Supporting Implementation of Digital Technologies

Progress report – *Focus on curriculum and pedagogy and learning outcomes*

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Disclaimers

The views expressed herein represent those of the research team and do not necessarily represent the views of the Australian Curriculum, Assessment and Reporting Authority.

Introduction

The *Digital Technologies in Focus* (DTiF) project, developed and implemented by the Australian Curriculum, Assessment and Reporting Authority (ACARA), was funded as part of the Australian Government's National Innovation and Science Agenda. DTiF supports the implementation of the Digital Technologies curriculum in 160+ disadvantaged schools across Australia by providing professional learning engagements for participating principals and teachers and promoting site-specific goals embedded within an action research cycle. Deakin University was commissioned to undertake an external case study evaluation, focusing on the engagements, outcomes and impacts for six schools.

Schools participating in the DTiF have very low ICSEA scores and evidence educational disadvantage based on the intersection of location (many are rural or classified as remote), language (many serve populations where English is an additional language – this includes both new immigrants and Indigenous students), and Indigeneity. Students at these schools face significant challenges associated with English language barriers, parental incarceration, trauma, intergenerational unemployment, financial disadvantage, and poverty. The schools face daily challenges associated with student attendance and readiness to learn, as well as structural challenges relating to resourcing and infrastructure. Issues relating to disadvantage and readiness were outlined in Progress Report 1 (Lynch, O'Mara, Cloonan, Auld & Speldewinde, 28 September 2018).

The purpose of this report is to communicate the progress and preliminary findings of Data Point 2 (DP2) in support of an ongoing dialogue between ACARA and the Deakin University evaluation team which will inform a final report. Data Point 1 (DP1, subject of Progress Report 1) focused on establishing the site-specific contexts of each case study school, including local factors impacting on the school, the history of digital technologies in the school, and the backgrounds of those people participating in the research. This phase also provided insights into individuals' and schools' early engagements with the project, and how these engagements were being received. Interviews with principals and teachers suggested that ACARA's methodology was suitably flexible and responsive to local needs, with face-to-face support from Curriculum Officers identified as particularly effective. Case study schools appeared to be focusing on building basic resources and skills.

Data Point 2 was differently focused, asking the case study schools to provide accounts and evidence of curriculum and pedagogy that have been developed as part of their participation in the program, and of learning outcomes observed. The generation of data at each site involved:

- Revisiting questions (in individual interviews with school leaders and teachers) pursued in DP1 pertaining to the schools' engagement with the project, the focus and progress of each school's project plan, and any issues encountered;
- Discussing (with individual school leaders and teachers) teacher engagement and professional learning in the project;
- Discussing (with individual teachers) teacher-selected student cases that illustrated engagement, growth or particular issues or affordances of the digital technologies work in each school.

These conversations took place in semi-structured interview formats, where interviewees had been previously briefed on the focus and purpose of the interviews, and were invited to bring along accounts or artefacts that illustrated aspects of the program or evidence of outcomes of the program, particularly as pertain to curriculum and pedagogy, and learning outcomes. In this

invitation, it was suggested that teachers choose particular students, whose learning journeys might evidence particular impacts or issues. Schools were offered funding to cover CRT costs associated with preparation for interviews. The fruitfulness of this approach varied across the six schools, with some participants presenting at interviews well prepared to talk through the details of particular students' engagement and learning in digital technologies, but with other schools finding this type of preparation was not possible in the context of staff changeover and staff shortages. In some contexts (at least three of the six sites, CRTs are difficult to source even when funding is available). Despite variability in preparedness to talk about curriculum, pedagogy and learning via selected student cases, participants at each site were interviewed, providing insights into progress and impact at each site.

In total, twenty-one staff members (five school leaders, fourteen teachers, and two teaching assistants/aides) were interviewed at DP2. Eighteen of these staff members had participated in DP1. Others were new to the project following departure or unavailability of their DP1 colleagues.

To report the data collected in a way that communicates the specificity of impact at each site, this progress report is structured around six school case studies (school pseudonyms use minerals and gemstones: Quartz Primary School, Jade Primary School, Amethyst Primary School, Opal School, Emerald School, Pyrite Secondary School). Some of these case studies (where data permits) incorporate narratives of individual teacher and student engagement and learning. For others, the case studies are structured around issues, themes and activities.

School Case Studies (DP1; DP2)

Engagement, progress and impact in the six case study schools are discussed below with reference to DP2 data. Quartz, Amethyst and Jade are primary schools. Quartz Primary is located in an inner suburb of a major city. Jade Primary is located near the urban fringe of a major city. Amethyst Primary is located in a regional town. Emerald School and Opal School are both remote independent schools offering primary and secondary education to their largely Indigenous populations. Pyrite Secondary is located in a small rural town.

Quartz Primary School

One school leader and three teachers were interviewed for DP2 at Quartz. All three of these staff members had also been interviewed for DP1. Of the six case study schools, Quartz Primary evidences the greatest continuity of staff members, both in the school and engaged with the project, with all of the staff members who directly participated in the project at the school's commencement in DTiF continuing to do so. Among the case study schools, Quartz also were best able to prepare for DP2 interviews.

