Education Review Office
Te Tari Arotake Mātauranga

ON YOUR MARKS…
GET SET…GO!
A TALE OF SIX SCHOOLS AND THE DIGITAL TECHNOLOGIES CURRICULUM CONTENT

January 2020

Ko te Tamaiti te Pūtake o te Kaupapa
The Child – the Heart of the Matter

www.ero.govt.nz

Contents

Background

Context

From January 2020 all schools are expected to be implementing the new Digital Technologies (DT) curriculum content for students in Years 1 to 10. The curriculum content incorporates two new strands in the Technology learning area: Computational Thinking and Designing and Developing Digital Outcomes. These strands have staged progress outcomes to indicate the minimum achievement expected for students operating at different levels of the New Zealand Curriculum. The rationale for the new curriculum content is to ensure that all students up to Year 10 experience sufficient opportunities to develop their understanding and capabilities about digital technologies. The intent is they become designers and not just users of technology and equip them for their future.

In Term 3, 2018, ERO undertook an evaluation to provide a high-level overview of schools' awareness of and readiness to implement the new content. This looked at 10 percent of schools through a random-sample survey (see ERO's report It's Early Days for the New Digital Technologies Curriculum Content[1]). Since 2018, the Ministry of Education (the Ministry) has provided a number of initiatives to raise awareness of change and to support schools to implement the new curriculum content.

At the time this survey was undertaken in 2018 only 7 percent of schools felt they had sufficient knowledge and skills to start implementation. While most leaders (95 percent) felt their teachers would be somewhat confident to start working with the content by January 2020, there were several barriers to progression. Some of these challenges were a result of difficulty navigating online resources, and the delayed provision of appropriate support programmes from the Ministry. The Ministry's package of professional support[2] covers a range of needs. The professional development (PD) options include:

- Digital fluency[3]
- Kia Takitū ā-Matihiko | Digital Readiness Programme
- Tailored DT and Hangarau Matihiko (HM) professional learning and support

Schools making most headway were already working with their staff to familiarise them with the requirements, sharing readings, accessing external PD from a variety of sources, and often had someone who 'championed' the DT curriculum content in the school.

ERO's formative evaluation was to inform the Ministry of strengths and areas for improvement in their support processes. Findings were shared with the Ministry in December 2018 and they have used these to action improvements this year.

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[1] https://www.ero.govt.nz/publications/its-early-days-for-the-new-digital-technologies-curriculum-content/
[2] http://services.education.govt.nz/pld/dthm/digital-technologies/dt-and-hm-professional-supports/
[3] Digital fluency PD, available since 2017, is not specific to the implementation of the DT curriculum content.

In Term 1, 2019, ERO undertook case studies of six schools from the initial survey to unpack how those schools were preparing to implement the new curriculum content.

Evaluation approach

The overall evaluation used a theory of change (see Appendix) that visualised the basis of ERO's evaluation approach. The theory of change lays out the three stages of **awareness, acquisition** and **application** of the new content by schools. While acknowledging that the theory of change presents a linear model of change, it was important to assess how implementation progressed in practice for schools. ERO's 2018 DT curriculum content survey tested whether the assumptions made at the time of developing the theory of change hold up. Schools also identified what helped or hindered their progress to implementation.

Within this theory-based approach, the evaluation sought to understand how some schools were responding to the DT curriculum content implementation, and the changes that were occurring as a result of such implementation.

Following ERO's 2018 survey, it was apparent schools were at different points in their journey towards implementation readiness. In this subsequent case study evaluation, ERO's focus drilled deeper into questions around the enablers and barriers to awareness, foundational knowledge and early implementation for schools during their journey.

The evaluation explored the following key evaluation questions (KEQs) and evaluative criteria:
- How were schools moving towards 2020 DT curriculum content implementation?
- What made DT curriculum content implementation work well in schools? What was working well (or not) for schools? (Effectiveness and impact)
- What were the barriers and enablers that made the difference between successful and challenging implementation and results? (Relevance)

A cascading set of sub-evaluation questions and prompts include:
Was awareness and support for knowledge acquisition facilitated? If so, how?
- What explains varying levels of school readiness[4] and understanding of DT curriculum content?
  - Did leaders, champions, in-school prioritisation and/or expectations explain this?
- What might explain varying levels of awareness and engagement among teachers?
  - Was there clarity in understanding the difference between digital fluency[5] and the DT curriculum content?
  - How was DT curriculum content viewed within the larger technology learning area?
  - Were they aware of content, pedagogical content knowledge, progress outcomes (POs), links within technology and links across the curriculum?

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[4] ERO's DT curriculum content 2018 survey showed that having many teachers aware is not the same as school readiness.
[5] http://elearning.tki.org.nz/Teaching/Digital-fluency#js-tabcontainer-1-tab-1

- In what ways did needs identification for teachers vary and why?
- To what extent did contextual factors help or hinder implementation?

Was the implementation aligned to ensure that the knowledge gained was applied in practice? If so, how and in what ways?
- What were teachers finding most useful when applying the new content knowledge?
- Pedagogy: how were the key competencies used to support learning in this area?
- How did teachers apply DT curriculum content in their teaching?[6]
- How were schools integrating DT curriculum content into their curriculum?

Have collaboration and networks helped in knowledge acquisition and application? If so, how?
- What opportunities did teachers have to share ideas, work and interact with others to gather information, and consider a range of approaches?
- Were there formal or informal networks that teachers tap into and how did that work – for whom, under what circumstances and why?

Case selection

ERO chose a purposive sample of schools for the case studies. The sample exemplifies the different points that schools were at in their journey to implement DT curriculum content. ERO used the DT curriculum content 2018 survey results to place the sample schools on a continuum of implementation.

The key criteria for case selection was schools' levels of awareness, engagement and application of the knowledge of DT curriculum content in their teaching practice. The Ministry did not establish any explicit success criteria at the start of the implementation about what constitutes successful implementation from a school perspective. However, two short-term outcomes identified by the Ministry were that:

- schools and kura have integrated the Digital Technologies (DT) or Hangarau Matihiko (HM) components of the technology or Hangarau learning areas in their local curriculum
- teachers and kaiako know how to teach the new content.

