Kia Takatū ā-Matihiko
Digital Readiness

Rauemi Pīkau | Resource Toolkit

Tūrangawaewae

Curriculum Level 4 and 5 - Years 9 to 10

Technology Nature of Technology - Level 4 and 5

Technology Technological Knowledge - Level 4 and 5

Technology Technological Practice - Level 4 and 5

Technology Computational thinking for digital technologies - PO4 and PO5

Technology Designing and developing digital outcomes - PO3

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TE TĀHUHU O TE MĀTAURANGA

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Rauemi Pīkau

Kia Takatū ā-Matihiko are pleased to share with you our Rauemi Pīkau | Resource Toolkits. Rauemi Pīkau are intended to be a comprehensive exemplar or model of how you might integrate Digital Technologies (DT), and Hangarau Matihiko (HM), into your local curriculum in relevant and authentic contexts.

Please note:

- Rauemi Pīkau are not an integrated unit plan and should not be directly taught from.
- Rauemi Pīkau have included all of the Technology achievement objectives, as well as progress outcomes, for the year levels for which they were developed however there is much more here than you need. Teachers should collaborate with colleagues across multiple year levels in order to develop a broad learning programme that covers all of the Technology strands over time. This is preferable to trying to incorporate learning from all the achievement objectives, as well as all the progress outcomes, at once.
- We have suggested possible curriculum levels and year groups that Rauemi Pīkau might be appropriate for however we encourage teachers of students in higher or lower year levels to adapt these resources as they wish to best meet the needs of their students.

How to use this resource

We suggest you might use this resource in the following way.

- Read through the Rauemi Pīkau to support your own understanding.
- Download your own copy of our blank template.
- Work alongside your colleagues to explore ways in which you might integrate DT and HM into your local curriculum, using your own authentic and meaningful concepts and contexts.
- Pick aspects of our Rauemi Pīkau and personalise the learning to your context by considering how you might adapt them to meet your needs and the ages and stages of your students.
- Share your learning to support the learning of others by sharing your integrated plan with others in Ngā Kiriahi!

Concepts and context

We have pre-selected **concepts** and **contexts** in order to provide a wide range of meaningful and relevant **possible learning activities**.

- The **Concepts** we have selected are based on bicultural themes in keeping with our uniquely Aotearoa approach to learning in the Kia Takatū ā-Matihiko | National Digital Readiness programme.
- The **Contexts** were selected to align with the concepts. We have been mindful to select contexts that could be easily adapted to your local curriculum. Authentic and meaningful contexts support students to take action. They'll contribute to their local community as well as having a positive impact on themselves and others such as their whānau, iwi/hapū and wider community.

Connections to the strands

Teachers should make connections to the technology strands via the achievement objectives and progress outcomes to support a coherent pathway of learning for students.

Achievement objectives support you to start considering learning intentions, planning, and explicit teaching concepts. Progress outcomes are what you are aiming for, the desired learning performance. It's important to understand that the progress outcomes build year by year and are used to identify learning progression.

Relationships to support learning

Our Rauemi Pīkau support you to think about how you build relationships with others to enhance student learning. In particular, we've shown how these relationships can have an impact when supporting students to take action. This might include people in your community, local businesses, iwi/hapū, other schools etc. People, expertise and materials are required to enrich your local curriculum and create engaging learning opportunities for students. It's important that schools draw on their existing relationships, as well as create new ones, to support their learning programmes.