At Quartz, students have started with a low base in ICT capabilities in a context where access to devices outside of school is very low. Quartz therefore developed a focus on ICT capabilities, access to devices, and 'plugged' learning activities as a first step to implementing the Digital Technologies curriculum and building capacities in teachers and students. DP1 and DP2 data support a narrative of acceptance and learning, where both student and teacher awareness and skills have improved. Of particular note is the impact that the implementation of digital devices, digital media and online platforms has had on inclusive teaching and learning practices. Gains are noted in general ICT capabilities and the integration of digital devices across the curriculum. Participants at Quartz plan to repeat their initial skills audit as part of the school's action research project, which would provide

quantitative evidence of outcomes. It was suggested that the evaluator's visit might prompt the school to act on this plan.

Unlike most of the other case study schools, this school has a relatively stable teaching staff, which supports opportunities for sustained work to promote particular agendas around pedagogy and curriculum. The implementation of the Digital Technologies curriculum is particularly supported by the resourcing of a specialist teacher, but it also aligns with other teaching and learning priorities in the school. The school leadership is aware that positioning Digital Technologies as a specialism may limit the impetus for the wider teaching staff to develop detailed knowledge and changed curriculum practices. School leadership sees a next step in the implementation of the Digital Technologies curriculum as engaging other teachers in Digital Technologies concepts such as *computational thinking* through, for example, 'unplugged' activities. This would support teachers to develop understandings about the distinctions and relationships between digital devices, ICT capabilities and the Digital Technologies curriculum. Most of the accounts of learning activities and changed pedagogical practices focused on the introduction of digital tools and digital media into other curriculum areas and into teachers' professional practice generally. The focus on digital tools and digital media rather than on knowledge particular to the Digital Technologies curriculum may be partly a function of school type – being a primary school, this school has a strong emphasis on literacy and an interest in how new digital tools and media intersect with and/or transform traditional literacies.

Teacher QC1 — changed professional practice

Teacher QC1 is not part of the team that participates directly in the ACARA DTiF project. Teacher QC1 was interviewed because the principal identified her as a good test case for impact. She is a very experienced teacher, but started from a very low skill base in digital devices and tools, and reports she had very low confidence. This teacher self-identified to the principal as needing to focus on improving her digital skills in her professional work and in her teaching. QC1 was interviewed in March 2018 and again in August 2018. In her initial interview she admitted to not seeing how the Digital Technologies curriculum or the use of digital devices might be incorporated into her teaching. She admitted not being familiar with the focus and scope of the Digital Technologies curriculum. The second interview evidenced a significant change in attitude and confidence. This teacher recounted some of her previous professional practices (e.g. creating all of her planning documents by hand and then needing to scan them to get them into the school system), and she described some of her current practices (e.g. using the Google suite to create her planning docs; expecting her students share their work with her electronically; and, incorporating videos and photography into her teaching for the first time). Her story of skill development and changed practice evidences quite dramatic change, which both she and the principal attribute to the school's participation in DTiF activities. This teacher was able to provide examples of using digital technologies with her students to support learning across the curriculum, including online repositories and online production tools, and she believes the use of these tools has improved student learning processes and outcomes.
Teacher QC2 – DT Specialist

Teacher QC2 is employed part-time in the school to teach Digital Technologies as a specialism. She participated in a MOOC provided by the DTiF project and noted that, although much of the content was already known to her and similar to that encountered in other professional learning courses, it provided her with additional ideas about implementing the Digital Technologies curriculum. She commented that the MOOC was valuable for her colleagues who don't have a strong familiarity with the Digital Technologies curriculum, particularly the support provided for understanding the

specialist terminology found in the Digital Technologies curriculum area, much of which she believes would be new to her generalist teacher colleagues. In her teaching, QC2 has made use of a lending library that was suggested to her via the DTiF project, borrowing robotics and electronics kits for use in lessons. Although she is responsible for teaching Digital Technologies within the school, she hopes to use other the equipment made available via the lending library to encourage colleagues to use robotics in other curriculum areas—for example, encouraging teachers to use Bee Bots in mathematics. She has also been working alongside generalist teachers to assist with integrated studies planning and how digital tools might be used to support that. In terms of her own professional practice, she commented that, as the only Digital Technologies specialist in a small school, she doesn't have colleagues to work with and to promote accountability in terms of curriculum planning. In this context, and as a graduate teacher, contact with the ACARA Curriculum Officer has provided important affirmation of her curriculum practices.

Student QC1 – Productive links between literacy and coding

Student QC1 has problems with receptive and expressive language. He gets frustrated when he does not respond to the specificity of teacher instruction, or when others (peers/teachers) do not respond to his own non-specific expressive language. As part of the digital technologies specialism offered in the school, this student has participated in learning activities involving visual block coding using Scratch. His classroom teacher reports that participation in these activities has required QC1 to attend to the detail in language (in this case, a coding language) and has supported a realisation that particular instructions produce particular responses: "He understood that actually there are times you have to be very explicit, there are times you have to be very specific and you also have to take responsibility. So if you don't give the right directions or the right information well then it's not going to turn out the way you wanted" (Quartz School, Teacher interview, DP2). The classroom teacher says that this realisation and practice has resulted in a broader awareness of the importance of detail, and has supported improved social interactions for this child in class.

Student QC2 – Digital Technologies as a level playing field

Student QC2 is below his peers in literacy and numeracy, starting from a low base in Foundation and having participated in both Reading Recovery and Mathematics Intervention. Because very few students in the school have access to devices outside of school and students' skill levels were generally very poor (as assessed by an initial skills audit), 'plugged' learning activities provide a relatively level playing field, where this student does not have the deficits evident in other learning areas. QC2 has thrived in this curriculum environment, developing his expertise and now supporting his peers in coding activities. For this student, academic success and being positioned as a burgeoning expert is a new experience, enabling a focus on his capacities rather than his deficits: "it took a lot of convincing him, but he's actually one of the best in his class at it" (Quartz School, Teacher interview, DP2).