Both of these outcomes were enmeshed into the theory of change, which identifies short-term implementation outcomes.

ERO's six case studies focused on different points in the journey – some schools were early adopters who had progressed further than others still starting out. We considered other factors for selection such as school type, location, roll size and the presence of curriculum champions, where relevant, to ensure a variety of contexts. In the ERO DT curriculum content 2018 survey, the presence of curriculum champions was shown to be strongly related to schools with higher awareness and engagement.

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[6] http://seniorsecondary.tki.org.nz/Technology/Digital-technologies/Pedagogy

On your marks… | …get set… | …go!

This case study phase drilled deeper into questions around the enablers and barriers to awareness, foundational knowledge and early implementation for schools. The case studies exemplified a range of initial and current progress journeys that schools were on, drawing on the key themes identified in the baseline survey. ERO determined the pre-conditions, if any, that led to successful journeys, and the characteristics of the schools which had progressed further into their journey of implementing the DT curriculum content.

ERO identified stages of readiness similar to a three-command start when racing: on your marks (get on your lane/spot), get set (get to starting position), go! (take off). In each state of readiness, we had two schools – a contributing and a composite/secondary school. These were mostly in urban locations, barring one secondary-urban area school. For each school's most recent ERO review, four were well placed, and two were very well placed.

Findings

Leaders set the conditions for implementation

In the 'go!' schools, senior leaders had established a culture within the school where teachers were open to new learning. This set the conditions for implementing the DT curriculum content. Senior leaders understood their role in implementation and making sure they supported the requirements to implement the DT curriculum content. Senior leaders identified key curriculum leaders for the DT curriculum content. They did not leave understanding and implementation plans of the DT curriculum content just to curriculum leaders.[7] They made sure internal and external support was provided for teachers. Resourcing of devices in these schools were aligned to their school's context and needs. Leaders[8] also made sure to keep parents informed about the DT curriculum content and how they planned to implement it.

Senior leaders in 'get set' and 'go!' schools promoted a growth mindset for teachers

These leaders deliberately fostered school-wide cultures of openness to learning and innovation. In some schools, senior leaders had been engaging in significant curriculum review and were already encouraging teachers to think 'outside the box' for teaching and learning practices.

> *Before focusing on the DT curriculum content, we have had an almost two-year focus on developing innovative teaching and learning practices and promoting a growth mindset amongst teachers.*
>
> Principal

Senior leaders encouraged teachers to take risks and trial new approaches for learning. Teachers were supported to become more comfortable learning from, and alongside, students and allowing students to lead more of their own learning.

Innovative practices in these schools had been sustained over time through the active modelling and involvement of leaders; effective identification and support for those teachers leading this practice; and flexible, relevant and responsive professional development. These schools had experience in managing change, a depth of leadership capability across the school, and high levels of staff buy-in to exploring new teaching practice.

For some teachers, the change built on the development of digital literacy and fluency amongst staff and increasing effective use of digital technologies in teaching and learning.

In the 'on your marks' schools, there was no evidence of a growth mindset to support implementation, let alone a clear progression to delivery of the DT curriculum content.

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[7] In this report a curriculum leader could also be a curriculum champion, but a curriculum champion is not necessarily a curriculum leader.

[8] In this report, leaders include senior and curriculum leaders.

Leaders in 'get set' and 'go!' schools had a clear understanding about the intent, content and implications of the DT curriculum content

These leaders understood:

- how the DT curriculum content differs from digital fluency and e-learning

- the intent of the content to be integrated across learning areas

- the nature of the strands and progress outcomes (POs)

- that over time schools should support all students to achieve the outcomes expected by the end of Year 10.

We are clear as leaders, and with our staff, that the DT curriculum content needs to be taught and learnt.

Principal

Senior leaders deliberately built their knowledge of the DT curriculum content through participation in launch events, attendance at conferences, conversations with external PD providers or in discussion with curriculum leaders.

Leadership teams in these schools had spent time together to build a shared understanding of the DT curriculum content and develop the implementation plans going forward. They had followed this up by providing meaningful opportunities for middle leaders to learn about the DT curriculum content.

We asked our professional development provider for digital fluency to deliver PD to our senior leadership team on the new curriculum content. As a senior leadership team, we have been working with our teaching team leaders to build their confidence and capability to lead this in their teams.

Deputy Principal

In the 'on your marks' schools, curriculum leaders were in the very early stages of unpacking the DT curriculum content and had not yet shared this with other leaders.

Senior leaders in 'get set' and 'go!' schools were aware of their responsibilities for the DT curriculum content implementation

Senior leaders were developing school-wide implementation plans to make sure the DT curriculum content was implemented by 2020. They had strategic and annual plans and goals that reflected the priority for DT curriculum content implementation. This planning covered each of the year groups in their school.

This planning linked the DT curriculum content to other school-wide priorities and goals and to consideration of appropriate resourcing, professional development and curriculum leadership needs.

We have created a charter goal for implementing the digital technologies curriculum content and teachers have included a related goal in their appraisal and teacher inquiries.

Principal

Leaders in some of these schools made clear links to the Technology learning area whereas other schools were not explicit in their recognition of the place of DT curriculum content in the learning area overall.

One 'get set' secondary school deliberately created a new subset in their Technology Curriculum with a compulsory programme for all Year 9 students, as well as integration across other learning areas in Years 9 and 10. Teachers' notes emphasise the strands of the Technology learning area.

In one 'go!' school, leaders planned to embed Year 8 use of Micro:Bits[9] in other technology areas to address the progress outcomes of the DT curriculum area. They have worked with staff to help them understand that this area is a 'new part of the curriculum' and how the Technology strands still relate to it.

Leaders in 'go!' schools looked at current status and where DT curriculum content could be integrated

These schools had undertaken an audit of existing programmes to identify where the progress outcomes of the DT curriculum content were already being met, and where there was potential to integrate other aspects of the DT curriculum content. This then helped leaders prioritise and plan implementation. The audit helped to reassure teachers where they were already implementing some of the DT curriculum content, to demystify key concepts such as computational thinking, and to build teachers' understandings of what progression looks like over time. Teacher anxiety lessened with the knowledge that there was a planned approach to the curriculum's introduction. One school undertook this audit using a curriculum-mapping tool.

