although cost was not an issue for his parents, he was always fed by someone else. The Adaptive Design Association created a table out of cardboard, especially for his needs, thus enabling him to feed himself for the first time, increasing his independence and his self- confidence.

The Staten Island MakerSpace (SI MakerSpace) is a not-for-profit organisation that offers low cost access to space and equipment for teachers, school students and community makers. I toured the facility and interviewed Emily Perina, the

Figure 1: Adaptive Design Association - prototype

Operations Manager. She showed me around the wood shop, the metal shop and the digital fabrication equipment.

The organisation runs regular training classes on all their equipment and members can then use this equipment to build their own projects. There is also a substantial education program with the organisation hosting workshops for school students at their premises on Staten Island and taking a mobile makerspace called the STEAM Wagon around to New York schools.

The premises are divided into two main sections. On the industrial side the workspace has equipment that includes metal cutters, welders, a CNC router, a table saw, drill press and bandsaws. Women trainers conduct workshops for other women to encourage them to try new skills. Welding is a particularly popular workshop for women.

On the other side of the workspace they have local artists and entrepreneurs renting member studios to work on a variety of their own projects, including painting and metalwork sculptures. One member makes innovative compostable toilets designed and prototyped for particular international conditions and then he builds them in-country. Another member restores and resells old typewriters.

The STEAM Wagon is a big box truck. The organisation built benches and shelves along the sides and it now carries elements of the whole maker space and sufficient equipment and materials

Figure 2: Staten Island MakerSpace - STEAM Wagon

to showcase the capability of makerspaces to teachers who may not have not seen or used one. The STEAM Wagon always carries one of the restored typewriters, an example of older technology that seems to fascinate students.

There is also a community internet radio station, a not-for- profit in its own right, called Maker Park Radio, where volunteers learn radio techniques and public speaking skills, broadcasting local news and events and specialising in music and arts programming. Local theatre groups hold readings and record radio plays and local bands gain experience with live recording.

Figure 3: Staten Island MakerSpace - Maker Park

In a park opposite their premises SI MakerSpace stores the work of the local community in shipping containers. They invited local artists to paint and add sculptures to the site. The park is now used for community events and taking a seat in the park offers an unexpected and brilliant view of Manhattan's skyline.

Museums have long been a fantastic resource for teachers. In 1897 the Hewitt sisters, Sarah and Eleanor, established the Museum of Art and Decoration in downtown New York and both their remarkable collection and their industrial arts vision was preserved when the Smithsonian Institute acquired the museum. The collection is now housed in the Andrew and Louise Carnegie Mansion, Manhattan which, after extensive renovations, re-opened as Cooper Hewitt, the Smithsonian National Museum of Design in 2014. The museum itself demonstrates adaptive reuse of a private residence that has national significance.

The museum showcases traditional and contemporary design to a modern audience and allows visitors to experience design as a potentially transformational process. All visitors are equipped with an electronic pen that personally curates their visit by offering a download of information about the exhibits they have viewed.

The mission of the museum is to inspire, educate and empower through design. For example, there are exhibits that display music using vibration only; this allows people to experience music without sound much as a deaf person might

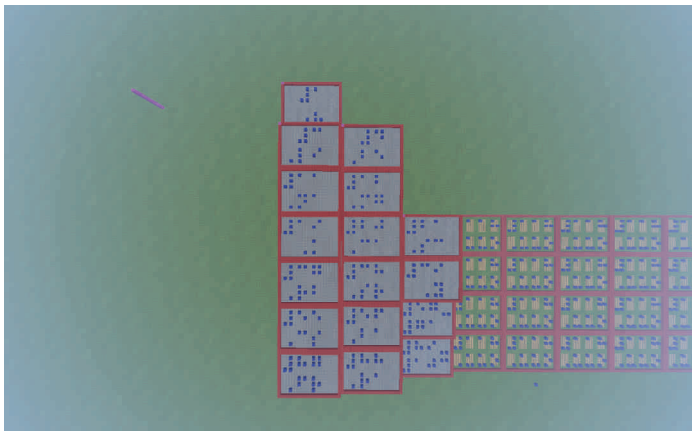
experience it. There are creative uses of technology to empower people with disabilities such as in the design of innovative prosthetics with models and prototypes on display.

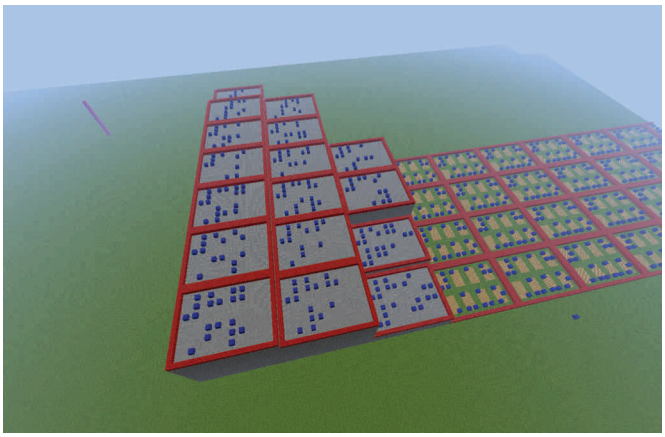
The museum also hosts the annual National High School Design Competition where teams from schools across the United States design a solution to a real world problem. Examples from 2017 finalists included a table that could be readily adapted to accommodate a wheelchair, a solar powered transportation aid that encourages mobility through an automatic wheelchair that changes into a walker and links the wheelchair status to a health application and GPS. Another example was for people who suffer hearing loss or impairment to access public announcements in public places. The design was for a smartphone application that translates audio into text linked to GPS that reproduces audio announcements as text.

The winning design for 2017 was intended to improve community access to healthy fresh foods by offering senior citizens and other people who are homebound, a food delivery service by high school students linked to local produce sources. The design included an organiser for the refrigerator to store foods based on their shelf life.

Designing an accessible periodic table in Minecraft

By Stephen Elford, Director, EduElfie Pty Ltd, Minecraft Global Mentor, eduelfie@gmail.com





What started as a staff room conversation turned into a six month project, and something that changed the way I view accessibility and support for students in classrooms. Wind the time clock to 2013 and 3D printers were just at the price point of becoming accessible to schools. I had purchased one myself to explore applications and quickly realised that it was going to be a 'hard slog' to get students using these as part of their normal learning processes. While there is a pretty steep learning curve when it comes to 3D design, this hurdle is nothing that cannot be surmounted with the right software and support.