Student QC3 – Digital tools are enabling

Student QC3 has very low literacy skills and difficulty producing legible handwriting. By using digital tools for composition, Student QC3 has shown improved processes and achievement in writing. "it would be about two words of handwriting, and now he's able to produce like half pages of work in a really short amount of time, like the growth is incredible" (Quartz School, Teacher interview, DP2). This advantage of using digital tools was noted with respect to numerous students who struggled with handwriting due to limited fine motor function and other difficulties in producing handwritten script that are a source of stress and a barrier to engaging in traditional compositions activities. The

production of digital texts was also noted as promoting review and editing processes, supporting skill development in this area and better quality final products.

Student QC4 – Digital research

Student QC4 became highly engaged in an investigation activity involving internet searching and the preparation of a presentation using Google Slides. In the course of her investigations, the teacher introduced QC4 to considerations of the authority and reliability of internet sources, as well as issues concerning plagiarism and the risks involved in combining handwritten notes with text cut and pasted from internet sources. This student became fascinated with the existence of different accounts about an historical figure that she was investigating and with the emergent conversations about how the effective and ethical use of online sources. The use of digital online sources and tools in this learning activity supported an authentic consideration of the reliability of sources that might otherwise not have been addressed (and which is not found in the Digital Technologies curriculum until higher levels).

Jade Primary School

The school, near the urban fringe of a major city, evidences challenges relating to school climate and perceived risks to security. The school grounds are surrounded by a large metal fence that is kept locked during the school day, with entry facilitated via video link to the General Office at two sequential entry points both involving confirmation of identity. The fencing is to both stop students from running away and to stop members of the community from entering the school grounds during the day, and was built as a result of previous incidents. On entry, visitors are required to sign a form, declaring they are not under the influence of drugs or alcohol, they have no weapons, and will not be abusive or violent during their time in the school.

Jade has been focused on a whole of school renewal program, with ICT at the centre of many of the developments.

DP1 and DP2 data show the strength of commitment to the students from the staff. The principal (School Leader JL1), has been in the role of ongoing principal at the school from the beginning of 2018, but has worked in the area for over 30 years. She is very enthusiastic about the school and said, 'I love being here. It's a great community to be a part of'. She is leading school renewal with a sense of hope and commitment to the community, focusing on making sure that the community, who are disadvantaged outside, are not disadvantaged inside school. She noted the commitment of the staff saying, 'things can be tough—the staff are very committed. They want to make a difference. It helps us get out of bed every day, because some days, as I've said, are quite tough'. Several interviewees have worked at the school for a long time, and we noted in the interview the high level of compassion, care and commitment to the students shown. For instance, Teacher JTL2 has worked at the school for some time, and even after moving house to a location an hour and a half's travel from the school, she was determined to remain teaching at the school, despite passing by many other schools much closer to where she now lived.

The school is trying to turn around the negative perception held of it in the wider community. This had a significant impact in the school, not just in terms of enrolments, but, significantly for the project, in terms of employing casual relief teachers (CRTs). Teacher release time given at the school for professional learning (or sick leave etc.) was not always able to be utilised if a CRT could not be found, and classes would be split to cover the teacher who was away. Teacher JTL2 reported, 'So many classes have to be split, it's not about funding. If a teacher's away, they're sick, or whatever, the Department pays for them to be replaced. But it's… we can't get them. We can't get the casual

teachers to come in the school, and as you can see, it's a little bit difficult, a little bit tricky in some ways. But honestly, it's, it's, it's not as bad as, as the perception out there is'. By DP2, School Leader JL1 felt that there was a slight improvement in the general community perception of the school, but she was still having troubles finding CRTs to release teaching staff.

Of the five Jade staff members who participated in DP1 interviews, only two were available for DP2 – one school leader and one classroom teacher. Accounts of individual student learning were not provided, but wider benefits of participation in DTiF were noted and evidenced in the context of wider school agendas. The following four themes draw across the two DP2 interviews, with reference to DP1 data supporting a narrative of impact and change.

Wide benefits of Improved Technology Infrastructure

Developing a strong ICT program and good access to technology is a key aim for the school. JL1 has been focused on improving the technology infrastructure, in particular the wireless access. At DP1, the technology infrastructure at the school was in poor condition. There was no functioning wireless network in the school, and the main technology in use was electronic whiteboards in every room. The school is made of double brick and there was very limited wiring infrastructure—an ethernet lab is available in the school library. JTL2 reported, 'for us it was quite frustrating, because we all want to get in and get on this technology bandwagon, and we've got these kids who go directly to the high school on the same site as us, who are going to have to have all these skills, and we've got nothing we can show them to teach them or to prepare them'. At DP1, the principal had received a series of quotes for rewiring the school and installing wireless points, and these had been completed by DP2.

The ICT program is being implemented alongside a positive behaviour program, and teachers and leadership see the engagement possibilities of the technology usage as key in this program. When JL1 began at the school, there was a culture of students being sent from classes for poor behaviour and many students were walking around the school, outside of their class. At both DP1 and DP2, she talked about this, and the positive changes that were slowly happening. In DP1 she said that the focus on keeping the students in the classrooms was 'a big one' for her and she said, 'I know this sounds funny, and in other schools it would be, but we've reduced the amount of smashed windows.' These first goals, of keeping children in class, and engaging the students in the classroom, have been documented as reducing the numbers of smashed windows and fights at the school.

