Progress outcomes for digital technologies

The learning progression frameworks illustrate the significant steps that learners take as they develop their expertise in Digital Technologies | Hangarau Matahiko from years 1 to 10.

We can use the progress outcomes to identify students' DT|HM knowledge, skills, and attitudes. Teachers can also use the progress outcomes to plan programmes that provide learning opportunities which will enable their students to succeed at secondary school and beyond.

The progress outcomes:

- prompt teachers to notice what students know and can do across the breadth of the curriculum content
- support teachers to understand how students develop their expertise in DT|HM
- assist teachers to identify if DT|HM knowledge and expectation of the programmes they provide for students is in line with the curriculum expectatio

References:

Ministry of Education. (2010). The Literacy Learning Progressions. Wellington, New Zealand: Author.

Ministry of Education. (2017). Technology in the New Zealand Curriculum. Wellington, New Zealand: Author.

Raranga Matihiko
Weaving Digital Futures

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The tapestry of understanding cannot be woven by one strand alone

PROGRESS OUTCOME 1

Computational thinking for digital technologies

In authentic contexts and taking account of end-users, students use their decomposition skills to break down simple non-computerised tasks into precise, unambiguous, step-by-step instructions (algorithmic thinking). They will give these instructions, identify any errors in them as they are followed, and correct them (simple debugging).

Key aspects of this outcome:

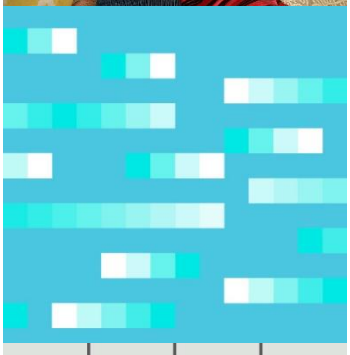
- Sequencing
- Debugging (identifying errors)
- Decomposition (breaking problems down in steps/looking at just one aspect)
- Step by step instructions (algorithms)
- Non digital/unplugged activities

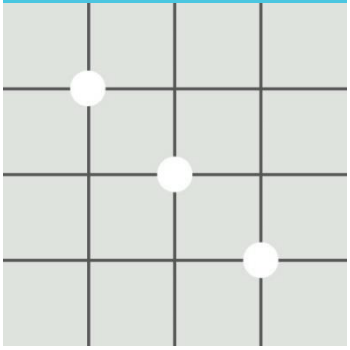
What this might look like in your existing curriculum

- Daily routines (sequencing, instructions)
- Storyboarding to plan stories (sequencing)
- Numeracy strategies such as "Making 10" (decomposition)
- Breaking words into parts (e.g. re-new-able) (decomposition)
- Word families (l-ight, n-ight. r-ight etc.) (decomposition)
- Editing writing (identifying and correcting errors/debugging)
- Instructions for tasks (algorithms)
- Following maps (algorithms)

Some practical activities to reinforce learning for this progression:

- Tie laces (sequencing, following process, following instructions/algorithms)
- Cooking (sequencing, following process, following instructions/algorithms)
- Orienteering (following instructions/algorithms, debugging)
- Waiata-a-ringa (following instructions, sequencing, decomposition)
- Poi routine (following instructions, sequencing, decomposition, debugging)
- Tītītōrea games (following instructions/algorithms, sequencing, decomposition, debugging)
- Draw Tukutuku panels (sequencing, patterns, order)
- 'Be a robot' - one student instructs another student who is a 'robot' and has to follow the instructions they are given, swap roles (giving and following instructions, sequencing, decomposition, debugging) (Teaching robots to dance, Exemplar 2, Ministry of Education, 2017)





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PROGRESS OUTCOME 2

Computational thinking for digital technologies

In authentic contexts and taking account of end users, students give, follow and debug simple algorithms in computerised and non-computerised contexts. They use these algorithms to create simple programs involving outputs and sequencing (putting instructions one after the other) in age-appropriate programming environments.

Key aspects of this outcome:

