

When things come unplugged

By Steve Grant, December 2018

How can you teach Digital Technologies when you have no digital technology? Curriculum officer Steve Grant explores the alternatives.

I arrived at a remote school last month to find that the school internet was out. I was there to do model lessons in Digi Tech. Roadworks along the one road into town had sliced through the only NBN fibre optic cable. It was not certain if we would get the internet back at all.

"I hope that doesn't muck up your plans," the principal said.

It did.

But I wasn't going to let it. Time to go to plan B... and then C.

The best laid plans of mice and men...

The scenario may sound familiar to most who work with technology. You have planned a lesson that depends on access to the internet, or to the computing lab, or to robots that are not charged – again! Something changes that removes the tech from your tech lesson, and the situation can derail your day, not to mention your lesson. But that's ok. Because Digital Technologies is not always about digital technologies.

The assumption is that we need digital technologies to teach Digital Technologies. However, <u>it is estimated that 50</u> <u>per cent of the curriculum can be taught without</u> <u>students using digital devices</u>. So if it's not about mobile devices, laptops, robotics and internet apps, then what is it about? The curriculum is about developing thinking and problem-solving skills, and there are loads of activities you can do in class (and are probably already doing) that develop these skills.

Little, some, none...



What does the 'no tech' classroom look like? For some, 'no tech' means limited or no internet access. For others, it means there are few or no information and communication technologies (ICT) to work with. Let's look at these and other permutations – which all seem to be a function of internet connectivity, access to devices, and time – and see how we can work around them.

Planning: no devices and no internet, medium – long-term solutions

Usually, we'd expect problems with access to internet or devices to get worse with time, not better. The best advice is to plan around it.

The biggest challenge is with <u>digital</u> <u>implementation</u> when students automate an algorithm, typically by writing a computer program (coding) or by using appropriate software.

Programming constructs, such as algorithms (Jam Sandwich algorithm), branching (Plan a Choose Your Own Adventure story), conditionals (Crazy Conditionals) and iteration (Fun with Maths and Flowcharts), can be taught using paper-based or hands-on activities (Years 9–10).

Where the curriculum refers to visual (3-4, 5-6), general-purpose (7-8) and object-oriented (9-10) programming languages, there is no escaping the need for students to use a digital device to code the solution. When long-term internet outages combine with no access to devices, it is usually a problem that only the school administration can solve. Involve admin in your planning and flag

that access to devices and to the internet is an issue.

A good place to start is with data <u>collection</u>, data <u>representation</u>, and data <u>interpretation</u>. A good understanding and conceptual basis in data are essential for students in Digital Technologies. If a problem can be made into data, it can be automated with an algorithm, and encoded using a program for a computer to solve. If students do not have a good grasp of data, they will encounter more problems with their coding once they do get online.

Check out what you can do with surveys, graphing, creating infographics from data in your classroom.

When you are ready to move into algorithms, there are **unplugged activities** that

act as substitutes for using devices. This can relieve pressure on resources. There are short-, medium- and long-term solutions. Each of them is influenced by how far in advance you need to plan around your tech outage. Here are some workarounds and cheats to get your lessons back on track.

Unplugged: few devices, no internet, medium – long-term solution, still need to consider options for digital implementation

Paper-based or unplugged activities model the behaviour of digital systems. Students may get a better understanding of concepts through hands-on activities or the use of manipulatives.

What you are looking for in unplugged activities is alternate ways that can illustrate the <u>10 key</u> <u>concepts</u> from the Digital Technologies curriculum. Off the shelf resources work best if they fit into the sequence of content you have designed. Massage when required.

<u>CS-unplugged</u> has a range of activities for different year levels that include Binary numbers, Error detection, Kidbots and Sorting networks. These aren't complete schemes of work and you will need to decide where these activities fit into your teaching and learning program. Target developing computational thinking skills with:

- counting using <u>binary</u>
- modelling <u>sorting networks</u>.

The <u>Digital Technologies Hub</u> combines unplugged and plugged activities into its scope and sequence documents. If you know the day before that you will not have access to the laptops, try one of their stand-alone unplugged lessons.

There are loads of resources around algorithms: <u>paper coding</u>, <u>picture dictation</u>, <u>the</u> <u>human crane</u>, which can leave you asking – what's next? If you are planning to use mostly unplugged activities, ensure you are clear about the intention of the activity and that it fits within your scope and sequence. Otherwise, these activities end up feeling disjointed. A bag of tricks: short-term, last-minute internet outage / no access to ICT



one's a cheat. And teachers can be the ones to wear the cost.

Over the years, I've put together a box of resources I can pull out. It includes a mobile device, an Arduino kit, Ozobots, a Sphero, Edison robots, a <u>Raspberry Pi</u> computer, a <u>Makey Makey</u> and some BBC <u>micro:bits</u>. There is not a class set of anything, except for the micro:bits. But these are enough to have stations where students can rotate through activities.

I've thought ahead of time which activities I can use for each resource and I have some print materials ready to go. They start with examples, and then move onto challenges the students can work through.

Having a small kit of your own ICT resources can cover a one-off lesson at a pinch, but it's not a long-term solution. This is not to say <u>teachers</u> <u>should be paying for teaching resources</u> either. If you have a capacity to purchase DT tools / toys, the back-up can be helpful in these sticky situations.

No internet – no problem: devices and no internet

What a great time to <u>model how the internet</u> <u>works</u>. Discuss with students what a <u>Domain</u> <u>Name Server</u> is and how it functions. Why not explore how data are broken up into packets and sent through the internet to its destination using TCP/IP Protocols, using the unplugged activity, <u>Tablets of Stone</u>. Blend in Design and Technologies, and make a model of the internet using found and recycled materials as teachers in the pictures did. When the internet is down, it's a teachable moment to discuss how information gets around the internet. Look at modelling how <u>routers work</u>.

For F-6, internet outages need not prevent students from coding. There is an <u>offline version</u> <u>of Scratch</u> (version 2.0), which means that even when the net is down, students can still be creating, saving and sharing their projects with classmates. Work with your IT manager to install the applications on student laptops or desktops – and away you go. Super-nerds can have a look at <u>Snap!</u> from Berkeley, which you can use offline and which has a range of addons to connect things like Sphero, Leap Motion, Speech Synthesis and Arduino, just to name a few.

The moral of the story is...

Plan. Anticipate that devices will not be around or that the internet will drop out. And focus on thinking skills, problem-solving and finding the essence of the curriculum. With a bit of flexible thinking, a lack of devices or access to the internet doesn't have to be a barrier to teaching Digital Technologies.



Teachers from Crossways Lutheran School build their own model of internet