At DP2 School Leader JL1 was upbeat about the improvements to infrastructure and student behaviour. The school had been completely rewired and the wireless network points were working well throughout the school. One of the things that JL1 noted was that improved ICT infrastructure resulted in the teachers being far less frustrated. Previously when teachers planned to use technology, their preparation would often be wasted due to the poor and unreliable quality of the infrastructure. Since the infrastructure had been so radically improved, this frustration was disappearing and the teachers felt really invigorated with the new Digital Technologies curriculum. She felt that this had resulted in a series of positive changes at the school, resulting in many fewer students outside of class. She said, 'I can tell you now, the lack of – when I first came, the amount of students that were out of class was just absolutely amazing. I'd never seen anything like it. And now, with teachers with that reinvigoration, that motivation, that support in all different areas – not just technology, but in all different areas, you'd be lucky to find a student out of class.'

Curriculum usage of new technology Equipment

The school had also purchased new equipment including a set of HP tablets and a class set of Sphero robots. JTL3 had previously noted that the library ethernet meant that things had been centred

around a laboratory model of computer usage, as they all had to be plugged in in the library. The new wiring and equipment meant that the technology was being moved 'from the library into every classroom, so that it becomes part of practice'.

JTL2 described the ways that the Spheros were being used at DP2. She explained that she spent time teaching the directional language (forward, backwards, side, left, right etc.) needed for programming the Sphero robots as many of the students did not know any of these directional words. The teaching of the language was built into the curriculum and as they taught the skills they made sure that the language was understood and able to be used by the students. The students then programmed the Spheros to make simple moves. The children had been totally delighted by this activity and were very engaged with the Sphero robotics.

Developing algorithmic thinking through children's literature

The focus of the Jade School action research project is the development of literacy and numeracy through algorithmic thinking. JTL3 was very enthusiastic about the support received from the ACARA support officer in establishing and developing the project. JTL3 described the ways in which algorithmic thinking was being embedded in the curriculum using early years literature. The class had read, *There's No Place Like Home*, by Rohogoy Josh. This Australian picture book is about a polar bear, who lives in the city. His house is too small and he goes to search for a new home, but becomes lost. JTL3 described that the class considered, 'How could we redesign his house to make it more comfortable, because he doesn't like the crowds?' In the story, the polar bear searches through a variety of landscapes until he gets to the Arctic, his home. JTL3 explained, 'So, well he doesn't like sleeping in trees, how could we solve it? How could we make it more comfortable?' The students discussed design possibilities emerging from the questions asked in the text. Students then undertook design processes to design new homes for the polar bear, including sketching their designs and building models. These 'unplugged' Design and Technologies activities supported thinking skills and processes that are foundational within the Digital Technologies curriculum.

Focus on positive relationships

JL1 sees the development of positive relationships throughout the school as 'key to everything'. She describes, 'That's how you move people along. You can't go into a school and just tell them, "that's the way it's going to be." It has to be gradual, it has to engage everybody, but mostly it has to be differentiated because as you know—with technology—we have people from all different ages, all different experiences and we really do have to be mindful and to cater for them because you don't want them left out or feel inadequate. That's the biggy'. Between DP1 and DP2, significant progress has been made in the development of a shared language and shared commitment to the Digital Technologies curriculum, reliable infrastructure, support of the teachers, professional learning and provision of new equipment.

Amethyst Primary School

Amethyst Primary School identified teacher learning in the area of Digital Technologies as a focus for their action research project. The school is undergoing change from a relatively stable leadership and teaching staff due to retirements and moves to other schools. Subsequently Amethyst developed a focus on developing and supporting knowledge and implementation of the Digital Technologies curriculum as their initial approach to building capacities in teachers and students. Data from DP1 and DP2 evidence a narrative of efforts to embrace learning against a backdrop of

upheaval and uncertainty due to ongoing staffing shifts. Five staff members were interviewed for DP2 – four teachers and one school leader. Three of these participants had not been interviewed previously, two had been interviewed during DP1 and one DP1 interviewee no longer worked at the school. Despite substantial changes, progress has been made in terms of digital technologies resourcing; teacher commitment to professional learning; teachers' pedagogical innovation; and student access to new digital technologies.

At Amethyst, the implementation of the Digital Technologies curriculum is supported by a well-respected specialist teacher, who holds multiple leadership roles in the school. The team also includes a curriculum leader and an early career teacher on contract. Focus has been on teacher professional learning opportunities. Key in this has been the development and resourcing of a dedicated Maker Space classroom and associated timetabling. Accounts emphasise teachers' growing knowledge of equipment and confidence in teaching in the Maker Space, giving students greater access to digital tools. Team participants are now seeking to further develop their own and other teachers' knowledge and confidence in integrating learning in a range of curriculum areas, rather than positioning Digital Technologies Curriculum as an addition to an already crowded curriculum. They are aware that Digital Technologies curriculum concepts such as *computational thinking* are, as yet, not being heavily emphasised.

The following narratives of teacher and student learning are instructive of how the DTiF has been taken up at Amethyst and illustrate outcomes noted by teachers.