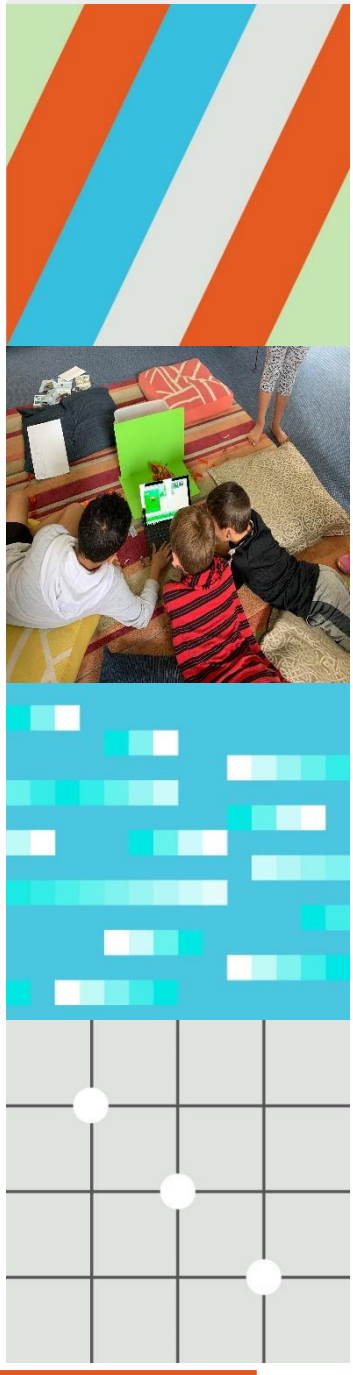
- Give and follow step by step instructions (algorithms)
- Putting the instructions in the correct order (sequencing)
- Creating a programme using simple algorithm/s
- Testing, identifying and solving errors (debugging)
- Awareness that algorithms can look different but solve the same problem
- Can be both computerised and non-computerised

What this might look like in your existing curriculum:

- Kapa haka, Tī Rākau, Tītītōrea, sports etc that require sequencing. The right order/sequence is needed, the rules followed in order to get the right outcomes (sequence, input, output)
- Literacy programme e.g., order and structure of writing, proofreading, identifying errors (debugging) and correcting.
- Food technology e.g following a recipe (algorithms, sequence, input, output).
- Maths e.g. breaking down problems, ordering numbers, family of facts, mapping skills (sequencing/patterns)
- Science experiments e.g. adding the right amounts of chemicals to create change (input, process, output)
- Social science e.g timelines and context of how things relate (sequence)

Some practical activities to reinforce learning for this progression:

- Hour of code activities that require the breaking down of tasks, sequencing, creating algorithms and debugging). Try Moana Hour of Code game (sequencing, algorithms, debugging)
- Programming a robot to move around a map or location (sequencing, algorithms, debugging)
- Students creating a treasure quest map around the school (sequencing, creating an algorithm)
- Bits and Bricks - creating simple algorithms
- "Catching Chickens" Using ScratchJr to create a program (Catching chickens, Exemplar 5, Ministry of Education, 2017)



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PROGRESS OUTCOME 3

Computational thinking for digital technologies

In authentic contexts and taking account of end-users, students decompose problems into step-by step instructions to create algorithms for computer programs. They use logical thinking to predict the behaviour of the programs, and they understand that there can be more than one algorithm for the same problem. They develop and debug simple programs that use inputs, outputs, sequence and iteration (repeating part of the algorithm with a loop). They understand that digital devices store data using just two states represented by binary digits (bits).

Key aspects of this outcome:

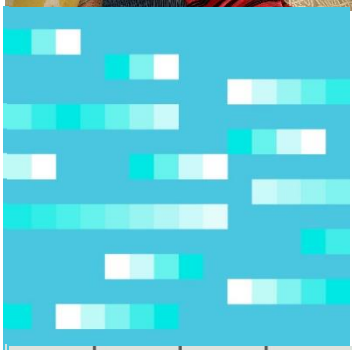
- Decomposition (break down problems) to create instructions (algorithms) for computer programs
- Use of logical thinking to predict behaviour (eg. thinking about what might happen) and understanding the need to be precise with instructions
- Understanding the difference between algorithms (a set of instructions) and a program (built using algorithms)
- Multiple solutions for same problem e.g algorithms can be structured differently but still solve the one problem
- Create an algorithm, using block based coding, to develop a basic program
- Identify patterns and iterating where code can be made more efficient using loops (repeating pattern/code)
- Understanding binary concepts and how they represent information

What this might look like in your existing curriculum

- Breaking down sports moves, drama or music activities into manageable steps (decomposition)
- Understand that there are multiple ways to make whole numbers (prediction, logic, more than one algorithm)
- Statistical investigations (prediction, logic, sequence)
- Music chords I, IV, V -> I (prediction)
- Code.org and Scratch (algorithms, debugging, sequencing)
- Creating movies or music using iMovie and Garageband

Some practical activities to reinforce learning for this progression:

- Binary coding activities CS unplugged (binary)
- Programming a robot to move around a map or location (decomposition, sequencing, iteration, algorithms, debugging)
- Using Scratch (or another coding app) to create a game (decomposition, sequencing, iteration, algortihms, debugging)
- Use a block based coding system to develop a programme and iterate to simplify algorithms (Dance Moves, Exemplar 6, Ministry of Education, 2017



PROGRESS OUTCOME 1

Designing and developing digital outcomes

In authentic contexts and taking account of end-users, students participate in teacher-lead activities to develop, manipulate, store, retrieve and share digital content in order to meet technological challenges. In doing so, they identify digital devices and their purposes and understand that humans make them. They know how to use some applications, they can identify the inputs and outputs of a system, and they understand that digital devices store content, which can be retrieved later.