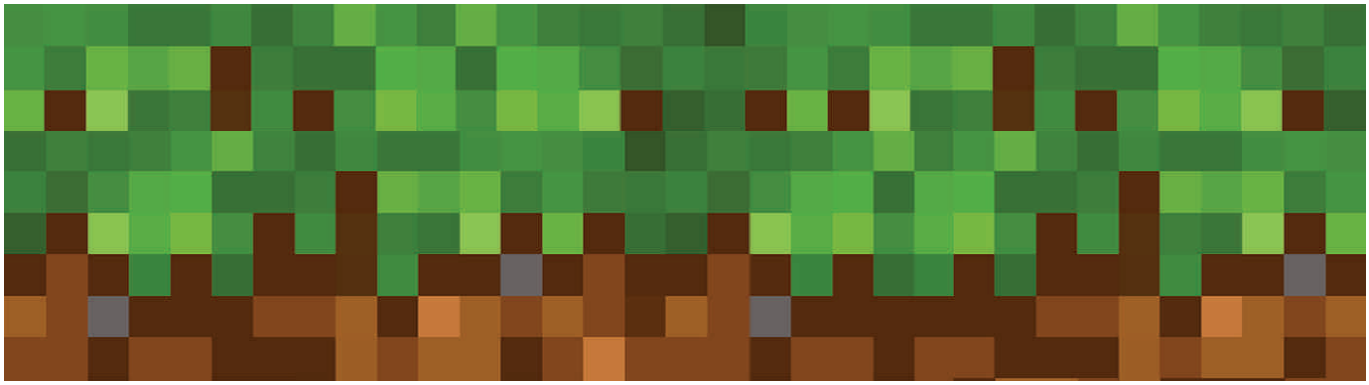
So, we finally had a 3D printer in our school, purchased by the Science faculty, but what were we going to do with it? This was the question floating around the staff room one afternoon just before the March long weekend. We weren't ready to get students designing in our classrooms, but we wanted some 'quick wins' to showcase the technology to our students in order to light a bit of a fire and get them excited about 3D printing.

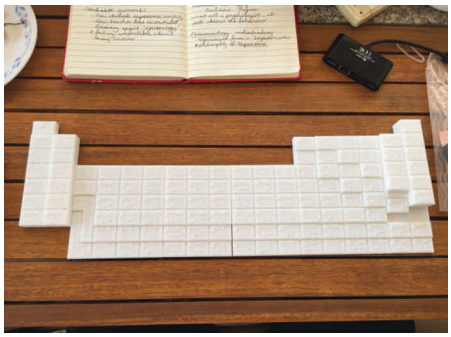
The Chemistry teacher, out of the blue said “Can it print a Periodic Table for a blind student?” This was a great question but it initially had me asking “Why? What is the benefit to the student if we do this?” Well, it turns out our students only had the elements of the Periodic Table in list form. If you have ever tried to teach the chemistry of the elements to Year 10 students you will know is a pretty big barrier to a complex learning topic. For one of our Year 10 students with a visual impairment, this wasn't just a multimodal luxury but rather an essential adjustment they required to be able to learn. This was 3D printing with a purpose!

As the 'on staff' 3D design expert, I began to dabble and experiment. My go-to 3D design software at the time was 123d Design, which as a side note, is still an amazing 'bridge' between Tinkercad and the more commercial level of CAD design programs if you can find it. This project was going to be a huge body of work to get the design right, and by huge, I mean a few hundred hours.

I began to think about what other options I had for designing something this complex, yet also quite simple in terms of the structure. This led me to my first ever 3D design space, Minecraft, or more specifically back then, MinecraftEdu with the advanced build tools! This took the design time from hundreds of hours to less than a hundred, because it was all so 'aligned' and strict in terms of the sizes.

Within a couple of hours, I had a sample piece ready to print for feedback from the teacher, the teaching aide, and most importantly the student. This is the point where I really began to understand how little I knew about accessibility, and how I could





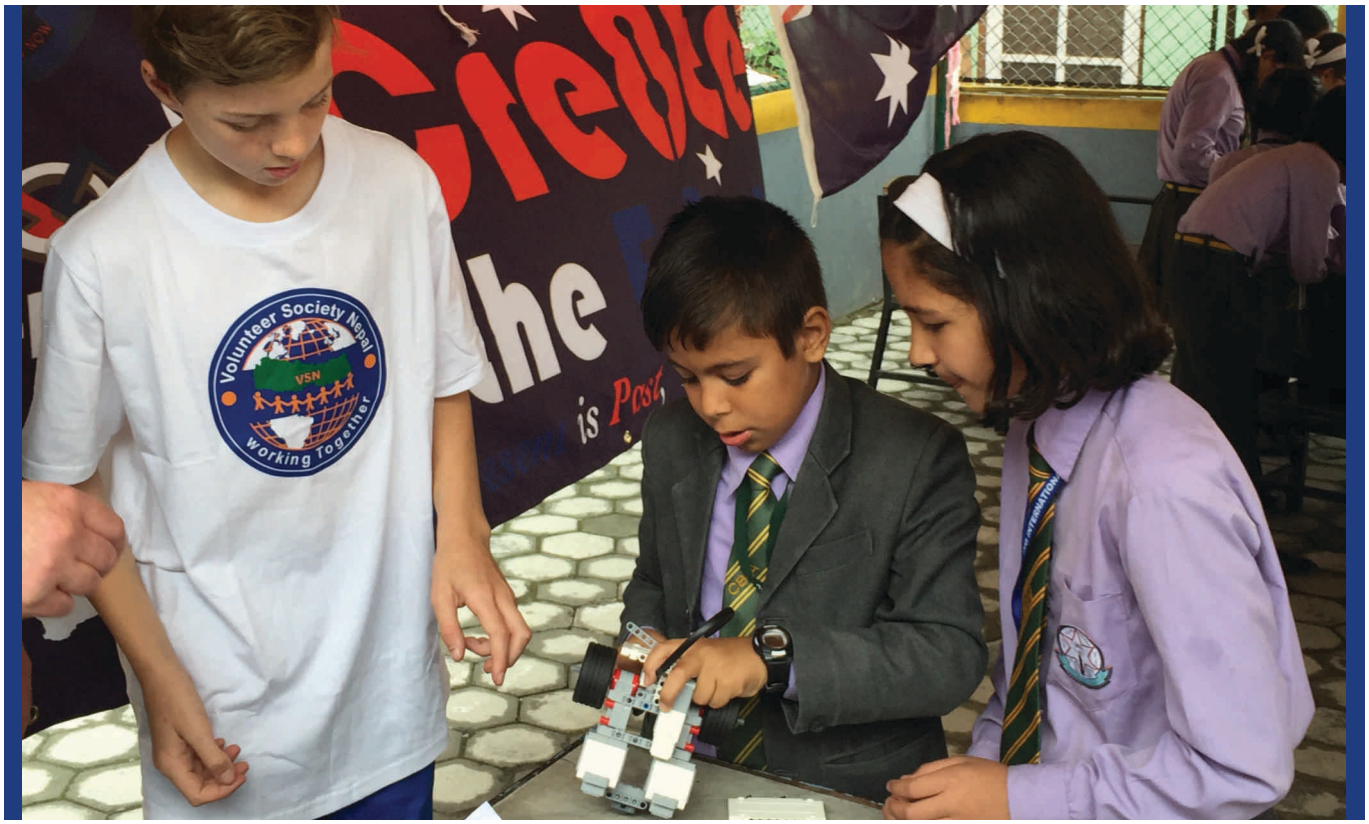
most effectively support this student. My first design was atrocious in terms of accessibility. I had the shape, but the student couldn't read any of the Braille because I was 'partitioning' the table so that I could see the different elements by having raised boxes around each element. This essentially 'blurred' the Braille and made it too difficult for the student to decipher.