Teacher AC1 — Changed attitudes and professional practice

Teacher AC1 is part of the team that participates directly in the ACARA DTiF project. After graduating in 2012, she worked part-time as a support teacher including at Amethyst for 2-3 years before being employed on contract to teach her first class in 2018. While her digital learning experiences at university were confined to being shown 'how to make a webpage, to put our portfolio on there', she is 'all for technology' and was prepared to be 'roped in' to the DTiF project. She has no other school-wide responsibilities. Prior to project involvement she was comfortable using a Promethean interactive whiteboard and tablets for programs such as Reading Eggs, Study Ladder, Just Dance and counting activates as well as Class Dojo as a communication app.

In 2018 she taught students in Foundation, their first year of school, half of whom had been to preschool. In May 2018 she found that the crowded curriculum, pressure to teach and assess literacy and numeracy and a lack of equipment worked against incorporating suggestions made during the DTiF professional learning. Significantly, she also wondered about the kindergarten students' capacities for coding and computational thinking as she was needing to teach students to operate the basic functions of computers, such as logging in. However, by November of the same year the school had set up a Maker Space, purchased three types of robots and Teacher AC1 was teaching her students to program Bee-Bots and Dash robots.

Teacher AC2 — Connecting coding and Digital Technologies terminology with other learning areas

Teacher AC2 is not part of the team that participates directly in the DTiF project, but is a relief teacher who teaches three days a week at Amethyst School including in Science, Technology and Physical Education. Holding a Bachelor of Science before entering Primary Education, he has strong interest and expertise in teaching Science and Technology. The Years 5/6 teacher at Amethyst, who does not evidence interest or confidence in teaching Digital Technologies curriculum, requested

Teacher AC2 take responsibility for weekly teaching of the Digital Technologies curriculum in his Years 5/6 class when the regular teacher is released for planning. Being part-time, teacher AC2 has only been involved in one professional learning session related to Digital Technology Curriculum at Amethyst which engaged teachers in tinkering with robots—a session he felt was fun and useful for his colleagues and the school in coming to the decision to set up the Maker Space.

Teacher AC2 has set up an online classroom on a self-paced coding website and has been taking the Years 5/6 students to the Maker Space where they have 'tinkered… and had a go at coding the robots to do specific things'. He explicitly teaches computer language 'so when we start using the word "algorithm" they know what we're talking about'. He also connects the learning with other curriculum areas, for example pointing out incidental mathematical learning, especially with coding and using terminology for direction. He links literacy with a focus on careful reading; and integrates ICT Capability into science units, for example engaging students in making PowerPoint presentations on micro-organisms.

Student AC2 – Productive links between attendance, access to digital tools and learning

Student AC2 started in Foundation in 2018. She had very poor attendance including not coming to school on Fridays until the class started going to the Maker Space on that day and other students told her about the work with robots. She began attending on Fridays, watched other students program the robots and asked the Teacher Aide to show her how the robots worked. She quickly learnt to program Bee-Bots and Dash robots independently. The Maker Space is also used as a rewards room at lunchtime for students who have had consistent attendance and complied with school uniform and behavioural expectations. Student AC2 has had additional access to the Maker Space at lunchtime due to her improved attendance and she regularly comes to school. She can now move the robot, make it talk, race robots and make them play a variety of sounds. She has become a group leader in the Maker Space.

Student AC2 – Seeing the potential of coding-led to motivation

Student AC2 only wanted to use the computer to play favourite games when on the computer. He and his friends would continually play the same few games. When introduced to coding applications like Scratch, they would restrict their use to listening to the music that people have uploaded and resisted coding. Similarly, when introduced to an online, self-paced coding classroom with levelled progression, student AC2 resisted engaging in what he perceived as basic, boring work related to coding, not seeing the point and considering it too easy. Student AC2 was shown what students working at higher levels could do including designing game-like sequences. After being introduced to what students who had developed initial coding skills could do, and seeing the game-related potential, Student AC2 was motivated to develop the capacity to design his own type of game.

Emerald School

Emerald has a high Indigenous enrolment and a school leader passionate about integrating digital technologies into the curriculum. There are multiple projects operating in the school reflecting the high level of support for building students' ICT Capability. The support from the Curriculum Officer is primarily towards the school leader who then mentors the teachers in ICT lessons with their classes. Narratives of student learning with ICT were often based on project-orientated approaches to developing collaboratively-constructed, culturally relevant texts.

Relative stability of staffing has contributed to progress in the project, with the same five staff members interviewed across DP1 and DP2 (one school leader, three teachers and one teaching assistant). Data suggests that the teachers at Emerald School are enjoying success in student engagement and in their own professional growth as a direct result of participation in DTiF. The student performances in the Digital Technologies curriculum were based on their strengths and ownership of their learning. Students often worked in groups towards a common goal with open ended approaches to integrating their learning. Teachers commented on how the project provided them with examples of relevant knowledge to extend their teaching for the specific needs of their classroom context. The Digital Technologies curriculum were married with opportunities of extending students' understandings of design, drawing on the teachers' pedagogical expertise with ICT. Teacher ET1's incorporation of design pedagogies into integrated literacy work that builds students' ICT Capabilities is an example of how the DTiF project has supported pedagogical and curriculum innovation that is culturally meaningful and supporting success among students at this school.