Key aspects of this outcome:

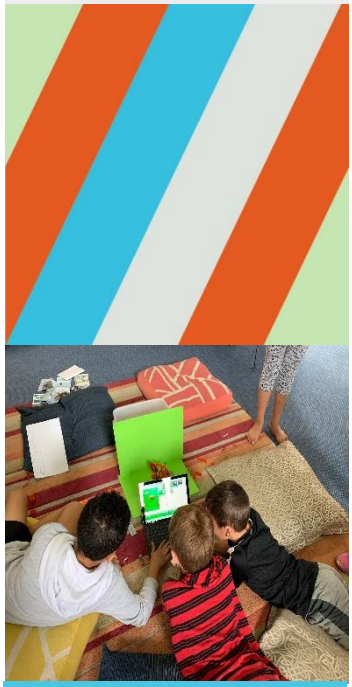
- Storage, editing, retrieval and share of digital content (teacher lead)
- Identify digital devices and their purposes
- Use of some applications
- Identify inputs and outputs
- Understand devices can store content

What this might look like in your existing curriculum

- Finding a Youtube video (retrieval and sharing)
- Recognise that digital devices store content e.g. digital camera stores photos, emails send messages, phones hold data (devices store different types of content
- Controlling light switch which results in light working (identify input and outputs of a system)
- Students use touch screen application to record that they are present in class (use of application, storing data)
- Locating images using google images or other web-based platforms (retrieval, searching)
- Searching for directions using Google maps (retrieval, input - address/search terms, output - result)
- Accessing online resources e.g. TKI, online student journals (retrieval, searching - input/output)
- Reinforcing maths understandings using mathletics (use of application)
- Publishing on a chromebook (storage, editing, retrieval, sharing)
- Students upload work to their ePortfolio (storage, edit, retrieval of work)

Some practical activities to reinforce learning for this progression:

- Use of digital devices to record reading to enable students to self-assess and self-correct (use of application, storage, retrieval)
- Digital storytelling using a range of digital tools (application use, purpose of device, storing, editing, retrieval and sharing, inputs and outputs)
- Identify digital devices and their purpose - selecting and identifying differences and purposes of devices and how these support everyday life (Vacuum cleaners, Exemplar 1, Ministry of Education, 2017)



PROGRESS OUTCOME 2

Designing and developing digital outcomes

In authentic contexts and taking account of end users, students make decisions about creating, manipulating, storing, retrieving, sharing and testing digital content for a specific purpose, given particular parameters, tools and techniques. They understand that digital devices impact on humans and society and that both the devices and their impact change over time.

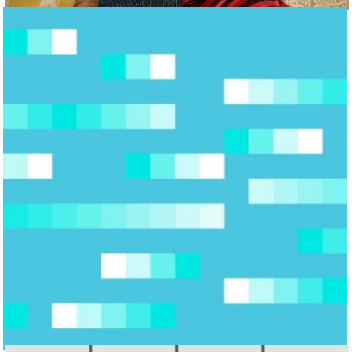
Students identify the specific role of components in a simple input-process-output system and how they work together, and they recognise the "control role" that humans have in the system. They can select from an increasing range of applications and file types to develop outcomes for particular purposes.

Key aspects of this outcome:

- Thinking about who the user will be and what their needs might be
- Making decisions about what tool to use to create, share and store work and select the best tool for purpose (including using particular tools within an application or programme)
- Understand the impact of digital devices on humans and society
- able to describe a range of real-world applications for systems
- Understand and can explain the input-process-output system
- Understand that humans control digital systems

What this might look like in your existing curriculum

- Students consider the needs of an authentic audience (end-users) and construct their digital outcomes for that audience. They use digital tools to create, manipulate and share digital content.
- Literacy: Thinking about the needs of the audience, identifying who will be reading their stories or blogposts, listening to presentations, engaging with their digital stories, and constructing for that audience (end-users)
- Science: Understanding systems e.g. solar system, life cycle or water cycle and identifying aspects of each system and how these aspects impact on the full system (input-process-output)



- Social Science: Developing understandings of space exploration and what is needed to survive on a space station (impact of digital devices)
- Social Science: Identifying how a product is made, focussing on raw ingredients, the process and the final product (input-process-output)
- The Arts & Literacy: Investigating toi Māori and applying their learning to tell stories
- Food technology: Cooking (input - ingredients, process - mixing and baking, output - finished product)

Some practical activities to reinforce learning for this progression:

- Investigating woman in technology - who were they, what did they do and what was the impact of their work
- Investigating the input-process-output system of a digital camera
- Have a debate on the impact of robotics on human society (Digital Debate, Exemplar 8, Ministry of Education 2017)
- Create a short documentary on different systems and components within systems (Video of a system, Exemplar 5, Ministry of Education, 2017