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Digital Technologies – beyond the panic

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For the last couple of years, I've been staring down the barrel of the gun that is the about-to-be-made-mandatory Digital Technologies Curriculum. At information technology conferences, there were nervous whispers in the food queue along the lines of "They're going to make us all learn to program" and "What the hell is computational thinking?". All of our support information was 'coming' or 'in development'. I would wake up at night screaming "Algorithms!" Finally, I went to a three-day conference in Melbourne to find out exactly what is going on and how much trouble I am in as IT Coordinator at a boy's Catholic secondary college. As it turns out, not as much as you'd think. That's not to say that I don't have work to do. I most definitely do. It's just not as terrifying as our conversations led us to believe.

Digital Technologies Curriculum?

Perhaps you're not in IT. Perhaps you didn't realise that there is a new Digital Technologies Curriculum that will be *in place next year*. You might not have noticed your Head of Technology pale faced and sweating while looking over a very thick document (of course you didn't, because the Head of Technology almost always has an office up the back of the school away from the other teachers). "So what," you might be asking "is this Digital Technologies thing and why should I start to panic?"

Let's establish a baseline:

You know there's a new National Curriculum, right? The whole country is going to follow the same curriculum standards (you know, unless you are Victoria), which means that there have been some major changes to the skills we are looking for and the topics we cover in various subjects.

Concentrating on Information Technology (or ICT, or DT, or CS, or ROFLMAO) there are two major changes:

- The ICT domain has been absorbed into the other domains.
- Technologies now covers Design and Technologies and Digital Technologies.

In real terms this means that much of the curriculum typically taken

by the IT subjects in schools (using spreadsheets and databases, using the Internet, presentations and word documents) are now expected to be intrinsically taught within the other curriculum areas. Furthermore, the IT subject will deal now with creation of content rather than the using of various software packages. And schools everywhere are FREAKING OUT!

What are people scared of anyway?

- Schools don't provide enough time teaching Digital Technologies to cover the curriculum
- The majority of teachers aren't qualified/trained to teach ICT skills to an adequate level
- IT teachers aren't trained in programming
- Schools don't have the physical spaces or hardware/software to provide this new program
- Giving to Digital Technologies means taking away from another subject/Teaching ICT skills in another subject takes away from other content in the subject
- How do we report on the curriculum across learning areas?

What's actually involved?

This is where I take a year's worth of incredibly confusing information and compress it into something that everybody can understand. Fingers crossed.First, the difference between ICT skills and Digital Technologies:

The best explanation I've received so far is that the ICT General Capability is for *users* of technology (Word, Excel, PowerPoint) and the Digital Technologies learning area promotes the *creation* of solutions *using* technology.

How can we implement this in high schools?

Implementing Digital Technologies in any meaningful way takes the combined efforts of Leadership and the teaching staff. It will most likely be coordinated by the Head of Technology (I know it will be at my school) but without the support of the Leadership Team any true change will be doomed to fail.

Furthermore, it is important to realise that the implementation of Digital Technologies will be a gradual process. Even though we will be assessing against the standards from next year, it will take time to get the staff upskilled and the equipment upgraded and in place. Hopefully most of you have started this process already, but all up, if done properly, we are probably looking at a 10-year process.

Step One: teach the teachers. Ditch ICT from IT classes

First up, we need a staff of teachers who are proficient in the ICT capabilities they are meant to be teaching their students. I know we're busy. I know that we're not expected to be experts across a range of fields. I also know that there's no getting around this. If you want to teach in a 21st Century classroom, you need to be conversant with 21st Century technologies.

- You should be using Styles in Word instead of pressing the space bar over and over again to get your heading into the centre of the page.
- You should be able to put together a budget in Excel (or Numbers, or Google Sheets).
- And if you're only now getting excited about PowerPoint, you're on the wrong end of the stick.

We can't teach this in our Digital Technologies classes. We can't assess it beyond what any teacher would be expected to assess. And our English and Maths and Science teachers can't just say "Do a PowerPoint" without checking to make sure that their students know how to 'do a PowerPoint'.