Back to the drawing board, and this is why I love 3D printing and 'rapid' prototyping, I literally could have had another test print ready in an hour or two and gather more feedback. Unfortunately work tends to get in the way, and it took me a couple of months to get back to it. I removed the boxes surrounding elements, and recessed them instead. This still indicated a different element but stopped it from getting in the way of the Braille. I printed off another test piece and very happily gave it to the student to take a pass over and provide any more feedback.

Unfortunately it still wasn't right, as standard Braille is standard for a reason. I had made the error of not sticking to standard Braille sizing because I didn't even know it existed. The Braille was too close together, which still made it too difficult for the student to read. This was another point where I felt about as silly as any one man can; off course there would be standard sizes! So yet again, I headed back to the design 'drawing board' and remade the whole table to about four times the size in Minecraft. This allowed me to push the Braille out to standard sizing.

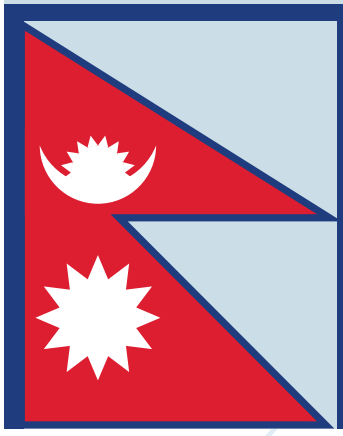
After another test print, I had the students approval as he could read it. It was then time to print the whole thing. I finally had the complete table ready to give to the student. All together the table was printed in seven parts, which took over 10 hours. Once printed I glued the parts together so that the whole table was in two halves for easier transportation. I made this decision after noticing that the resources this student takes to classes were significantly larger than 'standard' books, and anything I could do to lessen this burden was a boon in my opinion. The final product was around 45cm long, 15cm wide and 2cm high, fitting quite nicely in a little gift box.

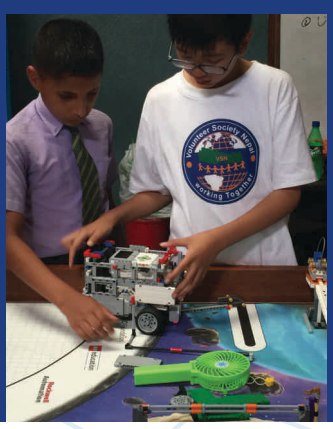
Mapping the Periodic Table in three dimensions was no easy task. I had to ensure that the tool was both functional for the student but also practical. It was this design process that I recognised how difficult it must be for our students with accessibility issues to get their hands on high quality resources. This was a design project that I relished as it made a real difference for my student, and showed that 3D printing could be more than gimmick.



A VISUAL DIARY OF A STEM ADVENTURE IN NEPAL

Not content with being the Australian *First Lego League* champions, students from Christ The King Catholic Primary School in Geelong travelled last year on the adventure of a lifetime to work with students and staff at *Stiching Education and Volunteer Society Nepal* in Kathmandu, Nepal. Led by their proud teacher and Digital Learning and Teaching Victoria member Aisha Kristiansen, the team spent weeks selling chocolates and developing teaching strategies to work with their Nepali peers. This visual diary offers just a small window into the collaborative learning that took place. Everyone involved recognised that this was a wonderful opportunity for cross cultural learning and sharing STEM expertise.





VISUAL DIARY STEM WITH DRONES

By Marcus Cook

cook.marcus.s@edumail.vic.gov.au | Upper Yarra Secondary College

CERTIFICATE III IN AVIATION REMOTE PILOT LICENCE (REPL)

UPPER YARRA SECONDARY COLLEGE

Drones are cool...

Marcus Cook – STEAM Specialist

Since 2018 students have had the opportunity to enrol in a course to fly drones, receive VCE Unit 3/4 credits, a Certificate III in Aviation and an actual Remote Pilot Licence!!! it has been a rollercoaster ride for both teacher and student. I'm a Science teacher who has an interest in technology and now I'm competent in Aviation law, theory and practice. Last year all students completed the course and gained their qualifications, with one student using his new-found skills to collect data to assist with roof inspections on local churches.

Nathan Bakker

The Certificate III in Aviation (RePL) appealed to me because I thought it would be fun and potentially open up job avenues for the future. In this class I have found the Teamwork and Flight exercises to be the most fun, but at the same time Flight exercises have been the hardest and most challenging part. At the beginning when I was uncertain of what to do and now I feel I am a competent drone pilot! I have enjoyed learning how to decode NOTAM's (Notice to Airmen) and I'm looking forward to receiving my Remote Pilot Licence.

Bailey Vogt

The main reason I chose to enrol in Certificate III in Aviation (RePL) is because I thought it would be much more interesting and fun compared to the other electives. We have challenged our judging of distance by seeing who can fly the closest to a cone without using the drone's camera. It has been really interesting to learn all the different rules that apply to flying a drone, although to most it's only a recreational activity. I am most excited to finally get my Drone Licence and to be able to fly with confidence.

Zachary Lawton

The reason I chose Certificate III in Aviation (RePL) is because I thought it might be interesting. I have enjoyed having fun flying the drone. It has been a challenge to fly in ATTI mode (no GPS) and hold your position against the variable gusts. I have learnt I'm not as good at flying a drone as I had thought, but I have improved steadily throughout the course. The main thing I'm looking forward to is building upon my flying skills.

Brayden Hedges

This year I chose to enrol in the Certificate III in Aviation (RePL) because I'm interested in drones. So far I've enjoyed flying drones but have found reading the NOTAM's challenging. Even though they are challenging, NOTAM's (Notice to Airmen) have also been interesting to learn about. Something I am looking forward to is being able to complete my 5 hours of flying to gain my Remote Pilot Licence.

Cooper Krisitc

I decided to enrol in the Certificate III in Aviation (RePL) because I wanted to try something new, I also find drones interesting and fun to use. I have enjoyed flying drones and learning the theory. To me I find the sub topics of aviation to be very interesting such as decoding TAF's (Terminal Area Forecasts). I am looking forward to passing all of my assessments and can't wait to see what we learn next.

Hiding messages in image files:

A fun context for algorithm design and implementation

By Ziad M Baroudi, Avila College

Ziad M Baroudi teaches Mathematics and Digital Technologies at Avila College, Mount Waverley. He has particular interests in teaching algorithms, computer programming and beginning algebra.

Working on a project in a Year Ten digital technologies elective, three students wrote a program that hides messages in grayscale PNG images. This "technique of hiding secret data within an ordinary, non-secret, file or message in order to avoid detection" (Rouse, 2018) is known as Steganography. For instance, the cat image below could carry the message "meet me tomorrow at six" but only you would be able to read it.

In this article, I will describe the project in some detail. I will also point you to the source code in case you wish to try it out yourself.

Figure 1: Grayscale image carrying a secret message. Source: https://www.pexels.com/photo/pet-fur-kitten-cat-57714/

Project objectives

Bob is a notorious pirate. He is stuck on an island and wants to send a message to his daughter, Alice, to come and save him. He decides that he'll hide his message in a black and white photo. He can email Alice a photo and a message like, "Remember when we spent 120 days at sea?". Alice receives the message and recognises that there are 120 characters in

the secret message. She now runs a program that reads 120 characters from that photo.