Teacher ET1 – Strength-based collaborative design work

ET1 works in a class of low attending students. While the classroom learning in the morning is based around a Direct Instruction pedagogy, the Digital Technologies curriculum provides the students and the teacher with a creative classroom enterprise. Teacher ET1 developed her students' understandings of film production initially by analyzing the production of 'Bush Mechanics' before students developed their own storyboards for their collaboratively produced films. The ICT Capabilities involved the students working on their strengths of visual meaning making. ET1 asked the students to record five words at a time to make the subtitles to a shared construction of the subtitled script with the teacher. This provided the students with a way of incorporating literacy in the Digital Technologies curriculum that was not over burdensome for them. ET1 made reference to the importance of the authentic purpose and audience for the students in the production of videos that were shared with the school community at a school open day. The group work pedagogy overcame the spasmodic attendance of the students, so even irregularly attending students could contribute to the project in meaningful ways. ET1 moved from this class to a lower level class a few months before DP2. While ET1 did not talk about a similar success with this lower class, seeing a project to completion was clearly important for ET1's professional standing with respect to the Digital Technologies Curriculum.

Opal School

Opal School has a high Indigenous enrolment. The context for ICT learning is based on supporting Indigenous Knowledges in the Digital Technologies curriculum. DP1 provided a rich narrative of hope where the non-Indigenous teacher (OT1) worked closely with the assistant teacher (OAT1) in ways that involved students and members of the community digitally documenting stories of cultural significance. It was very easy to see how the project was a close fit to the expertise of this non-Indigenous teaching team and why there was buy-in from the students and community.

However, DP2 data suggests that engagement and progress in DTiF has stalled at the school with the loss of key staff members. While other case study schools face turnover of staff, the impact of the non-Indigenous teacher leaving Opal School shortly after DP1 has probably been more pronounced in this context. The success reported during DP1 was based on a relationality and trust that this teacher achieved with the community over many years, together with his expertise in innovative

teaching with digital technologies. OT1's expertise was noted by the school leader in DP1, suggesting this teacher was self-managing the program. The DP2 data revealed how the new leader of the program and the new teacher were both coming to terms with the expectations and skill sets required for the program. The Indigenous Assistant Teacher (OAT1) was present for both DP1 and DP2 interviews and was a constant throughout this change. Unfortunately, the administration and planning for participation in the DTiF project was beyond the scope of his role as an assistant teacher who might otherwise have provided some continuity of focus and momentum.

School Leader OL2 – Need for stronger links with school-specific performance indicators

School Leader OL2 is the new leader of the program at Opal. She has been in the role of a leading teacher in this school before so knows the context of the work. Arriving at the school in term 4 2018, she is managing three new teaching staff in the section of the school involved in DTiF. OL2 made reference to successful transition following staff changes as being dependent on the staff to drive changes in pedagogy and curriculum. The Curriculum Officer was seen to play a role in supporting this transition. When OL2 took over as the lead teacher, the ACARA Curriculum Officer came to the school and explained the DTiF program. He also provided support to the new teacher (OT2) as part of this transition, setting up three-way meetings between the OT2, the teacher who was leaving and the Curriculum Officer.

At the time of DP2, OL2 held the view that, given the complex demands of working in the Opal school context, the program needed ongoing professional development for teachers interested in Digital Technologies. OL2 reiterated the importance of the visit by the Curriculum Officer, and compared this engagement favourably with the webinar delivery of professional learning, noting the face-to-face visit as being more supportive of dialogical engagement and therefore more effective in this school setting which has limited access to internet and computer resources. In particular, OL2 made mention of the community members showing off the work they had completed with the Curriculum Officer, the teacher and the assistant teacher before she began as the new leading teacher. OL2 also commented on the effectiveness of the model of scaffolding used by the Curriculum Officer based on working together around an open-ended project and how that model could be applied to other aspects of the curriculum. However, OL2 also noted that the project would be more impactful if it had stronger links to the performance indicators that are reported on by the principal.

Teacher OT2 – Need for leadership to prioritise program

Teacher OT2 arrived at Opal in July 2018, four months before being interviewed for DP2, having being recruited for a one-year period. OT2 noted that the Digital Technologies curriculum had limited relevance to the school because of competition with other programs in the school and due to the limited resources available. OT2 corroborated the value of site visits by the Curriculum Officer, seen as supportive for OT2 as a new member of staff to understand the scope and purpose of the project and to review the work the students and community had been doing with the previous teacher (OT1). While the Curriculum Officer has provided OT2 with professional learning about aspects of the project, at the time of interview OT2 had not applied this professional learning to his professional practice and student learning. According to OT2, the program has stalled primarily because it is not seen as a priority by the school leadership. He commented that the program was towards the bottom of the pile in relation to the work of teachers in his section.

OAT1 – Potential of community texts for promoting continuity

OAT1 is the assistant teacher who has worked with OT1 (interviewed in DP1) and OT2 (interviewed in DP2). While OAT1's grasp of English is limited, the interview revealed there was still potential for the program to integrate contextually made resources from the community. OAT1 outlined how the community were bringing OT2 videos in the same way they brought them to OT1 for integration into the digital resource they were curating. According to OAT1, there has been no work with OT2 on the digital technologies project since OT1 had left, a situation confirmed by OT2.