Leaders in these schools had made key decisions about starting points for implementation of the curriculum content and had made sure these were introduced school-wide, or in an integrated way across learning areas. One of these schools focused on the integration of the Computational thinking area at all levels across the school. In the other school this involved consolidating existing coding programmes in Years 1 to 6 and establishing a core Year 7 programme as the foundation for delivery of the content across learning areas in Years 8 to 10.

Leaders in 'on your marks' and 'get set' schools were yet to map the DT curriculum content across their school

The 'get set' schools were trialling a variety of implementation approaches and programmes in specialist or 'early adopter' classes. Leaders in these schools were beginning to map the DT curriculum content areas and progress outcomes.

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[9] Micro:bits are tiny programmable computers which can be coded using blocks of code or text. For more information see https://microbit.org/

The 'on your marks' schools seemed to be implementing aspects of the DT curriculum content for small groups of students (i.e. in lunchtime coding clubs, gifted and talented groups, or in 'early adopter' classes). However, leaders had not yet formally identified this implementation as DT curriculum content or linked it to their school implementation plan. There was no planned approach to mapping the curriculum, and no consideration given to how to provide access to the DT curriculum content for all students.

Supporting curriculum leaders and teachers with the DT curriculum content

Senior leaders in 'get set' and 'go!' schools had identified and resourced DT curriculum content curriculum leaders

Senior leaders in these schools gave curriculum leaders responsibility and appropriately resourced them to undertake related planning, professional development, staff mentoring and to lead whole-school professional learning in the DT curriculum content. In the larger schools, the curriculum leaders focused on building implementation teams or fostering DT curriculum content champions (who were not curriculum leaders) in teaching teams across the school.

> *We have released our curriculum specialist to run mini professional development sessions with a team of three people from each learning area. Each team will include the head of learning area, a leader of junior learning and a third teacher with an interest in digital technology. The hope is to foster curriculum champions starting with those teachers with a natural interest.*
>
> Principal

In 'go!' schools, the curriculum leaders organised the information received by the school about resources, programmes and services related to the DT curriculum content. They sorted it into what was most relevant to the school's planned approach and shared that information with teachers. Senior leaders incentivised experienced curriculum leaders, providing them with professional challenges, supporting them to pursue individualised professional development and explore industry secondments and sabbaticals, and involving them in leading and sharing effective practice in networks both within and beyond the school.

Leaders in 'get set' and 'go!' schools had a planned, responsive and phased approach to building teacher capability for implementing the DT curriculum content

Leaders were mindful of providing a variety of flexible and responsive opportunities for teachers to learn about the curriculum content and how to implement it. This included taking time to systematically unpack the content and vocabulary of the curriculum with teachers so there were clear and shared understandings. Other effective approaches included:

- offering a menu of 'just-in-time' internal and external professional development opportunities that teachers could select from according to their level of confidence and competence
- opportunities for collaborative learning in teaching teams and
- options of co-teaching and modelling in class.

Senior leaders in these schools had communicated clear expectations for teachers to engage in professional development, and actively participated alongside teachers. Leaders were developing systems for sharing examples of effective planning and practice, and curating relevant implementation resources.

Most schools built digital fluency before undertaking DT curriculum content PD

In the 'go!' schools, professional development was focused on the DT curriculum content, while the 'get set' schools had a focus on building teachers' digital fluency or understanding of e-learning alongside their knowledge of the new curriculum content. The following is a summary of the 'get set' and 'go!' support accessed.

Working with external professional development providers

In 'get set' and 'go!' schools, accessing expert, customised professional development was critical to the positive progress made.

All of these schools accessed centrally-funded PD from the Ministry to work with an external professional development provider. At the time of this evaluation, two have already started working with their provider and another two were about to start (including one through a Kāhui Ako).

> *Without the support of our PD provider we would have floundered. They have helped us to know where to start and how to proceed.*
>
> Curriculum leader

Through this PD, schools have unpacked the DT curriculum content for the whole staff, developed implementation plans, and provided targeted professional development for groups and individuals.

> *All our teachers have really valued having hands-on practical demonstrations of how to teach aspects of the DT curriculum content. It has made it easier for them to try things out in their classes.*
>
> Curriculum leader

> *We had a provider come and model teaching the DT curriculum content in a number of classes. While that was helpful in giving ideas, it also raised some teachers' anxiety about being able to do it on their own. The focus of our next PD contract will be on working alongside teachers in an ongoing way to build their confidence.*
>
> Senior leader

Schools found providers' advice about useful resources, applications, programmes and devices invaluable. Three schools relied on the support of providers to formally document their curriculum guidelines and expectations for implementation of the DT curriculum content.

In addition, two schools were supporting individual teachers to undertake self-paced online learning and making increased use of the Ministry-funded [Kia Takatū-ā-Matihiko](#)[10] and [Technology Online](#)[11] resources. One school was accessing specialist training for use of licensed products it considered beneficial to its planned approach to teaching the DT curriculum content (i.e. [Minecraft: Education Edition](#)[12] and [Code Club](#)[13]).

Curriculum leaders in 'on your marks' schools had little time resourced for them to work with the DT curriculum content

These leaders were yet to consider the professional development needs of staff or engage them in PD related to the delivery of the DT curriculum content. The schools had not yet introduced the DT curriculum content to the wider staff. Individual teachers and early adopters in these schools were accessing relevant PD, but senior leaders had limited engagement in PD associated with implementing the DT curriculum content.

Leaders in 'go!' schools considered school context when resourcing devices for DT curriculum content

Leaders in these schools had different, but well-considered, approaches to making decisions about purchasing equipment and devices to support the DT curriculum content in their schools. One, a large composite school, had significant experience integrating the use of digital technologies into teaching and learning. As a part of this move, they developed a robust relationship with their infrastructure provider. Leaders made sure technology support was led by someone with an understanding of the educational uses and purposes for digital technology.