Three students in Year 10, Sarah, Lauren and Rachel, were asked to write two programs:

- One that takes a message and a grayscale image from Bob and hides the messages in the image
- One that takes the image sent by Bob to Alice and reveals a specified number of characters from the image

Project structure

Implementing this project consisted of three steps:

On Bob's side

1. Encoding messages as binary numbers using the ASCII code
2. Hiding the bits (0s and 1s) in the brightness values of a grayscale image

On Alice's side

3. Reading the ASCII code back from the grayscale image as binary numbers
4. Reconstructing the message from the image

Sarah was in charge of encoding and decoding between the alphabet and ASCII, Lauren wrote the code that hid the ASCII in the image and Rachel read back the ASCII from the image.

Before I describe each of those steps in detail, I need to explain how grayscale images work. Namely, I need to describe pixel values, the numbers that determine the brightness of each pixel.

Grayscale images

Grayscale images consist of pixels, each of which can be located with a pair of coordinates. Once located, we can read the "pixel value" at that location. This is a number between 0 and 255, where 0 is the darkest possible and 255 the brightest.

Figure 2 below shows a grayscale images that is 600 pixels wide and 600 pixels high. The lines are 50 pixels wide and of increasing brightness. The pixel values are indicated on the lines. Figure 3 shows the Python code that produced this file.

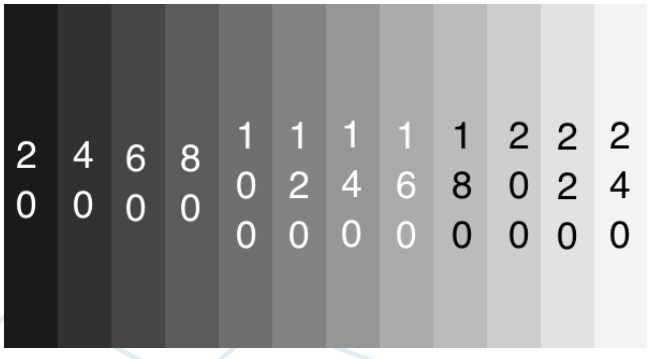


Figure 2: Grayscale PNG file

```python
from PIL import Image

# Initialise a new image with width and height = 600pixels
img = Image.new('P',(600,600))

pixel_value = 20 # initial brightness to be used

# Construct 12 lines
for i in range(12):
    j = i * 50   # j will take values 0, 50, 100 ... 550
    for x_coord in range(j, j+50):
        for y_coord in range(img.height):
            img.putpixel((x_coord, y_coord), pixel_value)
    pixel_value += 20

# Write the image to a file on disk
img.save('my_image.png')
```

Figure 3: Python code to create PNG file in figure 2

Words as numbers

As the reader probably knows, one mapping of letters to numbers is the ASCII code . Here, we will work with the mapping of lowercase letters to binary numbers according to the ASCII code (see Table 1). The complete ASCII code can be found in (Weiman, 2010).

Character	ASCII code in binary	Character	ASCII code in binary
a	0110 0001	i	0110 1001
b	0110 0010	j	0110 1010
c	0110 0011	k	0110 1011
d	0110 0100	l	0110 1100
e	0110 0101	m	0110 1101
f	0110 0110	n	0110 1110
g	0110 0111	o	0110 1111
h	0110 1000	space	0010 0000

Table 1: Sample ASCII code mappings

This allows us to turn a sentence into a set of numbers which in turn allows us to embed the sentence using pixel values. We will describe this process in the next section.

Here's an example: *(see Table 2 overleaf)*

From ASCII to pixel values

The ASCII code of each letter can be hidden in the least significant bit of 8 pixel values. This means that a pixel whose brightness is 120, 01111000 in binary, may need to become 121, 01111001 in binary. This change of 1 in the brightness will be imperceptible to the human eye. No one will suspect anything! Figure 4 below illustrates this point by showing an image before and after the message "meet me under the apple tree" is hidden in it. As you can see, there is no difference between the two!

o	n	e	<space>	s	t	e	p
01101111	01101110	01100101	00100000	01110011	01110100	01100101	01110000

Table 2: Using the ASCII code

pixels	10110010	10110011	10111000	10111001	10111001	10111010	10111010	10111011
Letter m	0	1	1	0	1	1	0	1
New pixels	10110010	10110011	**10110011**	**10111000**	10111001	**10111011**	10111010	10111011

Table 3: hiding the letter m in 8 pixel brightness values. Bold = change in value

Figure 4: Image before and after message is hidden in it. Original from (Free Images, 2017)

As an example, let's embed the letter m in the first 8 pixels of the original image. The first 8 pixel values of this image are: 178, 179, 180, 181, 181, 182, 182, 183. Table 3 below shows these values in binary and the transformation they undergo when we embed the binary representation of the letter 'm' (01101101) in them. As can be seen, only three pixel values needed to be changed while five already ended with the required bit (0 or 1). (See table 3)

A mathematical shortcut

While we did discuss the mathematics of decimal to binary conversions in class, the following facts can allow us to limit our work to the decimal system:

- Even numbers, eg: 250, always end with a zero in binary
- Odd numbers, eg: 125, always end in a one in binary

This means that, if you want to hide a one and the pixel value you read is 250, simply subtract 1 from it. There is no need to convert the pixel value to binary, change its last digit and then convert the resulting value back to decimal.

Enter Python programming

The students and I learnt to manipulate images in Python using the Python Imaging Library, or Pillow as it is now known. We did this using an online course (GrokLearning). The full code with an example of how to test it can be found on GitHub: https://github.com/ziadmbaroudi/Steganography

Curriculum strand

I believe that this project sits nicely in the "creating digital solutions" strand of the Victorian Curriculum. More specifically, it addresses the following two content descriptions from levels 9 and 10 (VCAA):

- Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (VCDTCD052)
- Develop modular programs, applying selected algorithms and data structures including using an object-oriented programming language (VCDTCD053)

Special mention

I was introduced to the idea for this project at a workshop held at the University of Melbourne (Bird, Meyer & Christophersen, 2013). It was presented by Associate Professor Bernie Pope. Dr Pope showed us a first year university assignment in which students hid messages in cat images. His students used colour images and manipulated the 4 values for Red, Green, Blue and Alpha (transparency). They were also set other challenges which I decided to leave out given that my students were three years their juniors.

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An insight on how design purposeful tasks can engage and encourage low SES students to learn a programming language.

Paulo da Silva

Learning Specialist at Williamstown High School, Victoria, Australia

1. Introduction

Over the past four years, I have been fortunate to have had the opportunity to visit many schools in Victoria and engage in an open discussion with educators across the state about the challenges they face when implementing STEM Education initiatives at their schools. Fortunately, I have witnessed a welcome increase in interest and discussion around the development and implementation of STEM curriculum, and the need to provide students with opportunities to learn valuable skills, which include problem-solving, creativity, data-driven decision making, critical thinking and collaboration. On the other hand, it is clear that there remains some confusion regarding STEM Education in general amongst educators, and how its integration into classrooms can benefit our students. For example, teachers have witnessed, anxiously at times, the current push for coding and programming classes in schools in the recent years, as politicians and policymakers advocate the idea to the community that that area of knowledge is an essential component of education for all; unfortunately, that has created the erroneous sense that coding is synonym to STEM Education, instead of a part of it. It is also clear that much work is needed in schools to allow teachers to gain STEM skills, as some teachers find it hard to gain access to quality Professional Development (PD) opportunities, which can ultimately make teachers feel less confident to explore, develop and deliver a local STEM program.