Concept

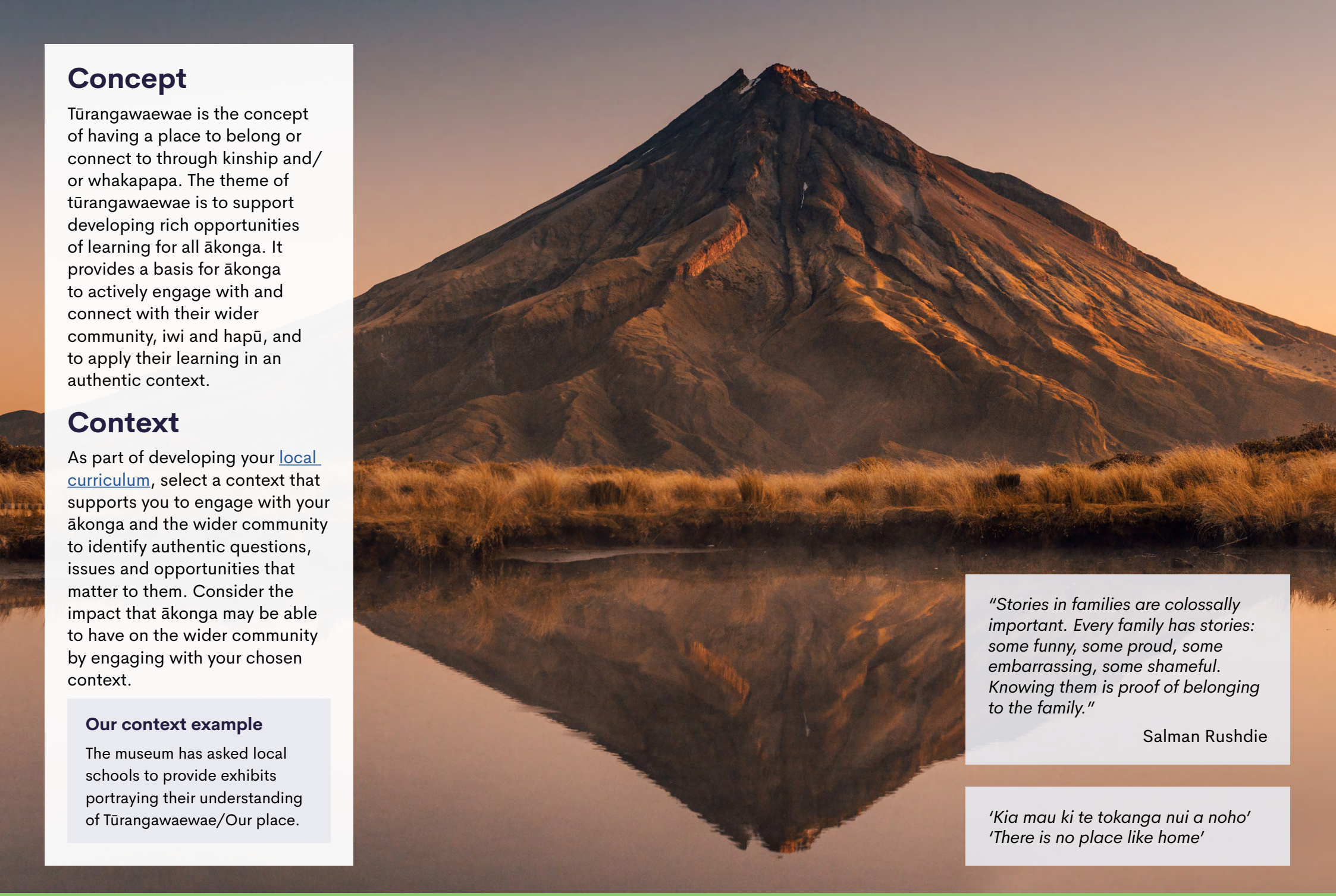
Tūrangawaewae is the concept of having a place to belong or connect to through kinship and/or whakapapa. The theme of tūrangawaewae is to support developing rich opportunities of learning for all ākonga. It provides a basis for ākonga to actively engage with and connect with their wider community, iwi and hapū, and to apply their learning in an authentic context.

Context

As part of developing your local curriculum, select a context that supports you to engage with your ākonga and the wider community to identify authentic questions, issues and opportunities that matter to them. Consider the impact that ākonga may be able to have on the wider community by engaging with your chosen context.

Our context example

The museum has asked local schools to provide exhibits portraying their understanding of Tūrangawaewae/Our place.



"Stories in families are colossally important. Every family has stories: some funny, some proud, some embarrassing, some shameful. Knowing them is proof of belonging to the family."

Salman Rushdie

'Kia mau ki te tokanga nui a noho'
'There is no place like home'

Students learn to know *why*

Nature of Technology

Technology Achievement Objectives

Students will:

Characteristics of technology

Level 4

- Understand how technological development expands human possibilities and how technology draws on knowledge from a wide range of disciplines.

To produce 'things' takes knowledge from different specialist people. A builder doesn't build all of a house, they get plumbers and electricians, and roofers (different disciplines) that come together to produce the technological outcome.

Many technological outcomes consist of products (physical things – eg mobile phones) or systems (actions/events – eg communication and transport networks) that enhance us as people to go beyond what "natural" functioning would otherwise permit.

Level 5

- Understand how people's perceptions and acceptance of technology impact on technological developments and how and why technological knowledge becomes codified.

When seeking to understand technology, its power, and its limitations, we must recognise that outcomes are of different value to different people, and in different places and times. The arrival of the musket in New Zealand had a different impact depending on whether you had easy access to it or not.

Codified knowledge refers to knowledge that has been recorded in a way that is easy to access and pass on. Tacit, or implied knowledge is the opposite—it's difficult to pass on and has to be worked out from the context or situation.

Teaching and Learning

Students come to understand technology as an intervening force in the world and learn that technological developments are inevitably influenced by (and influence) historical, social, and cultural events.

Students have opportunities to engage in informed debate about contentious issues and increase their understanding of the complex moral and ethical aspects that surround technology and technological developments. They also have opportunities to examine the fitness for purpose of earlier technological outcomes and make informed predictions about future technological directions at a societal and personal level.