We purposely appointed a teacher to lead our technical support. We wanted to ensure technical support was aligned with pedagogical support.

Head of information technology

Through trial and error, this school developed understandings about which devices and operating systems supported learning at different levels. They resisted loyalty to any one brand in favour of a focus on alignment with purposes and use in classrooms. Decisions about resourcing were well researched, discussed and tied to curriculum planning.

It is nerve-wracking making decisions about which resources to purchase. These are expensive decisions and there is such a lot to consider in terms of how well they will be used, how they will interact with school infrastructure, and whether they will continue to be serviced and supported.

Senior Leadership Team member

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[10] https://kiatakatu.ac.nz/
[11] http://technology.tki.org.nz/Resources
[12] https://education.minecraft.net/
[13] https://codeclub.nz/

For example, the school had recently purchased Micro:bits[14] for all Year 7 learners (as well as a class set for use in Years 8 to 10). They intend all students in the middle school will have these devices to support implementation of the DT curriculum content across multiple learning areas up to Year 10. Micro:bits, Sphero[15] robots, and Bee-Bots[16] are all examples of proprietary products which can be used to provide early coding experiences.

The small 'go!' primary school had different resourcing solutions for implementing the DT curriculum content. This school had limited resources for purchasing new devices. Leaders decided to maximise the use of the devices they did have, and made the decision to focus on the use of Sphero robots in their middle and senior classes and Bee-Bots in their junior classes. Teachers were working to integrate the DT curriculum content meaningfully across learning areas with these devices. This school also used unplugged activities as a low-cost option.[17]

In 'on your marks' and 'get set' schools', device strategies were not yet aligned with DT curriculum content
'Get set' schools were still working on the core DT curriculum content, which would then allow leaders to be more strategic in their decisions about device resourcing. These schools were more likely to be experimenting with different devices and equipment, often in response to teacher interest.

The 'on your marks' schools were more focused on devices supporting student and teacher digital literacy and fluency and were yet to consider implications for the specific progress outcomes of the DT curriculum content.

Engagement with parents for the DT curriculum content varied

Leaders in 'go!' schools made sure parents were informed about the DT curriculum content and the school's plans for implementation. For one of these schools, the focus on digital devices and DT curriculum content was such a central part of the school curriculum that it ran annual evenings with parents. These evenings helped parents understand how digital technologies were used to enhance teaching and learning, and how the school was intending to teach DT curriculum content at all levels of the school.

Leaders of 'get set' schools had consulted with their parent community about the integration of digital devices in teaching and learning but were in the early stages of informing them about the specific content and learning outcomes of the DT curriculum content.

Leaders in schools with secondary students were aware that some parents (and students) still had the perception that digital technology as a subject was limited to information management or business administration tasks and pathways, and there was a need to address this perception.

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[14] https://microbit.org/
[15] https://www.sphero.com/
[16] https://nzdigitalcurriculum.weebly.com/beebots-bluebots--probots.html
[17] http://technology.tki.org.nz/Technology-in-the-NZC/CT-Progress-outcomes-exemplars-and-snapshots The Ministry has a number of 'unplugged 'exemplars here, particularly in Computational Thinking and up to Progress Outcome 5.

As yet, schools' priority was on first implementing the DT curriculum content and they were not yet reporting to parents on children's achievement in relation to the progress outcomes of the content.

In summary: characteristics of leadership in different stages of the journey

	'on your marks'	'get set'	'go!'
Mindset and culture of school	• no evidence of a growth mindset being linked to promoting digital fluency or delivery of the DT curriculum content	• deliberately fostered school-wide cultures of openness to learning and innovation, which had been sustained over time	
Understanding of DT curriculum content	• curriculum leaders in the very early stages of unpacking the DT curriculum content • had not yet shared DT curriculum content with other leaders	• clear understanding about the intent and implications of the DT curriculum content and its place in the Technology learning area • participation in professional development for the DT curriculum content, and encouragement for middle leaders to participate	
Implementation across school	• DT curriculum content potentially delivered in pockets – may or may not be recognised as such • no consideration about how to implement DT curriculum content for all students	• recognised priority of DT curriculum content in strategic planning and goals • trialling approaches in 'early adopter' classes • beginning to map where the DT curriculum content areas and progress outcomes were addressed across school	• prioritised DT curriculum content in strategic planning and goals • implementation plan involved and benefited teachers • decisions made on how the DT curriculum content will be implemented and resourced across the school
Building curriculum leader and teacher capability	• little time resourced for curriculum leader to work with the DT curriculum content • professional development needs of staff not yet considered • yet to have a strategic approach to building teacher capability in the DT curriculum content	• curriculum leader given responsibility and resourced to support staff in DT curriculum content • planned, responsive and phased approach to building teacher capability, often starting with digital fluency, and increasingly, engaging with the DT curriculum content	• curriculum leader given responsibility and resourced to support staff • curriculum leader filters information about the DT curriculum content to share with teachers; curriculum leaders are kept continuously challenged • planned, responsive and phased approach

		• professional development attendance encouraged by senior leadership	to building teacher capability for implementing DT curriculum content • professional development attendance encouraged by senior leaders
Resourcing of devices	• selection and use of devices focused only on students' and teachers' digital literacy and fluency • selection of devices did not consider the DT curriculum content needs	• experimenting with different devices suited to implementing the DT curriculum content • intend to make decisions about devices after determining how best to implement the DT curriculum content	• kept school context and needs central to DT curriculum content resourcing decisions
Parents and Community	• no evidence of parents being informed of the DT curriculum content	• in the early stages of informing about the specific DT curriculum content and progress outcomes	• parents informed about the DT curriculum content and the school's plans for implementation

Teachers' and students' engagement reflected enablement by leaders

Across the three stages, the extent to which teachers and students had engaged with the DT curriculum content reflected the extent of leadership support mechanisms in place. Teachers' and students' understanding of the DT curriculum content was variable. Teachers and students in 'go!' schools had greater understanding of the DT curriculum content compared to the other schools. These teachers integrated the content into a variety of learning areas. Teachers' established growth mindset gave them at least the confidence to start to work with the DT curriculum content.