From the Australian Curriculum ICT Capability learning curriculum, here are the things that every teacher needs to know how to do so that they can teach the same to their students (with my comments in brackets):

- Recognise intellectual property (copyright. Did you know it is illegal to create memes in Australia?)
- Apply digital information security practices (making sure your iCloud photo drive is secure so that you don't end up in the next photo scandal. Also how to behave online)
- Apply personal security protocols (knowing what's out there about you, and how to limit your digital footprint. Knowing about your right to privacy, your own identity and emotional safety. Cyberbullying)
- Identify the impacts of ICT in society (basically: are iPads good or evil?)
- Define and plan information searches (how to decide what to search for online)
- Locate, generate and access data and information (using more than just Google to find what you need)
- Select and evaluate data and information (judging and selecting which funny cat video is the *right* funny cat video)
- Generate ideas, plans and processes (computers for brainstorming and timeline creation)
- Generate solutions to challenges and learning area tasks (use software to solve problems)
- Collaborate, share and exchange (creating online sharing spaces for group projects. Wikis, Facebook groups and Google docs are possibilities)
- Understand computer mediated communications (Communicating using the computer – Skype and Google hangouts. More specifically, when to use a specific tool for a purpose)

Honestly: you know how to teach. You're reading educational magazines, so you're probably passionate about teaching. You just need to find an hour a week for the rest of the year to concentrate on getting Digital Technologies into your head

How many of these are you comfortable with? How many of these are the rest of your colleagues with these? How can you explicitly teach and assess these in your Media class? Your Humanities class? Think about it. OK. Step One: ditch the ICT capabilities from IT classes. Check.

~~Step Two: Teach them Digital Technologies.~~
Step One-and-a-half: know what the Digital Technologies curriculum involves

Here I can help, but every teacher needs to spend time unpacking and deconstructing the subject area for themselves. Paul Clapton-Caputo from the South Australian Department of Education suggests that 20 hours of self-paced coursework can get a teacher to a point where they are conversant enough with the curriculum that they can begin to design units of work using their natural skills as teachers.

Honestly: you know how to teach. You're reading educational magazines, so you're probably passionate about teaching. You just need to find an hour a week for the rest of the year to concentrate on getting Digital Technologies into your head. I've listed a few courses and helpful websites in the resources section that you can look at in your own time to get up to speed.

But for those who don't have the time or inclination, here's a breakdown of the new curriculum with examples from people smarter than me:

Technology overview

The technology learning area is broken up into Design and Technologies (woodwork, metalwork, food and textiles, for example) and Digital Technologies. It is important to note that Digital Technologies isn't just IT rebranded. Dozens of experts (some of them even teachers) have spent years looking at what adults will need to know in a world where 90% of the jobs our students will do haven't even been invented yet. They realised that the current curriculum assumes the use of certain technologies, meaning that by the time the student enters the workforce, their knowledge is already outdated.

This is from the AusVELS ICT standards:

"Students build on skills developed in previous levels to share ideas with the teacher and others through a range of electronic communication means such as email, contributing to forums, SMS messaging, and interacting with websites such as Wikipedia" – AusVELS ICT Year 10 Learning Focus.

I am unconvinced of the likelihood that many of these technologies will be in regular use by the time my Year 9s leave school. Digital

The interaction between hardware and software, the use of different peripherals for different purposes, lead naturally to various STEM activities using Raspberry Pi or Makey Makey brains to create complex projects

Technologies focuses on getting the students to think in a manner that means that any software or technology they use will be within their grasp. It is broken into two strands (Australian Curriculum) or three (Victorian Curriculum). I'm going with the Victorian Curriculum because that's what I have to plan for.

Here are the strands:

Digital systems

Digital Systems is the exploration of hardware, software and networks. It looks at the different parts of a computer, the different kinds of software, the way computers and other devices talk to each other and the layers of hardware, software, networks and protocols needed to let me download *Game of Thrones* and complain about spoilers with my friends.

In early primary, students will learn the different components of a computer – the basic stuff like the monitor and keyboard. They will look at what different peripheral devices do and how they can be used.

By Grade Six they'll be taking machines apart, looking at the insides. They'll explore networks in a basic fashion, getting to grips with the concept.

In high school the focus shifts to networks, including how information is transmitted and how it can be kept secure. They'll look at why you would buy different computers for different purposes, or different components in a computer. A great practical example would be building a computer from scratch, or a small network which they can then use to interact with each other or play *Halo*.

At the upper end of high school, they will look at the interaction between hardware and software. How the operating system interacts with the hardware and more to do with network protocols (ftp, html, that sort of thing).

The interaction between hardware and software, the use of different peripherals for different purposes, lead naturally to various STEM activities using *Raspberry Pi* or *Makey Makey* brains to create complex projects.

Data and Information

There is a big difference between Data and Information. Data is the raw chunks that go into the sausage grinder. Lots of nutrients but not much good in their current form. Information is what comes out of the grinder, encased in intestine and ready to go onto the BBQ. Information is data once you've processed it into something useful.