There are two components in this strand: characteristics of technology and characteristics of technological outcomes. This resource includes a mix of level 4 and level 5 activities.

Possible Learning Activities:

Develop an understanding of cultural appropriation and copyright. Students check with the museum about copyright and who owns the intellectual property of their stories as well as how they are to be used. They check with the local iwi, hapū and kaumātua to make sure it's appropriate to tell those stories and for them to be used in the ways the students envisage.

Explore how technology has changed/eroded the concept of tūrangawaewae (easy communication, global connectedness, easy to move around etc...).

Find and interview someone who has lived in the area for a long time about the changes to significant places. What are the positive and negative impacts of those changes?

Take an everyday object/product/technological outcome like a computer keyboard or a kettle. Research what skills and understanding would be needed by the people designing and creating this. Group them into what they would have to know and do (the different disciplines that people collaborated across) so that the outcome was produced. For example explore the roles of business expert, designer, computer scientist, and artist/animator when creating an animated movie

Using an example of a past practice that was considered okay at the time, but then later was discovered that caused harm (like clearing bush, allowing stock to access rivers, hunting native animals), explore how having well researched codes of practice (rules of use) for these things before they were used, might have prevented people, or the environment, being harmed by using them.

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Students learn to know *why*

Characteristics of technological outcomes

Level 4

- Understand that technological outcomes can be interpreted in terms of how they might be used and by whom and that each has a proper function as well as possible alternative functions.

Explain how the technological outcome might be able to be used by end-users for purposes other than what it was originally designed for and discuss the likely impact of this.

Level 5

- Understand that technological outcomes are fit for purpose in terms of time and context. Understand the concept of malfunction and how "failure" can inform future outcomes.

'Malfunction' of an outcome can mean it is still of use. Failure can mean the end of an outcomes usable lifespan. Both of these events help the technologist improve the fitness for purpose, hopefully before the outcome is used by the public!

Possible Learning Activities:

Find an object (like a park bench) that is intended for use at home, but is also built for use in public spaces. How do they differ? What decisions have been made by the designers to cope with use in their intended environment? What changes have been made in response to uses that are different from its intended function (e.g. being used for standing on, rather than sitting). From there, consider what factors will need to be included in the design of the students' exhibit in response to the intended and unintended uses of their outcome.

Discuss current and historic methods of passing on history and a sense of belonging (cave paintings, landscape features, monuments, buildings, waiata, carving, weaving, story-telling, uniforms, museums, time capsules, books, etc...). Which of these are likely to survive and which may be lost? How you could determine what is useful to be preserved and of benefit to people in the future? What positive or negative impacts have these methods of recording history had on the people or environments?

Explore a range of small hand items (screwdrivers, butter or standard eating knife, scissors, pens etc) What is their purpose? What else can you do with them that wasn't what they were designed for? For example, a simple knife can be used as a screwdriver, to undo a flat-head screw, scissors can be used as levers, mobile phones started off as devices to talk to someone with, now they are calendars, calculators, torches, computers etc. How can a designer include both proper and alternative functions in their design concepts?

Consider the ways a museum or art gallery exhibit might fail. What sort of failures would render the exhibit unable to be used? What sort of failures would result in the exhibit continuing to be of use? How could the exhibit be designed to stop it failing in ways that render it unusable? What changes could be made to mitigate 'wear and tear'?

Don't understand a term?
Click a word with dotted underline to see the definition

Students learn to know *what*

Technological Knowledge

Technology Achievement Objectives

Technological Knowledge includes three components—Technological modelling, Technological products and Technological systems. For this pīkau, the specific context had few natural connections for exploring Technological products, so it has not been included.

Students will:

Technological modelling

Level 4

- Understand how different forms of functional modelling are used to explore possibilities and to justify decision making and how prototyping can be used to justify refinement of technological outcomes.

Modelling involves testing design concepts to see if the outcome under development (or some part of it) meets the appropriate physical and functional requirements. Also called "tests" or "mock-ups".

Level 5

- Understand how evidence, reasoning, and decision making in functional modelling contribute to the development of design concepts and how prototyping can be used to justify ongoing refinement of outcomes.

The better the functional modelling, the more confident a technologist can be that an outcome will be fit for purpose and have minimal unexpected and/or undesirable impacts.

Prototyping serves two functions; optimising the fitness for purpose of an outcome, and providing evidence that an outcome is ready for use in the real world.