Pyrite Secondary School

Pyrite Secondary School is a small secondary school situated in a small rural town. Two staff members were interviewed for DP2 (one school leader and one teacher). PT1 is the only teacher participating in the DTiF project. He teaches Digital Technologies as a stand-alone subject from years 7-9 as well as Maths and Business Studies. He is extremely enthusiastic about the level of support from the DTiF project, appreciating the 1:1 support from the Curriculum Officers, the professional learning opportunities, and, especially, the professional networking. He valued, 'just having someone to ask, "Hey, do you know anybody who is into this?", or "Do you know anybody who is struggling with this?"'. Having the opportunity to network with others from a relatively small and isolated secondary school was invaluable. 'It's just, it's so comforting as a teacher to just not be in your own little, especially where we are—we're 70 k's from the closest high school—you're just not in your own little world trying to email people that you have no idea who they are, and you've just got a face, someone to talk to and sort of point you in the right direction'. Across both DP1 and DP2, the value of the project in creating connections and seeking help from other teachers was cited as highly valuable.

PT1 feels highly supported by the leadership to implement the technologies curriculum and that this support has been maintained across a period of changed leadership (both the principal and the science coordinator have changed). PL1 (interviewed for DP1) retired at the end of 2018 after a long stint as principal. Technology was well supported by PL1, and her replacement School Leader PL2 is reported to be similarly supportive of the project, as are both of the Science Co-ordinators (PTL1 interviewed for DP1 and PTL2 interviewed for DP2).

Interview data across DP1 and DP2 suggest significant progress at this school, illuminated by high profile activities that are cementing the standing of Digital Technologies curriculum in the school.

Year 9 Technology Showcase – Student-led community outreach

Since the beginning of the DTiF project, the school has held a technology "Showcase" day once a year. The action research project is about improving ICT Capabilities across the whole community, not just the students in school, so this day provides outreach to the broader community.

The day is run by the Year 9 students and aims to showcase the Technologies curriculum work being completed in the school. Primary school students from the area, family and other community members are all invited to the school for the Showcase. Year 9 students train the junior students or teach the primary students about a technology. The Year 9 students are given eight weeks to prepare. They are told that the choice of technology is up to them. This provides for a very open and creative approach and PT1 notes that, 'all of the stuff that comes out of the woodwork through that process is really amazing'. The Year 9 students worked together in groups to run a 60-minute session

on their topic. This year 120 primary school students came to the Showcase day at Pyrite, and the students offered the topics of drones, virtual reality, information management systems and building computers.

PT1 and PLT2 reported the many positive benefits of the project, including the benefits for the primary students transitioning into high school. 'It's really good for the students who actually host it because they—most of them have some idea or some interest in that technology to start with so they're pretty good at it—but when they get tasked with having to actually teach it and develop a challenge for little kids, they've got to become, I guess, the masters of it'. As well as mastering the technology, they also develop public speaking skills and it is a 'really good confidence booster'. He describes this as particularly being the case for the 'techy, geeky type kid who doesn't really like talking'. These students have become more engaged with the school.

Because there is only a very small budget for the showcase, it requires a considerable amount of work on the part of the teachers to set it up and bring together the resources to enable it to function well. The showcase takes two days on the weekend for LT1 and other colleagues to set up. This year they set up the showcase on the weekend, but it had to be rescheduled due to extensive flooding in the region and the school had been closed around four times in the term due to this. This meant that the teachers packed it away and then set it up again later in the term.

Technology Connections between home and school

Teacher PT1 noted the connections that the young people were making between their out-of-school interests and skills and the Digital Technologies curriculum. There were a group of Year 9 students from farming families who brought their own drones to school, together with footage that they had made themselves. The footage was of racing, flying over landmarks and photography of beautiful natural landscapes. PT1 was enthusiastic that, 'stuff has got nothing to do with us at the school, that's just their own passion that they have at home and this sort of allows them to bring that into the school and just show it off, and all the kids are really, really excited by that because it's sort of a lot more authentic'.

Another student who had high level skills and interest in Virtual Reality (VR) technology had developed a role as the school expert. When the technology classes use the VR in class, this Year 10 student is called in as a guest speaker. He explains to other students how he uses it and brings in his laptop to demonstrate video games that use VR and how to wear the goggles properly.

University-based digital technologies challenge

Pyrite students have also been involved in a digital technologies challenge based at a local university. Twenty-five students from the school went to the university and completed a series of eight design challenges, including, for example, building towers to survive earthquake simulations and build vehicles to navigate Martian terrains. PT1 said, 'our kids were outstanding'. Many of the schools were 'top-end private schools', and Pyrite Secondary School finished in the top three schools. PT1 explained that students benefited from seeing that they could succeed at the university, and by going to the campus to look around and imagine themselves studying there in the future.

Time and Space

In 2017, when PT1 started at the school, there was minimal time spent on Digital Technologies at the school, and this time tended to be focused on basic skills using Word and graphs. DTiF has enabled

PT1 to build the technology culture at the school and to strengthen this curriculum area. The Showcase helps to promote the work, and at the parent evenings PT1 promotes the work that the students are doing in class. The project and its successes at Pyrite has given PT1 a platform to successfully request more time in the school program for Digital Technologies. This has resulted in the Digital Technologies curriculum being offered across Years 7-9 at the school. To build on this work and to support growing student interest in a Digi-Tech elective, School Leader PLT2 is advocating for a dedicated space for Digital Technologies at Pyrite.