The Data and Information strand deals with the raw data and the patterns and processes needed to turn it into juicy information. In the Foundation-Grade 2 space, students are recognising data and patterns in data that allow us to sort and label it. In these early years, they start to collect data, and then process and present it creatively. Across the curriculum, this could mean creating family trees for History or pie graphs in Maths. Even now they're using tools such as mind maps, charts and graphs, movies and presentations to present information in a creative way. Finally, they will begin to use online spaces, limited to communicating on secure intranets and only with people they know, but already they are collaborating on work over a network.

As primary school progresses, students expand their idea of what data is and become more aware on their role as online citizens. They look at the usefulness of alternatives in presenting information to an audience and there is an increased focus on collaboration online, but most definitely stressing the safety aspect of online interactions.

Scarily, by the time they hit middle years (5–8) they are looking at how computers communicate in binary and validating data, automating calculations and using advanced search functions in online searches. They should be using software to create online meetings, checking free times for all members (and how

many of your staff can do that in Outlook or Google Calendar?). They're even checking facts on the internet for authenticity, which is more than can be said for 99% of Facebook users. Database queries and modelling real life objects for computer games also fit into the Year 7 and 8 elaborations. Are you worried yet?

By Year 9 and 10 we have moved beyond collecting data to analysing it, protecting it using passwords and other security measures, validating, compressing and storing it safely. Middle secondary students are investigating the legal responsibilities they have when creating information products, including privacy issues and copyright. Instead of accessing collaborative web solutions, they are *creating* web-based projects, focusing on the ethical considerations of making their work accessible to people with disabilities and ensuring that they aren't offending people from different cultures.

Creating Digital Solutions

And here's the one that is scaring the life out of History and English teachers who have been given some Digital Technologies classes to round out their load. I'll flick through it quickly because there's a lot in it, and then move on to *how* we can do this.

Creating Digital Solutions is the one that most separates DT from ICT. This is where the user becomes the creator. From the Foundation level, students are solving problems by following processes that they can use throughout their school life into their professional careers.

In high school, visual programming is used less as text-based programming takes over. Part of this is the ability to structure algorithms in English before translating that into code

An algorithm is a sequence of instructions to perform a task. There is a fantastic short animation in the resources section at the end of this article that explains it better. From Foundation onwards, students will experiment with algorithms, creating lists of instructions to complete tasks. This does not have to be done on a computer, although it's worth starting to look at robotics or visual programming, if your budget allows.

In Grades 3–6 we're starting to break the problems down (deconstructing) and looking at different ways to describe instructions. Visual versus written instructions is the simplest example. They are programming solutions from Grade 3, using visual programming tools such as *Scratch*. These will take user input and involve branching choices, much like a Choose Your Own Adventure story. Moreover, they are looking at how apps, websites and other software tools are laid out – how the user interface works. They should be looking at the needs of the user and how these needs are satisfied by their own software designs. Finally, they have to start to consider the social and environmental considerations of their software programs.

It's starting to sound tricky, but that's only primary school.

In high school, decomposition takes on added complexity. When looking at the problem, students need to look at the players involved (users, company head, parents of students), the constraints of the problem (time, money, knowledge of the user, location or availability of technology) and how each problem can be broken down into smaller, more manageable problems. This is simply the way we should be solving all of our problems, so no big deal here. They also need to look at the issue of *scalability*.

The example we were given at the Digital Technologies conference was that of making a sandwich. The instructions for making a sandwich can be easily written down. There's repetition. There's choice. There's the possibility of peanut butter. The instructions for making two sandwiches would most likely be the same as those for making one. But if you were making 10 sandwiches, you would probably streamline the process. The same goes for a number of other problems.

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in English before translating that into code. Furthermore, the students should be able to give a visual representation of the program using a flowchart or other diagram.

The design of an information system – a game or a website or an app – has to be researched and laid out. Once they've created their product, they also need to be able to test and evaluate their solutions for a number of possible test cases. I usually give my software programs to my daughter to see if she can break them. Or my wife.

By Year 10, the complexity of the problem has increased, as well as their ability to decompose the problem and design multiple solutions. In the decomposition stage, the students will be interviewing clients – not just users, but other stakeholders – to discover additional constraints. They will focus on project management, hopefully using software to manage jobs and time. Basically, they will be operating beyond the natural level of any teacher not specifically trained in IT. It is important to take note of this.

So what now?

Step Two: teach them Digital Technologies

NOW you can build your Digital Technologies curriculum, with the support of leadership and a cohort of willing colleagues from the Technology Department. This is definitely not a job for a single overworked Head of IT. And it needs to be established in concert with Leadership so that the entire school knows how the system will be implemented.