Teaching and Learning

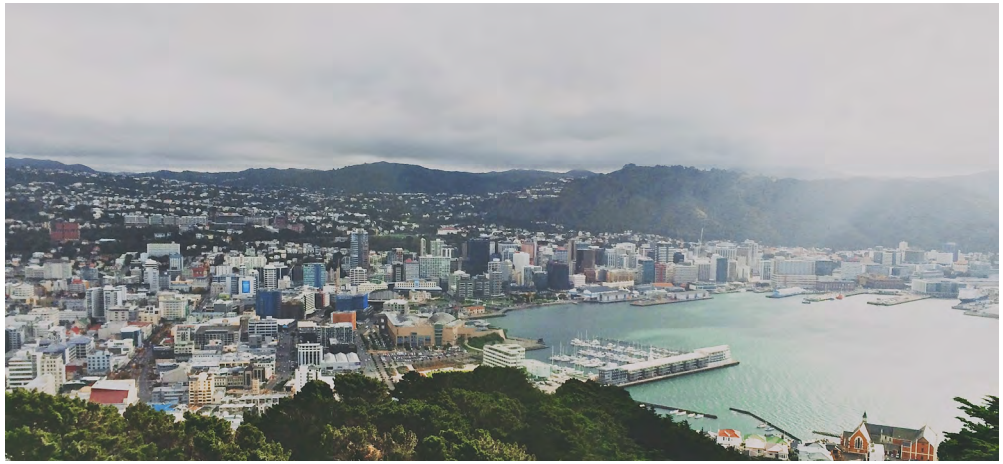
By exploring functional modelling, students learn to compare simulated representations of reality to the reality itself and come to appreciate the power and limitations of functional modelling. By exploring prototyping, students come to understand its importance and how they can use it to advantage in their own technological practice. By gaining knowledge of materials used in technological products and of components and connections used in systems, students can bring greater understanding to their own technological practice and decision making.

This resource includes a mix of level 4 and level 5 activities.

Possible Learning Activities:

Design several concepts for an exhibit at the local museum. The concepts are modelled in software or drawn and presented to the class for feedback. A cardboard model of the favoured exhibit is created and tested, showing how the public will view and interact with it.

Test models to see if they will stand up to public use by installing them in the school hall foyer, or other suitable area, where they can be used by groups of students and any failures noted and redesigned.



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Students learn to know *what*

Technological Knowledge

Technological systems

Level 4

- Understand how technological systems employ control to allow for the transformation of inputs to outputs.

Control mechanisms enhance the efficiency of a technological system by maximising desirable outputs and minimising undesirable outputs.

Technological systems are sets of interconnected components that transform, store, transport, or control materials, energy, and/or information for particular purposes. In any system, how the parts work together is as important as their individual characteristics.

Level 5

- Understand the properties of subsystems within technological systems.

Subsystems are another system within a system. Subsystems are responsible for a key change/transformation. Each has a specific function that supports the functioning of the whole system. They enable it to achieve its intended purpose.

Possible Learning Activities:

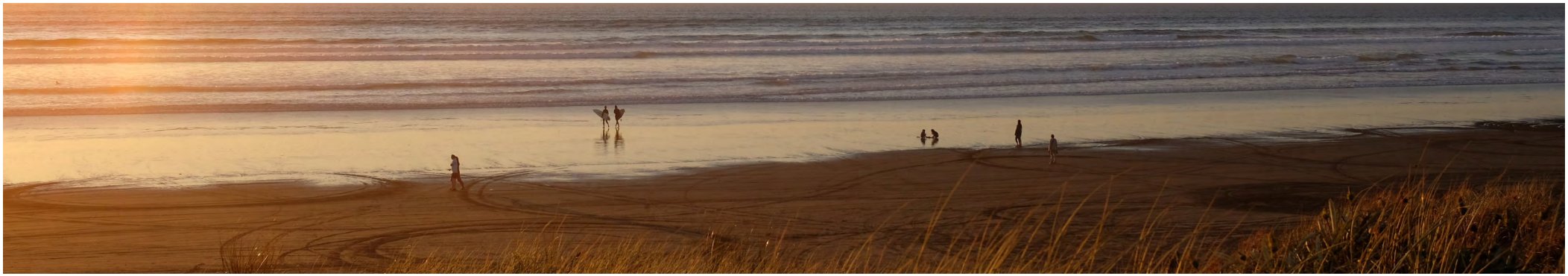
Investigate adding interactive elements to a display. How will the public interact with the exhibit, and what effects will public interactions have on how the exhibit looks, behaves, and works with other exhibits in the same space? How much control will the end users have? How will the exhibit reset itself for the next user?

Describe examples to illustrate how a technological system's fitness for purpose was enhanced by the use of control mechanisms (e.g. feedback from sensors enabling a physical computing device to respond to user input).

Use basic circuits as examples of processes that are controlled to enable the inputs to be transformed to outputs. Students explain how transformation processes within a system are controlled.

Draw a sequence/flow diagram to show how subsystems interface with each other within a greater system.