Although challenging on a number of fronts, many enthusiast educators have greatly benefited from PD opportunities offered by reputable providers (e.g. DLTV, Quantum Victoria), free online resources (i.e. EDX.org, Coursera, Instructables.com), and consequently enriched their own learning, gaining confidence and, honestly, increasing their own career's prospects. There is little doubt that teacher upskilling can be a game-changer in regards to STEM Education in our communities, schools and country, and that the lack of an action at federal and state level should not be used as justification for lack of action. In this article, this author shares his experience on how to design and purposeful tasks can impact and create a positive change in our local school communities.

2. School setting

In this article, I will endeavour to illustrate my journey through the "STEM maze" currently present in the vast majority of all schools today. Late in the year of 2014, I decided to defer my PhD studies and become an educator. One of the main motivations for such decision was the desire to take my experience in research and industry into the classroom, allowing students to undertake relevant tasks and to connect with professionals in the area of STEM. Fast-tracking into early 2016, I started my new career as Secondary Science School Teacher at Wyndham Central College (WCC), in Werribee, Victoria. I soon realised the challenges faced by that school community, which included student absenteeism, low student engagement, literacy and numeracy levels. Although a challenging environment, it was clear to me that WCC was also, and still is, fertile ground for the introduction of novel pedagogical approaches.

Later in 2016, I met the school principal and proposed to create a STEM program for WCC. The program, soon to be called STEM Academy, became the first integrated STEM program in the western suburbs of Melbourne, and it is still active today. Although exciting at first, I soon realised how complex building a STEM Program from scratch would be. For example, I was sadly surprised with the scarcity of studies discussing how female, koorie, and low-socioeconomic (SES) students deal with the current technological revolution, or ideas on how that cohort learnt STEM skills best; such studies are limited in Australia (good examples here: Boon & Lewthwaite, 2016; McKinley, 2016). In summary, the idea that female, koorie, and low SES students are more likely to underperform in STEM subjects at school is well established, however, ways to circumvent that reality are not. The way ahead was clear; it was time to conduct research to establish baselines conditions for students at WCC, and design a tailored program (e.g. based on data) for that specific cohort.

3. Research and development

The idea of a new STEM Program for students at WCC gained momentum and support from most teachers at that school, which was encouraging. I invested some considerable amount of time contacting STEM experts in Australia and overseas, attempting to gain a better idea on the best way to develop and implement the program. Throughout the first semester of 2017, I approached a group of progressive teachers (early adopters) and started working towards writing surveys and getting as much data from students as possible. The initial goals for this newly established STEM Team were: a) determine the areas for improvement on the delivery of STEM subjects, b) gather data to understand student engagement at WCC, and c) advocate within the school community for the adoption of cross-curricular collaboration amongst educators. The evidence gathered via surveys (e.g. Engagement, Growth Mindsets, Attitudes to STEM, Social Network Analysis) and

Purpose of Assessment	Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication (VCDSCD061) Work flexibly to safely test, select, justify and use appropriate technologies and processes to make designed solutions (VCDSCD062) Explain how designed solutions evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (VCDSTS055) Evaluate design ideas, processes and solutions against comprehensive criteria for success recognising the need for sustainability (VCDSCD063) Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (VCDTCD052) Develop modular programs, applying selected algorithms and data structures including using an object-oriented programming language (VCDTCD053)
Task	- Students will work in groups (3 maximum) to build a working robot using "Lego Mindstorms". - Students will program (write algorithms) allowing the robot to perform a minimum set of functions that are relevant to real world applications. - Students will research the relevance of their chosen robot in the real world and apply their knowledge gained to have the robot they have been built solve a real life problem.

Fig. 1. Table containing information about common assessment tasks for students.

discussions with students were revealing and compelling, here are some of the findings:

a. Unattractive curriculum: it seems students found it difficult to comprehend the tasks about to be delivered to them. For example, Fig. 1 is an example of how students were introduced to common assessment tasks at that school at the time. Interestingly, when quizzed about the way the documentation looked like upon inspection, students promptly told me "I have no idea what that code means"; the student was referring to the content descriptors found in the document.

b. Absence of authentic and purposeful tasks: around 92% of students surveyed (n=126) reported that they could not comprehend how the tasks proposed were relevant to their future life. Reasons for such score might include educators' failure to communicate the relevance of such tasks to students, or students' struggle to comprehend the tasks because of the language used by teachers was too complex (point a, above).

c. Very low student confidence: some students at WCC have experienced many challenging events throughout their lives, and most (77%, n=126) reported not remembering the last time they were encouraged by their peers or family when undertaking a challenging task at school. On the other hand, a Growth Mindset survey revealed that half of the students believed that educational outcomes are a function of effort, and accessible to all as long as you work hard for it, which was very encouraging.

d. Low student engagement: a questionnaire developed by our team revealed that most students surveyed (84%, n=126) were disengaged, reinforcing the idea that these students could benefit from an alternative educational program.

e. Desire to use technology: 95% of students said that they wanted to use technology in class or during lessons, presenting us with opportunities to use technology to enhance their learning experience.

4. Designing the intervention

Results discussed above gave us clear indication at the time that our students could benefit from a very specific intervention, aiming at increasing their engagement, participation and, consequently, learning outcomes. From that moment onwards, our focus was to design challenging and purposeful tasks that created opportunities to encourage our students to excel. Here are some of the proposed interventions:

a. Make tasks more attractive: it was important to create resources that do not look like the infamous "worksheets", but look as attractive, colourful and desirable to read as a modern magazine (see Fig. 2).

b. Make tasks relevant: this is one of the greatest challenges faced by educators worldwide; however, we have found that creating tasks that address issues known to students (e.g. youth crime, drug abusive, lack of job opportunities) is a powerful way to engage students because most of them want to improve their quality of life.

c. Structuring classes: it became clear to us that students at WCC value certainty and structure, as they want to know

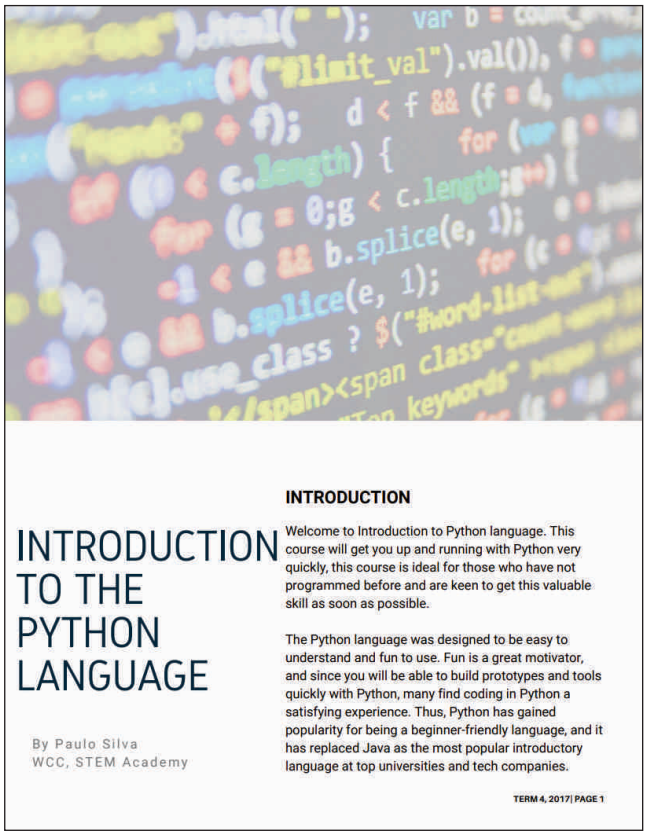
what they are about to learn, when, how and why. Therefore, we invested considerable time to create educational opportunities to all students using several online tools, including a Vimeo video channel and use of Learning Management System sites; that allowed students to become accountable for their progress.