First up, take your time. Especially in high schools, you have a couple of years before you'll start receiving students going through the new curriculum. You can assess the kids against the Level 8 standards in Years 7–10 and build a curriculum as you get familiar with how it works. James Curran – one of the developers of the Australian Curriculum – told us that even though he hopes everybody jumps on board next year, realistically this is a 10-year project from implementation to full acceptance and saturation throughout the schools. That 10 years has already started, by the way. But we still have some time.

Given that the students are going to be at vastly different levels of knowledge until the system settles down, it is very important to audit new students coming into the school. Eventually, students should all be at a similar level, accounting for basic ability, but to start off with, you might have some with very little knowledge and others who have been programming since Grade One.

Secondly, it is important to take advantages of the skillsets of parents and others in your school community. I know of at least five parents at our school that are professional IT software developers. More working in networking and other computer systems. Make use of them. Ask them to come in to teach a class, or to talk about a specific concept with a year level. If you want to formalise the relationship, there is a program called *ICT in Schools*. It came out of the Scientists in Schools program and lets you form a partnership or mentoring role with an ICT professional. When you sign up and let them know what you're looking for, the organisation will link you to someone suitable. From there, the two of you decide how best to use your ICT professional.

While you're putting together the Digital Technologies super-interesting classes, make sure the school is promoting and assessing the ICT Capabilities skillset. A Tech Skills Passport could be the answer, with students getting checked off on different skills in a number of classes.

Audit what you're already doing. There are a number of tools out there that allow you to do simple checklists and tick off information against your current curriculum.

Start using computational thinking in all of your subjects. Whenever you are given a problem, you can break it down (decompose it) using computational thinking.

Send enthusiastic teachers to Digital Technologies conferences. Not just (or not even) your Head of IT, but a couple of Maths teachers, or a LOTE teacher. Digital Technologies has applications across the board, and it's important that not every push to change the curriculum comes from the IT faculty.

And even thought it might take a Babel Fish to understand the new DigiTech Curriculum, listen to Douglas Adams and DON'T PANIC. There are plenty of resources coming out. The country's education departments are all dedicated to making sure you understand how this works. Make sure you spend the time and money necessary to get your teachers comfortable with the technology. Make sure you provide the DigiTech faculty with the toys and resources that let them experiment with what makes good teaching in the area.

And always know where your towel is.

Resources, organisations and further information

Free

https://hourofcode.com/au – One of the most fun ways to introduce students to coding. Coding isn't the be-all and end-all of Digital Technologies, but it is the skill that the least amount of teachers are comfortable with. This can change that.

Education.microsoft.com – an online community for teachers, with plenty of resources for course development and the support of likeminded teachers to keep you motivated.

Trailblazer.io – see your browsing history in a graphical form – great for seeing whether students are researching properly.

MOOC – Massively Open Online Course – CSER Digital Technologies F–6

ICT professionals in schools – like Scientists in schools, but with computer professionals. http://www.scientistsinschools.edu.au/ict/ictprofessional/index.htm

Wespeakcode.net – a Microsoft initiative designed to increase the number of coders and computer professionals in the world. There are a number of courses, ranging in skill level, for any school curriculum. This is basically a hub linking you to other coding sites on the 'net including:

Touchdevelop.com – another Microsoft initiative that allows students (and teachers) to create apps for use across all devices. There are courses running from 6 weeks to 18 weeks, led by professional instructors.

Paid

Grok.com – easy to teach courses in Web Development and Programming, assessed by the Grok team and with competitions and analytics to make the course stimulating for both teachers and students.

Auditing

VCAA Digital Technologies advice and links – http://www.vcaa.vic.edu.au/Pages/foundation10/viccurriculum/digitech/digitech.aspx

http://www.acleadersresource.sa.edu.au/ – a course to run through the Digital Technologies curriculum.

Multimedia

Videos to explain Algorithms and Decomposition: https://dltv.vic.edu.au/resources-australian-curriculum-digital-technologies

STEM

I'm linking you to the official sites for the companies that provide hardware for STEM-related projects, but you should search for Australian suppliers or buy from eBay to save money here.

https://www.raspberrypi.org/ – Raspberry Pi motherboards for building interactive projects.

http://www.makeymakey.com/ – Makey Makey boards.

http://www.intel.com/content/www/us/en/do-it-yourself/galileo-maker-quark-board.html – Intel Galileo kits for STEM education.

https://www.arduino.cc/en/Main/GenuinoBrand – Arduino (or Genuino outside of the US).

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