Identify the subsystems in a system. Explain what each subsystem does and how each connects with other subsystems to enable the product to function in the way that it does. e.g. the parts of a computer, keyboard, screen etc.



Students learn to know *how*

Technology Achievement Objectives

Students will:

Planning for practice

Level 4

- Undertake planning that includes reviewing the effectiveness of past actions and resourcing, exploring implications for future actions and accessing of resources, and consideration of stakeholder feedback, to enable the development of an outcome.

Analysing the impacts and implications (ethical, environmental, political, and so on) of technological practice and the consequent outcomes is an important aspect of planning.

Level 5

- Analyse their own and others' planning practices to inform the selection and use of planning tools. Use these to support and justify planning decisions (including those relating to the management of resources) that will see the development of an outcome through to completion.

Teaching and Learning

Students gain a sense of what they may be able to achieve as they undertake their own technological practice to find solutions to identified needs and/or realise opportunities. Their practice is enhanced as they embed philosophical ideas encountered in the nature of technology and technological knowledge strands.

There are three components in this strand: Planning for practice, Brief development, and Outcome development and evaluation.

This resource includes a mix of level 4 and level 5 activities.

Possible Learning Activities:

Introduce and learn how to use a range of planning tools such as flow charts, step by step sequences/lists, time plans (Gantt charts). Choose appropriate tools and use them for the current project. Review afterwards: were some tools better for different jobs?

Keep a diary, showing the key stages of the project. Record deadlines — met or otherwise, and note any other factors that influenced the completion of the project.

Students recall their planning from a previous technology project, and explain how their current planning is an improvement over their previous attempts.

Use a 'Bulls-eye' chart (three concentric circles – outside circle labeled attributes, middle circle 'key' attributes, inner circle specifications). Refine identified attributes into specifications (ie, measurable/observable physical and functional nature of the intended outcome).

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Students learn to know *how*

Technological Practice

Brief development

Level 4

- Justify the nature of an intended outcome in relation to the need or opportunity. Describe the key attributes identified in stakeholder feedback, which will inform the development of an outcome and its evaluation.

Stakeholder feedback is an integral part of brief development. When seeking feedback, technologists choose a medium to communicate the brief (for example, oral, written, or visual).

Key attributes are the vital/important must-haves that the stakeholder has provided.

Level 5

- Justify the nature of an intended outcome in relation to the need or opportunity. Describe specifications that reflect key stakeholder feedback and that will inform the development of an outcome and its evaluation.

A specification is able to be objectively measured/determined (ie, more specific), while an attribute is usually subjectively measured/determined.

Possible Learning Activities:

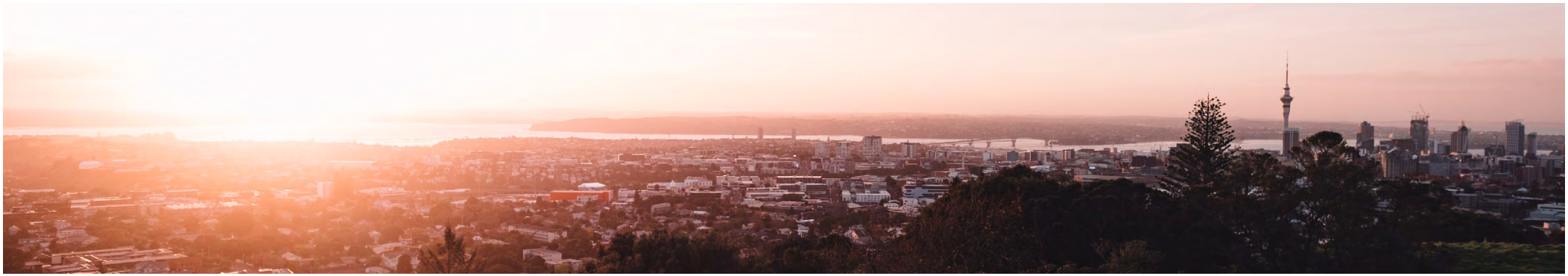
Practise giving and receiving feedback with each other, and keep evidence of how they have incorporated feedback into their iterative designs.

Identify potential needs or opportunities related to this context, including identification of who their stakeholders would/may be.

Work in groups developing interview questions for a stakeholder to help to identify a need or opportunity around the museum.

Establish the key attributes for their exhibit by considering stakeholder needs and wants. Work in groups to identify and justify those key attributes.

Establish a conceptual statement that communicates the nature of the outcome and why such an outcome should be developed. Ask students to identify the 'key' information presented in the conceptual statements. e.g. Where is the outcome to be used? Who will use it?



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Students learn to know *how*

Technological Practice

Outcome development and evaluation

Level 4

- Investigate a context to develop ideas for feasible outcomes. Undertake functional modelling that takes account of stakeholder feedback in order to select and develop the outcome that best addresses the key attributes. Incorporating stakeholder feedback, evaluate the outcome's fitness for purpose in terms of how well it addresses the need or opportunity.