d. Give students a voice in the classroom: students are used to entering the classroom, move onto their seats, answer the roll and expect to be seated for hours on end; this monotonous daily reality will certainly alienate some students. Therefore, our team came up with several simple, yet powerful, adjustments to the way classes run for STEM Academy students, including:

- Allowing students to choose how they want to submit their work (e.g. essay, video, poem, movie script, poster);
- Making sure that students understand that the whiteboard also belongs to them and that they are welcome to grab a pen and add their contribution to it;
- Taking students to a 5-minute walk around the campus. These short walks allow students to relax, communicate with the teacher and their peers, and refocus before they return to class;
- Encouraging students to create and determine the success criteria for assessments. That proved to be a powerful way to hear their perspective, promote discussion and boost their participation in decision making inside the class.

5. The first project: introduction to Python language programming

The STEM Team worked throughout that year (2017) to make sure students felt safe to test new ideas, prototype and design during the Robotics elective sessions; the positive environment created by our team was vital to get students excited about coming to classes and having a go. During term 4 (2017), we introduced students to the Introduction to Python programming



INTRODUCTION TO THE PYTHON LANGUAGE

By Paulo Silva
WCC, STEM Academy

INTRODUCTION

Welcome to Introduction to Python language. This course will get you up and running with Python very quickly, this course is ideal for those who have not programmed before and are keen to get this valuable skill as soon as possible.

The Python language was designed to be easy to understand and fun to use. Fun is a great motivator, and since you will be able to build prototypes and tools quickly with Python, many find coding in Python a satisfying experience. Thus, Python has gained popularity for being a beginner-friendly language, and it has replaced Java as the most popular introductory language at top universities and tech companies.

TERM 4, 2017| PAGE 1

Name					**TERM 2, 2017**
Teacher		**Class**	**Year 9 Robotics**	**Assessment / Due Date**	
Victorian Curriculum	Design and Technologies: Level 9-10 Digital Technologies: Level 9-10				
Purpose of Assessment	Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication (VCDSCD061) Work flexibly to safely test, select, justify and use appropriate technologies and processes to make designed solutions (VCDSCD062) Explain how designed solutions evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (VCDSTS055) Evaluate design ideas, processes and solutions against comprehensive criteria for success recognising the need for sustainability (VCDSCD063) Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (VCDTCD052) Develop modular programs, applying selected algorithms and data structures including using an object-oriented programming language (VCDTCD053)				
Task	- Students will work in groups (3 maximum) to build a working robot using "Lego Mindstorms". - Students will program (write algorithms) allowing the robot to perform a minimum set of functions that are relevant to real world applications. - Students will research the relevance of their chosen robot in the real world and apply their knowledge gained to have the robot they have been built solve a real life problem.				
Action Plan	1. Prepare folders for this CAT on the schools "n:\" with appropriate subfolders for each CAT component. 2. Obtain the LEGO Mindstorms "robot builds" from your teacher and choose the robot you wish to build. 3. Download all additional information / resources provided by your teacher for this CAT via Compass. 4. Develop a classroom/homework plan over 6 weeks to ensure all elements of the tasks are complete by the due date. 5. Investigate and answer each question from the attached CAT and compare your solutions with the marking rubric provided. 6. You are required to submit a built robot and associated algorithms as part of this CAT. 7. The research component of this CAT also needs to be submitted, using an approved method. 8. Each group will submit an electronic copy of their work (where possible) to your teacher for marking via Compass by due date.				
Progress Check	Midpoint (3 week) – self assessment and teacher using the rubric Weekly verbal constructive comments – via regular lessons, Compass and or Cornell notes Students write / reflect on progress: using AVID strategies Signed:				
Feedback	Signed:				

Fig. 2. An example of how tasks are now presented to students using in the so-called "magazine style" (left), compared to the more orthodox style (right).

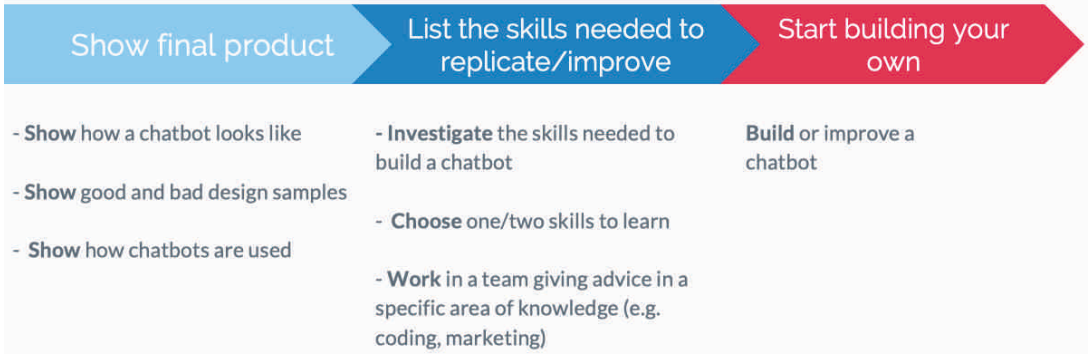


Fig. 3. The reverse engineered lesson model.

course, where they would gain their experience with that language; the assessment task for that term was to create a chatbot capable of assisting a small business operator in Australia. Here is a breakdown of the approach used to introduce students to the task:

1) Introduce students to (what we called at the time) "reverse-engineered lessons" (Fig. 3), where students start their learning journey by seeing, not being told, what the final product looks like.

2) Investigating the skills (hard vs soft skills) needed to replicate such product (e.g. coding, graphic design (Table 1).

Product	Skills		
Chatbot	Hard skills	Soft skills	
	Coding	Problem solving	Able to listen
	Programming	Communication	Negotiation
	Legal	Motivation	Presentation
	Graphic Design	Analysis	Time management
	Web design	Creativity	Teamwork
	Accounting	Critical thinking	Testing
	Bookkeeping		Work ethic

Table 1. Students investigated the skills required in software development. Students soon realised that coding and programming was actually a small component to the task.