'go!' schools' teachers understood, and students articulated, the vocabulary of the DT curriculum content

These teachers knew about the content, structure and progress outcomes of the DT curriculum content, and how this was different from using digital devices in the classroom. They were also actively participating in a variety of PD linked to DT curriculum content for the needs they had identified for themselves. Both schools had external PD and one consolidated this with internal PD.

Students in these two schools understood the vocabulary related to the two strands of the DT curriculum content. For example, students spoke of terms from Progress Outcome 2 for the

computational thinking strand. These students spoke of learning about terms such as loops, algorithms, and the purpose of debugging.

'get set' schools had pockets of knowledge with students and teachers
In 'get set' schools, teachers were developing an understanding of the difference between using digital devices and the DT curriculum content. Some teachers in these schools knew about the content, structure and progress outcomes of the DT curriculum content. Along with their understanding, these teachers were also developing the knowledge, capability and confidence to implement the DT curriculum content.

Teachers were participating in a variety of PD aimed at supporting both digital fluency and the implementation of the DT curriculum content. One school offered teachers a selection of PD they could choose to attend according to their needs. This PD addressed digital fluency and aspects of the computational thinking strand. The school intended to increase their focus on the DT curriculum content for 2019.

The 'get set' schools had some pockets of students who understood the vocabulary of the DT curriculum content. These students were from classes focussed on DT curriculum content.

´on your marks' teachers and students were not intentionally working with the DT curriculum content
Teachers in these schools had not been introduced to the DT curriculum content and were unaware of its structure and progress outcomes. Individual teachers in these schools were potentially implementing aspects of the DT curriculum content, without realising how their work tied into the curriculum content. For example, many teachers already use SCRATCH[18], which introduces the rudiments of computational thinking and elementary coding. These teachers seemed to be digitally fluent and making use of digital devices to enhance learning.

Most students in these schools were not aware of the DT curriculum content vocabulary. Students who did experience aspects of the DT curriculum content belonged to coding clubs or their teacher had an interest in the DT curriculum content. There were limited opportunities for the students with an interest in the DT curriculum content to extend their learning in class.

Teachers were increasingly integrating DT curriculum content into other learning areas

'go!' schools' teachers integrated the DT curriculum content into, and across, other learning areas
Teachers integrating the DT curriculum content into other learning areas worked with their students to plan activities which followed students' interests. This included links to geometry, physical education, science and social studies. For example, Year 1 and 2 students in one of these schools learnt about algorithmic thinking in physical education through an unplugged resource

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[18] https://scratch.mit.edu/

called [Move it, move it][19]. Students put together instructions (i.e. an algorithm) for their classmates to follow to music, such as *forward three, turn left, spin*.

Students in 'go!' schools experienced authentic DT curriculum content learning in inquiry topics. For example, one of the schools had students solving the problem related to the impacts of flooding on their community's roading. They used digital technologies to arrive at their solution. Students worked together and re-designed the roads for their community. They tested the new layout using a [Sphero] (to act as cars) and [Micro:bits] (to act as traffic lights). The layout of this activity can be seen in the right-hand image.
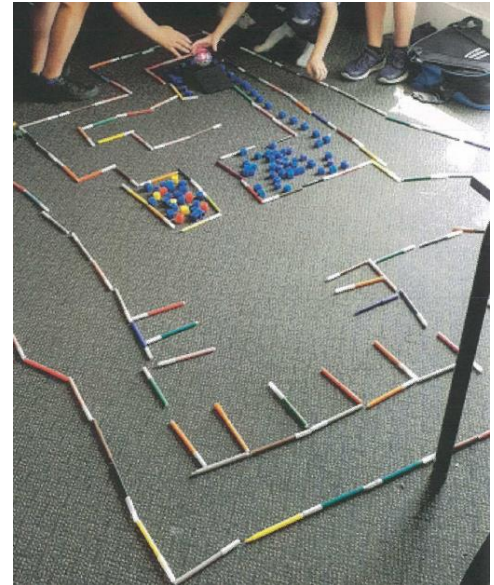
Students had the ability to lead not only their own learning but share this learning with their classmates and teacher. This practice was not uncommon. One school had a student with a significant interest in working with computers lead a learning exercise with their class. This extended the teachers' and students' learning in the DT curriculum content.

Some year-groups of students belonging to 'go!' schools were able to speak about their learning progress with the DT curriculum content. Students were confident describing how their DT curriculum content knowledge has improved since last year:

> *Last year we were working with coding on applications, but now we are working with coding robots to move in real life. It gets harder, but the more you learn, the easier it becomes.*
>
> <div align="right">Student</div>

It is important to note 'go!' schools were still on a journey towards implementation across their school. In one of these schools, students across the year-groups had different levels of exposure to DT curriculum content. For example, while students in Year 7 could speak about the DT curriculum content, the students who were in Year 7 the previous year had very limited DT knowledge. These students' understanding was more aligned to information technology, even referring to the class as a "typing" class. This was clearly not the DT curriculum content.

In the 'get set' schools, more teachers were integrating the DT curriculum content with other learning areas

The curriculum leader in the secondary school worked with teachers motivated to change their practice relating to the DT curriculum content. For example, the curriculum leader worked with a mathematics teacher to consider ways of connecting statistics and data collection to progress outcomes in the DT curriculum content.

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[19] https://code.org/curriculum/course1/2/Teacher

Some students in these schools, mostly in specialist or early adopter DT classes, could speak about authentic learning opportunities in the context of the DT curriculum content. These schools were beginning to integrate the DT curriculum content into other learning areas outside of specialist DT classes. Students could speak about linking the DT curriculum content from specialist classes into other learning areas. For example, students themselves recognised the links between binary taught in their DT class and what was taught in mathematics.

In the 'on your marks' schools, teachers had not integrated the DT curriculum content with other learning areas

Because teachers did not provide learning opportunities with the DT curriculum content, there were limited opportunities for students in these schools to link the DT curriculum content to other learning areas.