Functional models are important for communicating proposed outcomes to stakeholders and others. Stakeholder feedback should be sought regularly and critically analysed so that it informs ongoing development.

Level 5

- Analyse their own and others' outcomes to inform the development of ideas for feasible outcomes. Undertake ongoing functional modelling and evaluation that takes account of key stakeholder feedback and trialling in the physical and social environments. Use the information gained to select and develop the outcome that best addresses the specifications. Evaluate the final outcome's fitness for purpose against the brief.

Data obtained from functional modelling and prototyping provide a basis for justifiable decision making, ensuring that the final outcome, when produced, should be fit for purpose as described in the brief.

Possible Learning Activities:

Prepare and deliver a simple presentation to museum staff about a planned exhibit, demonstrating how it fits the brief provided to the school, and what features it has to help people understand what tūrangawaewae means.

Provide a range of print media that use visual attributes to engage users. Examples might include posters, advertisements and public information flyers. Discuss how different visual attributes are prioritised because of their intended use/stakeholder needs. What attributes will be prioritised in your exhibit based on knowledge of your stakeholders/end-users and the intended use of your outcome?

Select and develop the outcome that best addresses their identified key attributes.

Develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and increasing the range and complexity of functional modelling.

Evaluating final prototypes/ outcomes – Have students evaluate each other's outcomes to determine if they address the intended need or opportunity. Ask if they can guess what the key attributes are of each other's outcomes. Use post-it notes to comment on students' work.

Present a range of ideas for their exhibit to a stakeholder (teacher or parent/relative). Key attributes are evaluated, and solutions redesigned until the stakeholder is happy, the design meets the brief, and will be fit for purpose.

Communicate the key attributes that allow their outcome to be evaluated as fit for purpose.

Provide a range of materials/ components and support students to develop the necessary knowledge and skills to test and use them.

Use a Dragons Den type round robin discussion with the group brief and ask students to talk about how their outcome met the attributes described in the brief.

Progress Outcome 4

In authentic contexts and taking account of end-users, students decompose problems to create simple algorithms using the three building blocks of programming: sequence, selection, and iteration. They implement these algorithms by creating programs that use inputs, outputs, sequence, basic selection using comparative operators, and iteration. They debug simple algorithms and programs by identifying when things go wrong with their instructions and correcting them, and they are able to explain why things went wrong and how they fixed them.

Students understand that digital devices represent data with binary digits and have ways of detecting errors in data storage and transmission. They evaluate the efficiency of algorithms, recognising that computers need to search and sort large amounts of data. They also evaluate user interfaces in relation to their efficiency and usability.

Decomposing a problem involves breaking down a task into sequenced steps that can be performed by a computer (an algorithm).

Comparative operators compare values eg. greater than, less than, equal to, not equal to. This could include text, in which case alphabetical order is usually used instead of numeric order.

Iteration is repeating a set of instructions a certain number of times until a condition is met. eg. instead of writing a program to draw each side of a square as a sequence of four instructions, a short sequence is written to draw one side (and turn) which is repeated (iterated) 4 times.

Selection is when a program checks some requirement (such as if a value is over a limit) and, depending if it is met, takes one of two courses of action. In many programming languages it is done using an "if" command.

All digital devices ultimately represent everything – text, images, sound and even apps – using symbols that have just two values. These symbols are usually referred to as binary digits, or bits for short, and are stored using devices that have just two states, such as the transistors on computer chips that can be "on" or "off", or a magnetic disk that can store particles that are magnetised to "north or south".

These progress outcomes include evaluating 'the efficiency of algorithms', and 'recognising that computers need to search and sort large amounts of data.' For this pīkau, the specific context had few natural connections for exploring these ideas, so they have not been included in the activities.

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Computational thinking for digital technologies

Progress Outcome 5

In authentic contexts and taking account of end-users, students independently decompose problems into algorithms. They use these algorithms to create programs with inputs, outputs, sequence, selection using comparative and logical operators and variables of different data types, and iteration. They determine when to use different types of control structures.

Students document their programs, using an organised approach for testing and debugging. They understand how computers store more complex types of data using binary digits, and they develop programs considering human-computer interaction (HCI) heuristics.