3) Gradual Release of Responsibility: using the I do, we do, you do model, where students were introduced to basic Python syntax, and then asked showed how to build or modify simple programs created by teachers or other students (Fig. 4)

At first, students hesitated to even attempt to write any code using Python, and I have particularly clear memories of the first three sessions I ran with my students where I could see that the jump from the visually friendly block-based programming into the text-based Python was intimidating for some.

```
File  Edit  Format  Run  Options  Window  Help

#This is a simple dialog using Python, please share and modify it! Mr Silva

feeling = input("How are you feeling today? A: Good, B: Alright, C: Bad \n")
if feeling == "A" or "a":
   print ("I am feeling gooooooood!")
elif feeling == "B" or "b":
   print ("I am ok today")
elif feeling == "C" or "c":
   print ("I am not feeling good at all")
else:
   print ("That wasn't A, B or C")
```

Fig. 4. A simple software written by a student and shared and modified by all. Source: Paulo da Silva (2017).

For instance, this challenging situation created opportunities for differentiation in our classes, since some students jumped into the opportunity to start working with "pure Python IDE" (Figs. 5 and 6), whilst the others preferred block-based alternatives such as Blockly.

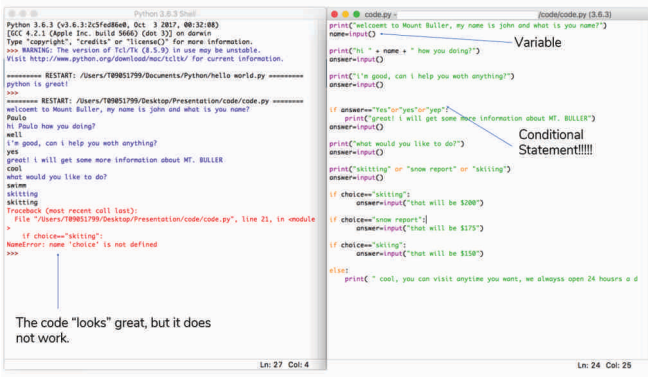


Fig. 5. An example of trial and error using Python IDE.

Fig. 6. An example of a highly functional code using Python IDE.

6. Conclusion

In this article, we discussed how a small team of educators designed and created an integrated STEM programme at Wyndham Central College, Werribee, Victoria. The team used a data-driven approach to curriculum design and development, which required the use of well-established and some novel pedagogical approaches to offer differentiated curriculum and learning opportunities to students from low socio-economic backgrounds in that school.

Our team's motivation to change the status quo at Wyndham Central College was born from the belief that all students across Australia deserve the right to learn valuable 21st-century skills. We then asked ourselves, how do we, as educators, create an environment for gradual change in our school community? In our case, the answer was to become STEM Education advocates in our classrooms, school campus and overall community in Melbourne's west. I hope this article can inspire you to have a go at teaching programming to your students in your school (e.g. no need to start an elective, Code Club will bring students in!).

I finish this article by celebrating that students in one of the most challenging schools in Victoria learnt the basics of Python programming language. Our students were able to, by using carefully designed literacy scaffolds, understand the link between literacy, logic and programming, and gained a better understanding of how technology can be used to our benefit. They realised the importance of using Digital Technologies to create media, instead of only consuming it. Importantly, they proudly told us about how they created their very first program, as all students (through perseverance and hard work) learnt how to develop simple software using block code (Blockly), most moved from blocks into the Python IDE, whilst some managed to develop their first ChatBot using this amazing programming language.

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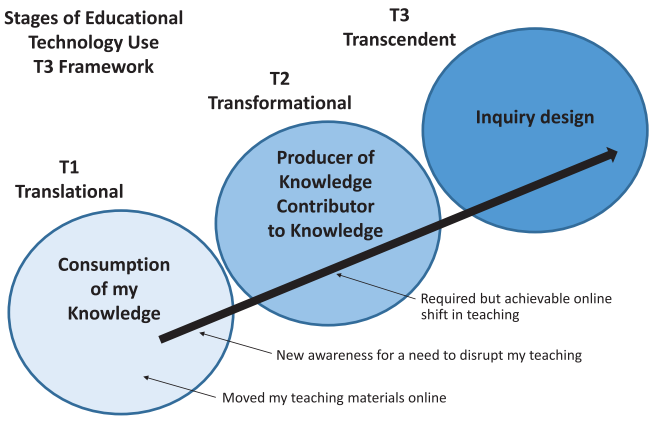
Transforming online teaching: Disrupting my practice

I write this reflecting back on the last 3 months – the time when COVID-19 pandemic changed teaching globally. Education in 2020 will be forever characterised by the COVID-19 pandemic. Schools and university faculties suddenly emptied, with students taught remotely at home. Many teachers and academics struggled to teach online. Complicating this newly required educational delivery format was our confidence and competence for online teaching. I am not an ICT teacher; this was new to me and most other teachers.

I found myself analysing my online pandemic teaching efforts. I came across a small easy to read book *Disruptive Classroom Technologies* and this provided me with a lens to not only see the nature of my online pandemic teaching, but also a lens to improve my curriculum design and my teaching. Whilst the *T3 Framework for Innovation* aims at categorising student learning as translational (T1), transformational (T2), and transcendent (T3), I see potential of the same T3 framework providing the teacher with a planning framework for online teaching.



(Modified from Magana, 2017)

In the early days of the pandemic I had the idea that this online teaching should be able to match, if not surpass my current teaching – that the technology should be able to open doors to learning that are not there in my classroom. I found myself asking questions: *How can my online teaching do more than just present current activities? How can I teach online, and generate new learning opportunities?* Initially I was not able to answer these questions, but since reading *Disruptive Classroom Technologies*, I realise I was not disrupting my teaching. My teaching efforts included converting my face-to-face resources to online resources where I was presenting 'old' tasks in 'new' ways – analogue to digital as Magana calls it. This is T1 translational. T1 sees students being consumers of knowledge - my knowledge.

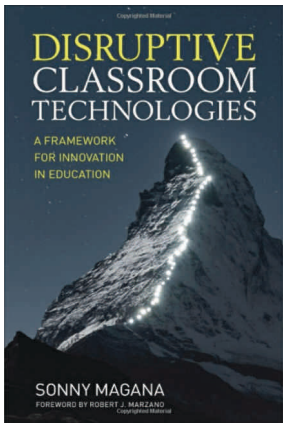
I saw this approach as okay, as a way of helping my students adjust to the online teaching, quarantine and isolation that was characteristic of the pandemic, but not OK for optimal learning. I was not happy, I realised that I needed to disrupt my thinking, and adopt a T2 transformational approach to my teaching and student learning. This is where substantive changes are needed to the nature of my resources themselves, to my pedagogical approach, and to the role of my students as they do my tasks. I needed to help shift my teaching and my students learning from that of consumer to producer. So was I doing this? Was I able to put my students at the centre of the learning experience? I believe I am beginning to understand how to do this, but my end of semester results will be my evaluator. Imagine a regular 12-week university unit, taught via a content driven T1 translation of electronic resources, a-synchronous discussion forums and synchronous Q&A sessions.