Established growth mindsets helped teachers to implement the DT curriculum content

In the 'go!' schools, the majority of teachers had the capability, and certainly the confidence, to implement the DT curriculum content. Their growth mindset helped teachers be comfortable with uncertainty and accept ako, allowing capable students to lead the learning. One teacher reflected on their experience of a student leading their class's learning:

One of the tasks required for students was to do a survey. I would never have thought of saying to do it on the survey maker on your Chromebook. But a student thought of it and made a survey for other students to follow. And once he did it the whole group followed suit. So, he led the other students' learning. Once he led the students through the survey I took the next step and asked 'okay, now what can we do with this information?'

Teacher

Teachers in 'get set' and 'go!' schools actively sought out and took advantage of support that leaders offered. Leaders provided PD curated to teachers' individual needs.

In 'get set' schools, the established growth mindset meant teachers were open to learning about the DT curriculum content and different ways to implement it. Leaders at one of the schools made sure they continued to foster the growth mindset by encouraging teachers to trial integrating the curriculum. This helped to overcome the reluctance of teachers to implement the DT curriculum content.

'On your marks' schools did not foster a growth mindset, and certainly not in the context of the DT curriculum content, and teachers did not seek out support for DT curriculum content implementation from leaders.

In summary: characteristics of teachers in different stages of the journey

	'on your marks'	'get set'	'go!'
Understanding of DT curriculum content	• not introduced to DT curriculum content, though may be delivering aspects without recognising them as part of the digital technologies curriculum content	• increasing knowledge, capability and confidence to deliver the DT curriculum content • increasingly more teachers understanding differences between DT curriculum content and using digital devices	• understand content, structure and progress outcomes of DT curriculum content • teachers understand differences between DT curriculum content and using digital devices
Integration with other learning areas	• DT curriculum content not integrated into other learning areas	• increased numbers of teachers integrating DT curriculum content with other learning areas	• DT curriculum content integrated into a range of different learning areas
Growth mindset	• growth mindset not evident in the context of DT curriculum content	• growth mindset helped with implementation of DT curriculum content	• established growth mindset helped teachers have confidence to deliver DT curriculum content • helped teachers feel comfortable with uncertainty and ako

In summary: characteristics of students in different stages of the journey

	'on your marks'	'get set'	'go!'
Vocabulary of students	• students unaware of, or do not use, vocabulary of DT curriculum content	• students in specialist classes understand and use the vocabulary of the DT curriculum content	• students in particular year groups understand, and can articulate, vocabulary of the DT curriculum content
Reach of curriculum content	• some students may have experienced aspects of the DT curriculum content through individual teacher interest or code club	• DT curriculum content most likely delivered in a club, specialist classes or subject specific setting	• in process of rolling out DT curriculum content across all year levels • integrated across other learning areas

Integration with other learning areas	• limited opportunities to make links between DT curriculum content and other learning areas	• some students see how DT curriculum content works with other learning areas	• students create digital solutions and use computational thinking in more than one learning area
Authentic learning experiences	• focus is on information management, and maybe digital literacy and fluency	• some students able to talk about authentic learning experiences with DT curriculum content, and what they are learning	• students talk about authentic learning experiences, and what they are learning • students recognise their developing capabilities in DT curriculum content
Collaboration & extending learning	• students with interest in DT curriculum content have limited opportunities to extend or lead their learning in class	• some students have opportunities to extend computational thinking and work with others to create digital solutions in class	• students able to lead learning to support their teacher and peers • working collaboratively with other students

Leaders had a variety of external connections to support DT curriculum content implementation

The connections included PD providers, across-school networks including Community of Learning | Kāhui Ako, and industry partnerships. More than one leader in one of the 'go!' schools brokered with external connections to support implementation.

'go!' schools had a close relationship with their PD provider

Leaders and teachers in 'go!' schools worked closely with their PD provider to tailor to their school's context and needs. One of the 'go!' schools co-constructed their professional development with their provider. The PD provider looked at topics that teachers intended to cover in class, and how these could be linked to DT curriculum content. For example, the provider helped teachers make links between Computational thinking (using SCRATCH Junior), and how it could be used in their upcoming unit on the ANZACs.

The 'get set' schools were developing a relationship with their PD providers. The support provided was increasingly customised to teachers' needs for implementing DT curriculum content. Some PD

focused on developing the teachers' understanding of digital fluency or e-learning, seen by the schools as a precursor to DT curriculum content knowledge.

The 'on your marks' schools' professional development focused on digital fluency, and not the DT curriculum content. These schools targeted digital fluency, as leaders wanted to build teachers' fluency before introducing the DT curriculum content. They intended to shift to DT curriculum content PD in the future.

'get set' and 'go!' schools were increasingly taking on leadership roles in networks

One of the 'go!' schools had several teachers who actively participated in a variety of networks, ranging from local to international, to help support implementation of the DT curriculum content. The local network this school belonged to, their Community of Learning | Kāhui Ako, shared understanding on the importance of the DT curriculum content, and supported each other:

In our Kāhui Ako we have recognised the need for our schools to bring everyone onto the same page with the DT curriculum content. Across our schools the staff are at various levels of knowledge about the DT curriculum content. We have been quite strategic as a Kāhui Ako to have a group of in-school leaders that are focusing on the DT curriculum content.

The next step is to map the curriculum together, so we don't re-invent the wheel. We are supporting each other across the schools to make sure we implement it effectively.

Professional Learning Lead

The national network included a teacher who was a facilitator with Code Club. In this role the teacher supported schools across New Zealand with professional development in the DT curriculum content, building teacher knowledge about the DT curriculum content and coding capability. Another school leader, involved in an international network, learnt about how schools in other countries had implemented their country's DT curriculum. This helped inform their school's progress. As part of this network, the leader developed resources for Minecraft: Education Edition that were related to the NZC.

One of the 'get set' schools had their DT leader engage in a small number of professional networks with a particular focus on science, technology, engineering, arts and mathematics (STEAM) in their Kāhui Ako, which supported a new project-based unit. The DT leader also collaborated with other teachers in the Digital Technologies Teachers Aotearoa (DTTA) network[20], and indeed took a leadership role in that group.