Logical operators are actions that join two decisions; the main ones are 'and', 'or', and 'not'. eg. age is over 18 ***and*** *they are a citizen. The speed is over 50* ***and*** *under 60.*

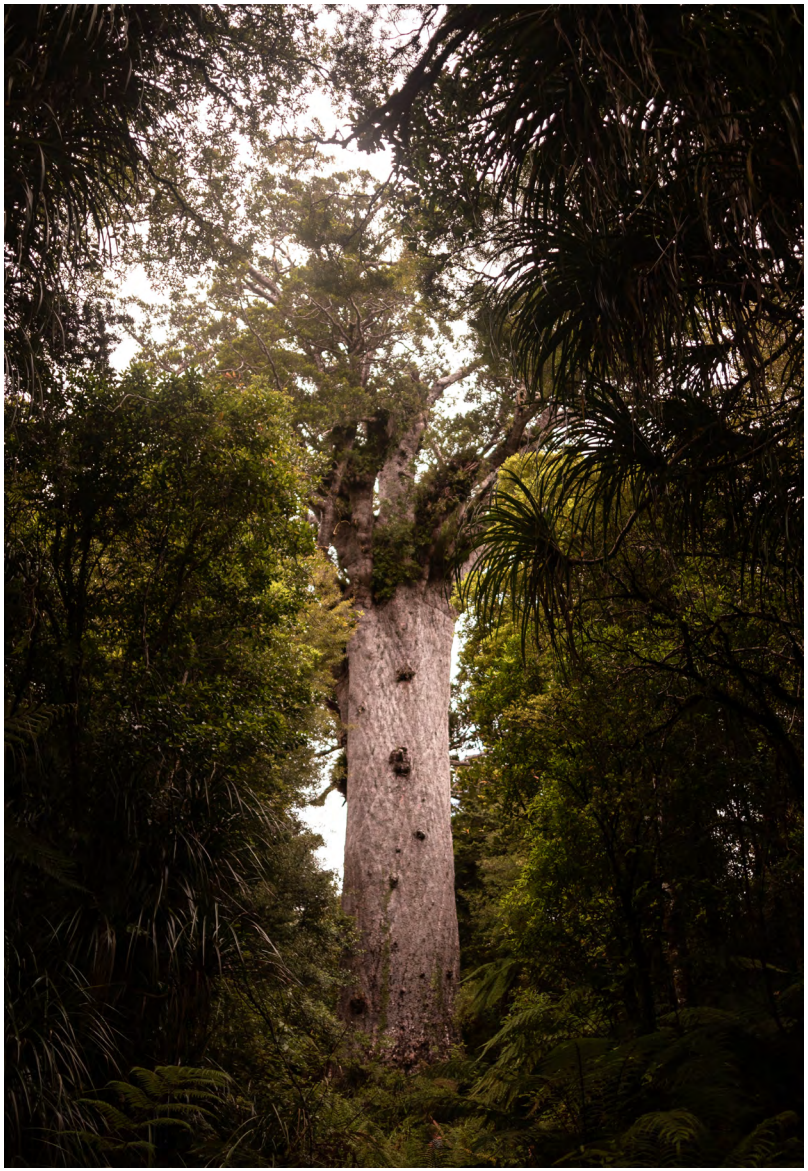
Data types include characters (text or strings), integers (numbers), and booleans (true/false statements).

Documenting your program (adding comments to blocks of code) is good practice and enables anyone—including your future self—to understand what blocks of code do, and how they relate to the code before and after them.

A control structure is a command in a program that can change the flow of a program so it doesn't just follow a simple sequence, such as an "if" that makes a selection, or a "repeat" that goes back to the start of a sequence.

A variable can be thought of as a storage box with a specific label, the contents of which can be changed while keeping the same name of the variable. E.g. a variable could be called 'user name', and be programmed to change with each user, but it is used in the same way each time by the computer program. Types of variables include integers (only store whole numbers so can be used for things like counting and adding), and strings (sequences of characters typically used to store a person's name or a line of typing).

HCI (Human-computer interaction) highlights that programs are written for people, not computers. It's important to understand how people will use your program and to design in attributes that will make it easier for them to use (or harder for them to make mistakes).



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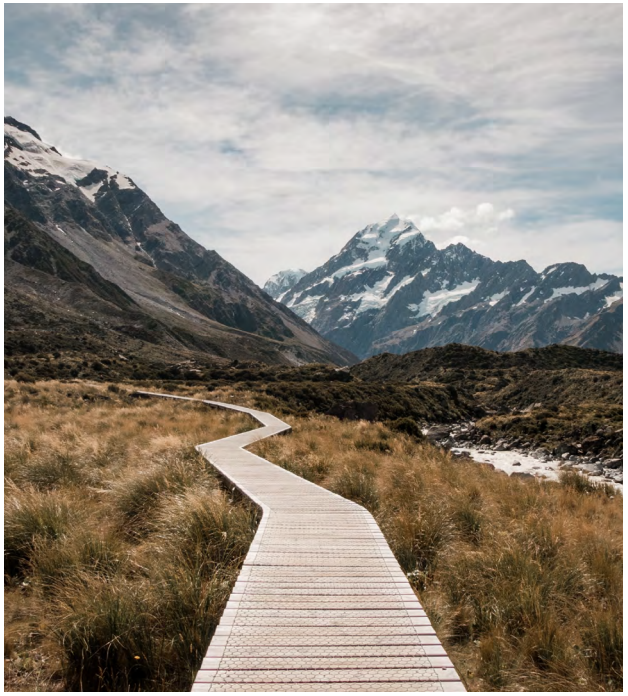
Computational thinking for digital technologies

Teaching and Learning

Computational thinking for digital technologies enables students to express problems and formulate solutions in ways that means a computer (an information processing agent) can be used to solve them.