Findings

The case studies illustrate variation in terms of program engagements and responses and diversity in terms of outcomes and impact. Conclusions based on the case studies at DP2 include:

- Establishing enabling infrastructure and inspiring equipment seems a fundamental ingredient to progress. Participation in DTiF has stimulated changes in infrastructure and equipment at most sites. At some sites, new equipment (e.g., robotics) introduced as part of the school's participation in the project has been used as a vehicle for gaining attention and enthusiasm beyond the project team for Digital Technologies—reaching other staff members and also communities outside of school.
- All sites appear to be working on ICT Capabilities as part of their work in the DTiF. For some sites, ICT Capabilities is their main focus, seen as foundational to future work on building Digital Technologies curriculum implementation and the types of pedagogies that support it. ICT Capabilities is a focus for both students and teachers, and building confidence is seen as an important part of skill development. Most sites report greater teacher confidence with using digital tools and resources; though sometimes confined to those staff members directly involved in the DTiF professional learning.
- Integrated curriculum approaches are evident at all sites. At primary schools, integration with literacy learning is common, particularly through a focus on designing digital texts using a range of media and with projects involving research.
- A high level of value is derived from face-to-face contact with ACARA Curriculum Officers. This is emphasised at each site, even at Opal where—at the time of DP2 data collection—project momentum had stalled following school staffing changes.
- Professional networking (with other teachers in other schools) is noted as a positive outcome at some sites, particularly those small schools with one specialist Digital Technologies teacher.
- Provoked by the action research projects, methodologies of audit and ongoing professional learning have stimulated positive change at some schools, where the schools can identify their focus and track change. However, at some sites, progress and awareness of the action research element is not a strong feature of the work being done.
- The DTiF program's flexibility and responsiveness supports a range of engagements, allowing schools to develop their own site-specific foci and activities. This approach is seen as necessary in highly disadvantaged settings where contextual factors contribute to an often tenuous grip on change agendas.
- Flexibility and open-endedness also feature as important characteristics of teaching and learning in these settings where students' face serious challenges in their home lives, where school attendance is low, and where relevance of and connectedness to schooling requires ongoing work. Embracing flexibility and differentiation appears to be the foundation of successful collaborative, strength-based pedagogies at some sites, particularly with a focus

on connecting school work with community via design processes, extended project work and community outreach. These pedagogical approaches are looked on positively by teachers and are contrasted with previous approaches, such as teacher-centred use of electronic whiteboards, laboratory-focused computer work, or narrowly focused training in how to use particular software packages. However, in some cases (Indigenous settings), the open-ended pedagogy associated with the DTiF project is at odds with the highly ritualised teaching performances promoted as the standardised delivery of curriculum. Both the development of digital pedagogies and enhanced ICT Capability suggest possibilities for the DTiF project to support positive impact in other curriculum areas, and this is evidenced at some sites.

- Pedagogical innovation and the use of digital media has promoted engagement and success in diverse learners, allowing students who haven't previously achieved well to flourish. Examples cited include students with schooling issues (e.g., low attendance), physical or learning disabilities, or with symptoms of trauma, whose engagement and progress and sense of belonging at school has been supported via digital devices and inquiry/design/project-based work. The DTiF project provides teachers with opportunities to engage in strength-based approaches to student learning which have positive impacts on teacher-student relationships and outcomes for students beyond the project.
- Staff turnover is a significant challenge for maintaining project focus and momentum as it is a constant feature of some sites, particularly in rural and remote schools and in contexts that are subject to numerous (sometimes competing) programs where Digital Technologies might not seem as important as other foci. Agents of continuity are necessary in such contexts, whether human or nonhuman. In settings where continuity of personnel is complemented by establishment of enabling equipment and infrastructure and supportive resourcing, a better focus and clearer evidence of impact is evident and sustainability is more likely. The ACARA Curriculum Officers were critical in providing the continuity in the face of staff turnover in disadvantaged contexts.
- Curriculum implementation and pedagogical innovation is highly complex work at these disadvantaged sites. A challenge to DTiF is that this work will likely take longer to achieve at some sites than the project timeline allows, and that if change is not embedded it may not be sustained.

Looking forward to Data Point 3

The final data collection phase is DP3, which will focus on revisiting and extending narratives of curriculum and pedagogy and learning outcomes, and will also investigate wider impacts and the level of embeddedness and strategies for sustainability of outcomes and impacts at each site. We envisage DP3 will integrate evidence from school leaders, teachers, and teachers' aides/assistants for each case study school, and will include accounts about student engagement and learning where possible, drawing on data collected at each of the three data collection points.

It is anticipated that the final report will reference the objectives of the DTiF project:

- To support school leaders to facilitate implementation of the Australian Curriculum: Digital Technologies, in specific schools in disadvantaged areas identified by states and territories as requiring support to implement the Digital Technologies curriculum.
- To facilitate professional learning workshops nationally to support change management in targeted schools in disadvantaged areas.

- To provide in-school, face-to-face and online support to enhance implementation of the Australian Curriculum: Digital Technologies, in targeted schools in disadvantaged areas.
- To publish materials developed for use in workshops as legacy products to provide on-going support for other teachers and schools to implement the Australian Curriculum: Digital Technologies.

Discussion of the findings of the case study evaluation will focus on:

- Suitability and efficacy of program methodology, including transferability to similar initiatives.
- Outcomes of the program for participating schools, and transferability of outcomes to schools outside the project.
- Impact of the program at each case study school, including sustainability beyond the project life and what might be needed to achieve this.

Data Point 3 is scheduled to occur between September 2019 and March 2020, with dates to be negotiated as suitable with each school site. Deakin University will seek input from ACARA on data collection instruments and strategies for DP3, as well as an update on how the DTiF project is progressing and whether the original objectives of the program still stand or amended or additional (emergent) objectives should be considered.