The 'on your marks' schools were involved in networks, but these did not support the implementation of the DT curriculum content.

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[20] http://nzacditt.org.nz/

A 'go!' school had reciprocal partnerships with industry experts

One of the 'go!' schools worked with industry partners, such as the video game industry, to show teachers, parents and students how the DT curriculum content was important in the world beyond school. These examples gave teachers, parents and students awareness of real-world applications of the DT curriculum content.

In exchange, these partnerships provided PD opportunities from experts to the school.

In summary: characteristics of external connections in different stages of the journey

	'on your marks'	'get set'	'go!'
Professional Development provider	• PD related to digital fluency, not the DT curriculum content	• relationship with providers developing, and increasingly customised to school's context • still a focus on digital fluency or e-learning first	• PD customised to school's context and focused on DT curriculum content • close working relationship that was responsive to school needs
Across-school networks	• networks not focused on promotion of the DT curriculum content	• involvement and active participation in a small number of networks or collaborations to support DT curriculum content implementation	• involvement and active participation in a variety of local, national and international networks resulting in shared effective practice
Teacher role in network		• networks and collaborations mostly restricted to curriculum leader	• networks and collaborations associated with a range of teachers
Industry partnerships	• industry connections not common and, if present, not supporting DT curriculum content implementation		• partnerships with industry are reciprocal; these partnerships provided real-world applications of the DT curriculum content, and staff development

Enablers and barriers to implementation of the DT curriculum content

From our case studies, there is a clear set of conditions that play an important part in the effective preparation for and implementation of the DT curriculum content. Depending on what is present in the schools, components of each condition can act as enablers or barriers in the journey to implement the DT curriculum content. Contextual factors, such as school location, did not appear to act as enablers or barriers across the three stages of readiness, based on the schools visited.

Leaders' involvement with the DT curriculum content is critical for effective implementation

Enablers	Barriers
• Leaders know the difference between teachers extending learning using digital devices and the requirements of the DT curriculum content • Leaders are engaged with and understand implications of the DT curriculum content • Leaders take a planned approach to DT curriculum content implementation, including setting goals annually for school, departments or syndicates, and including appraisal goals • Leaders are proactive and supportive of DT curriculum content implementation • Leaders recognise the need to encourage and engage female students with the digital technologies curriculum content[21]	• Leaders do not see the implementation of DT curriculum content as a priority • Leaders do not engage with the DT curriculum content • Leaders do not have a clear understanding of DT curriculum content • Leaders do not have a planned approach to DT curriculum content implementation

An established growth mindset helps teachers be open to new learning

Enablers	Barriers
• Facilitated by leadership, teachers are willing to learn about, and learn from mistakes with, DT curriculum content • Teachers are open to learn with, or from, their students about the DT curriculum content	• Absence of a growth mindset means teachers may not be willing to 'have a go' with implementing the DT curriculum content • The school culture may not tolerate mistakes

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[21] A secondary school noted there was a reluctance for girls to engage with digital technology, viewing it as a male domain.

- Teachers may be unwilling to show students any gaps in knowledge or skills

Timely professional development supports leaders and teachers with the DT curriculum content

Enablers	Barriers
• DT curriculum content PD is prioritised, sometimes alongside curriculum review work	• PD for DT curriculum content is not a priority in school's strategic plan
• Internal and external DT curriculum content specialists are accessed for PD	• Time consuming PD application
• PD is timely for leaders and teachers to implement the DT curriculum content	• Lack of availability of specialist providers
• PD is tailored to school's identified needs	• A lack of PD in school's geographic area
	• PD not tailored to leader and teacher needs in DT curriculum content
	• No school champion or curriculum leaders to lead the DT curriculum content PD internally

Community connections play an important part

Enablers	Barriers
• Leaders engage parents and board members so they understand the importance of DT curriculum content and appreciate its significance in the workforce	• Parents have concerns about the extended use of digital devices
• School community supports school goals for DT curriculum content	• Parents have been provided little, if any, information on what the DT curriculum content is about
• Connections to networks outside of school provide extended support for teachers	• Learning is perceived to be divorced from real-life applications
• Industry connections provide authentic learning opportunities for students and staff	• Some vocal parents are concerned with children being over-exposed to wi-fi signals

Infrastructure and devices fit the school's requirements

Enablers	Barriers
• School identifies and minimises or eliminates infrastructure barriers	• Barriers not assessed or mitigated
• Board appropriately resources curriculum development	• Infrastructure provider not fit for needs of the school

- Leadership confidently negotiates with infrastructure providers to meet the school needs
- School leaders select the best tools and products to suit their school's way of teaching and learning
- School is not over-reliant on a particular brand or product for device or software

- School may be over-reliant on a particular brand or product for device or software which can limit opportunities for learning and make the school vulnerable to obsolescence

We came to the realisation that infrastructure should not drive what you to want to do. Rather, what you want to do should drive infrastructure.

DT leader

Our findings highlight that leaders who are successfully journeying towards implementation are proactive; they know their school, where the strengths and gaps are, and they make sure they have what is needed to keep their curriculum development moving forward.

Further considerations to support DT curriculum content implementation

Ongoing, practical support is needed to integrate DT curriculum content in the local curriculum

Schools are required to integrate the DT curriculum content into their local curricula from the start of 2020. The Ministry has provided a guide[22] to introduce schools to the DT curriculum content and there are resources available online.

These case studies show that schools were implementing the DT curriculum content in different ways. The DT curriculum content was implemented in specific Digital Technology classes, integrated across different learning areas or, as in some cases, a mix of both approaches. This illustrates the importance of schools being able to implement the DT curriculum content to suit the context of their school and community.

ERO's 2018 DT curriculum content survey showed many schools were slow to engage with the DT curriculum content. Leaders needed more guidance on what is expected of their school to be prepared for 2020. ERO found leaders and teachers needed ongoing and practical support from the Ministry on how the DT curriculum content should be integrated across learning areas. Potential barriers to accessing PD, such as time-consuming applications, and geographically-limited PD, need to be addressed. These findings were shared with the Ministry in December 2018 and since then the Ministry reports it has made changes to improve access to resources and PD.