Now imagine the same 12-week unit with a delayed start of 4 weeks. The same T1 translation of electronic resources, a-synchronous discussion forums, and synchronous Q&A session are available. However, during the 4-week delay, I was able to include a conscious effort at a student centred T2 transformational approach. The focus of the unit has become one of emphasising the processes involved, and not of the

content involved. During the Q&A session, students electronically share snippets of their writing for open critique. They have engaged with the T1 materials online, and are now representing what they know, what they are able to do, and how they think. The two units have the same online resources, but the conceptualisation of the delivery has changed, and the students in the delayed unit are responding as individual producers of their own knowledge, and not as consumers of my knowledge. Interestingly, I offer the students in the regular unit the same sharing of writing opportunity, but they are yet to engage. They seem to prefer the format of the unit they have experienced since Week 1 – T1 translation.

Have I managed to enable the learning of my students via the T3 transcendent aspect of the T3 framework? If I have, then my students will achieve something well beyond the normal range of expectations for a university unit. Again, my end of semester results will decide for me. I doubt I did achieve T3 for the regular 12-week unit offering. However, in the delayed unit I have been able to offer the automation of tasks (T1), provide information to be consumed (T1), and provide the platform to produce knowledge and to contribute to the knowledge of others (T2). For two students in this delayed offering of the unit, they have enjoyed an unprecedented growth in knowledge, contribution, and value-generating performance and are preparing to publish their work (T3). These two students have found a passion in their work beyond that of their peers, taking their learning to a higher level (T3).

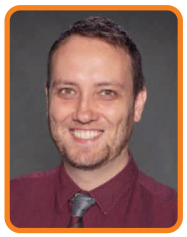
The T3 enlightened my pedagogical approach to teaching during the COVID-19 pandemic. I found it so easy to refocus my own learning and thus teaching, with a corresponding influence on my students learning. The coming semester will also see my units offered online. I do hope more students will be inspired towards a T3 transcendent learning experience.



Reference:

Magana, S. (2017) Disruptive Classroom Technologies: A Framework for Innovation in Education.

SAGE Publications



Review by
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Is it a micro:bit? Is it a GameBoy? No, it's Meowbit.

Developer: KittenBot / Microsoft

Summary

One of several devices built to support the MakeCode Arcade platform, the Meowbit is a tiny, handheld, programmable game console with the same bottom pins as a micro:bit. Oh, the possibilities!

This review is actually about two things; Microsoft's recently-out-of-Beta **MakeCode Arcade** platform and one of the devices built to support it, the **Meowbit**.

Important Links

MakeCode Arcade coding website
Meowbit homepage at Kittenbot (International website)

What is MakeCode Arcade?

Many teachers are now very familiar with the makecode.microbit.org environment used to write and test programs for the micro:bit, a programmable microcontroller that has taken classrooms by storm thanks to its hardy form, simplicity of use and relatively cheap cost.

The MakeCode Arcade platform at arcade.makecode.com keeps the familiar coding blocks, but moves in the direction of game design with a retro twist. In place of the micro:bit's simple 5x5 LED array, there's a cute 160x128 colour screen. A potential four channels of sound allow music and sounds to play simultaneously, and a GameBoy-like set of directional and action buttons give the player control. There's no radio messaging as standard, but JACDAC wired communication allows for rapid messaging and multiplayer games.

The coding blocks and commands are also geared towards retro game development, with scenes and sprites built up from 16x16 pixel tiles. Player movement can be handled with convenient functions. A simulator and video tutorials are provided.

It's not restricted to games, though. The colour screen is great for simulations and modelling, or data display.

As with the micro:bit MakeCode environment, Blocks and JavaScript* are the readily-available options for programming.

What is the Meowbit?

The Meowbit is one of several hardware devices built to support programs written on MakeCode Arcade. To run a game you coded, simply plug in the device via USB and drag-and-drop the downloaded code file across.

Made to resemble a tiny retro GameBoy, it has a 160x128 LCD colour screen, four directional buttons and two action buttons. A buzzer gives some audio, though it struggles with simultaneous sounds and music.

As hinted by its name, the device sports the same 25 connectors or "pins" as the micro:bit along its bottom edge, including the familiar set of 5 round pins perfect for alligator clips. The pins become available to the coder with the addition of a simple extension in the MakeCode Arcade environment, which opens up many of the expansion boards and circuit projects already made for the micro:bit. Except now you have a nice, full colour screen to show results!

Like the micro:bit, the Meowbit has a gyro+accelerometer to sense rotating and shaking, and built in sensors for light and temperature. What looks like a 3.5mm audio jack turns out to be the aforementioned JACDAC port, allowing for communication to another Meowbit (or other MakeCode Arcade device).

The Meowbit also has a slot for an SD card, possibly for use for additional storage or future add-on controllers. The electronics are covered in a silicone case with room for a lithium battery that can be attached at the back. The device can also be powered via USB.

Can I use Python?

It appears there's no simple online Python environment for MakeCode Arcade devices yet. Microsoft may be on the way to adding Python to the MakeCode Arcade environment itself as they recently did to their Minecraft environment.

In the meantime, CircuitPython, in combination with the offline Mu editor, allows access to the Meowbit screen and at least some sensors, including a REPL interface. See this video from Adafruit for a quick demo.

Are there other hardware options?

Yes, and many are available in Australia, though features and prices vary.

The Kitronik ARCADE is a larger, chunkier option that sits in your hands like the old Sega Game Gear. It also supports haptic feedback (vibration).

Adafruit has three entries - the PyBadge, PyBadge LC and PyGamer, with a handy webpage to compare them. (The latter has a headphone jack for improved sound over a buzzer.)

It's also possible to use a Raspberry Pi Zero as a MakeCode Arcade device.

Pros and cons

When the micro:bit came along, I fell in love with the lack of bells and whistles. There's less to distract students from the code. Other environments like Scratch can encourage a "spritefest" (credit to Prof. Tim Bell of CS Unplugged for this delightful term!). MakeCode Arcade brings in more colour and graphics than micro:bit, so there's definitely a little more there to distract.

Also, the Meowbit is between 2 and 3 times the price of a micro:bit. MakeCode Arcade devices are more powerful and complex. Even the simplest one I'm aware of, the Adafruit PyBadge LC, comes in at about twice the price of a micro:bit.

But do you have to use the hardware? This is highly relevant as I write this review at the beginning of Term Two 2020, with schools in Victoria starting their first week of COVID-19 enforced remote learning.

Like the micro:bit environment, MakeCode Arcade provides an on-screen simulation of the program being written.

The game-oriented development is arguably more engaging for students when there's no physical tech to use.

Of course, there are other free options for making retro graphical games if you don't need to put them on a little microcontroller. See, for example, the minimalist Bitsy, the versatile GDevelop or the classic Adventure Game Studio. Not all of these have the option to teach general purpose programming, or even visual coding.

I encourage you to try MakeCode Arcade for yourself and see if the pros outweigh the cons.

Some final questions

Will DLTV be running workshops on this?

That's the plan. Once we can get back to face-to-face professional learning workshops for teachers, we hope to get out a bunch of Meowbits and let rip!

Keep an eye on our fortnightly newsletter and upcoming workshops.

Where do I get a Meowbit?

The Meowbit and other MakeCode Arcade devices are available from electronics sellers in Australia, like DLTV sponsor Pakronics.

*Actually TypeScript language.

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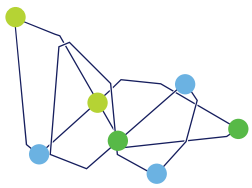

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