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[22] http://www.education.govt.nz/assets/Documents/dthm/DT-Support-Booklet-PRINT-PDF-20-07web.pdf

Each of the schools in this study had worked on e-learning or digital fluency at some point. Most schools believed digital fluency sits as a pre-condition to confident DT curriculum content implementation and had built, or were continuing to build, digital fluency in leaders, teachers and students. Clarification on the differences, and interactions between, digital fluency and the DT curriculum content will help support implementation.

Addressing specific barriers

Encouraging and engaging female students in the DT curriculum content

One school felt teachers needed to differentiate the curriculum for female students to make sure they stayed engaged in their DT curriculum content learning. For example, this school recognised female students were more engaged in creative subjects such as art, so they introduced coding into art.

The secondary school in this study also faced challenges attracting female students to the optional, specialised Year 10 digital technology class. It was also more difficult to attract the 'academic' students in Years 11 to 13 to senior digital technology classes. The female students considered DT curriculum content was about publishing and typing, rather than a core literacy that would be useful to them in a wide range of contexts.

Guidance for schools or exemplars for attracting and engaging female students would help schools with strategies to overcome this potential barrier. This is significant given that women in New Zealand are underrepresented in technology roles.[23]

Health and safety guidance for wi-fi in schools

One of the schools in this study had a strong culture of engaging parents in decisions relating to the use of digital devices and, more recently, the DT curriculum content. The school and parents valued this engagement as they could raise any anxieties related to students working in digital learning areas. One of the anxieties was the concern some parents had about their children being over-exposed to wi-fi signals. While school leaders acknowledged this was a small group of parents, they had found it difficult to address this concern.

There would likely be other schools experiencing similar difficulties. At present there is no public health guidance from the Ministry, or other government agencies, on the effects of wi-fi. Providing such a resource would be useful for schools to reassure concerned parents.

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[23] https://techwomen.nz/get-informed/

Appendix

Figure 1: Theory of Change 2018 for Digital Technology | Hangarau Matihiko (DT|HM)

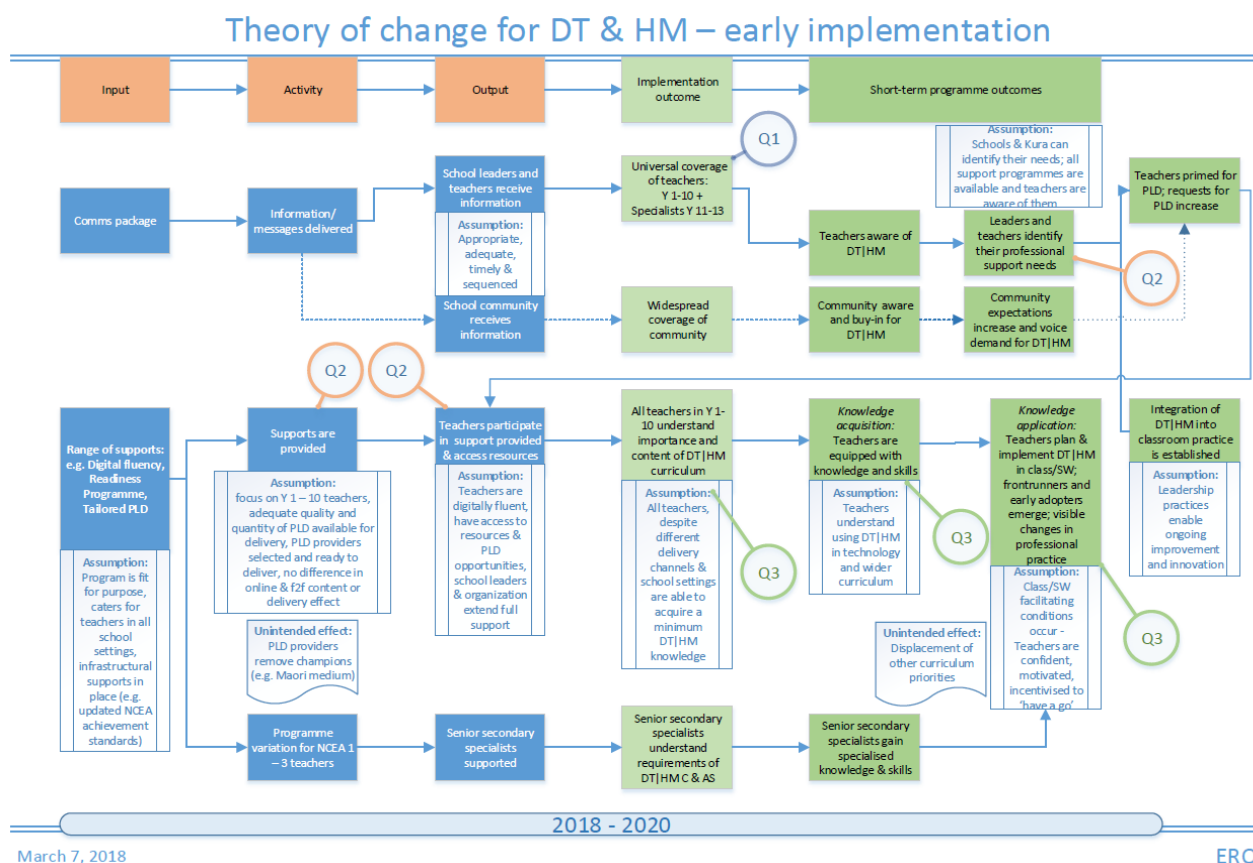Theory of change for DT & HM – early implementation

Figure 1 depicts the Theory of Change for DT|HM early implementation phases relating to support programmes and includes the groups of sub-questions (1-3) marked at the appropriate stages. These questions explore the key areas of:

- awareness activities
- needs identification and participation
- implementation and short-term outcomes.

The full description of the Theory of Change for DT|HM can be found in It's early days for the new digital technologies content curriculum[24].

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[24] https://www.ero.govt.nz/assets/Uploads/Its-early-days-for-the-new-digital-technologies-curriculum-content.pdf