In this area, students develop algorithmic thinking skills and an understanding of the computer science principles that underpin all digital technologies. They become aware of what is and isn't possible with computing, allowing them to make judgments and informed decisions as citizens of the digital world.

This resource includes a mix of progress outcome 4 and progress outcome 5 activities.



Possible Learning Activities:

Design and develop an interactive physical map using a single board computer (such as an Arduino) that will light an LED and tell the story of significant places in the local area.

Write and program a game or experience in an age-appropriate programming environment (such as Scratch, Python, Java Script) that explores an important historical local event. Allow users to be able to decide what aspects of the event they learn about and when.

Create an interactive mural about your experience of tūrangawaewae that responds to touch by playing waitata and short sound bites to create an appropriate atmosphere and share information.

Send and receive a message (file) over a long distance by holding up light and dark cards (bits) to transmit a simple picture of a local landmark across the school field. Each line is 8 bits long and a team at the other end fills out a grid to complete the picture.

Analyze program interfaces, such as online shopping or video streaming websites. Compare how easy/quick they are to use. How can you use this research to improve the interface on your interactive exhibit?

Explore ways local tangata whenua used binary to share information. For example signal fires: when the fire is lit we are being invaded, come help, or the kumara is ready for harvest, come help.

Create a sculpture for installation outside the art gallery that incorporates a flashing light to pulse a message of belonging in binary.

Document how testing and debugging is actioned within the exhibit projects. Display this as an algorithm.

Create a program for the exhibit, have a range of end-users test it, adjust the program to take into account end-user feedback and make sure it is ready for the public to use.

Explore how binary can be used to communicate in nature. How could binary be used to mark a path through the bush? Perhaps a bent branch means go this way, no bent branch, don't go that way.

Click here to learn more about Computational thinking on Technology Online

Progress Outcome 3

In authentic contexts, students follow a defined process to design, develop, store, test and evaluate digital content to address given contexts or issues, taking into account immediate social, ethical and end-user considerations. They identify the key features of selected software and choose the most appropriate software and file types to develop and combine digital content.

Students understand the role of operating systems in managing digital devices, security, and application software and are able to apply file management conventions using a range of storage devices. They understand that with storing data comes responsibility for ensuring security and privacy.

File types: the type of a file tells us what sort of data it contains, and which software is able to use it. For example, a "jpg" file contains a photo, and can be manipulated by image editing software, where as a "txt" (text) file contains unformatted text that can be edited by a simple text editor. Some types of file are specific to particular software, and others can be opened in a range of software. When files are saved, often there is a choice of what type it can be saved as.

Operating systems: this is the underlying software on a device that starts when you switch it on, and enables the user to run programs, select files, adjust settings and more. It also allows software on the device to access common resources such as printers and the internet. Examples include Microsoft Windows, macOS and Android.

Security: the main challenge of security is to balance confidentiality (only the appropriate person can access software or data), integrity (the data can be relied on), and availability (it is easy for authorised people to access what they need). There are many techniques used to achieve this, including passwords, firewalls, encryption, education of users, and intrusion detection.

File management conventions: when data is stored in a file, the file needs to be easy to find again. File management includes using consistent naming conventions for files, storing it in the appropriate place (e.g. in a folder system, or on the cloud), having good security, and making sure that the file type is suitable for others who need to use it.

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Designing and developing digital outcomes

Teaching and Learning

In Designing and developing digital outcomes, students understand that digital applications and systems are created for humans, by humans. They develop increasingly sophisticated understandings and skills for designing and producing quality, fit-for-purpose, digital outcomes. They develop their understanding of the technologies people need in order to locate, analyse, evaluate and present digital information efficiently, effectively and ethically.

Possible Learning Activities:

Create an interactive display that can be used on the museum's tablet computers exploring the idea of tūrangawaewae. It's important to acknowledge tangata whenua and to ensure proper intellectual property protection and protocols for access to local stories.

Create a video and audio explanation of what tūrangawaewae means to various groups.

3D scan an object that can be displayed using merge cube and cospaces.io

Create a museum exhibit using Gamefroot.

Gamefroot

Create a digital map that shows local place names and land uses and how they have changed over time.

Create a digital artwork about your tūrangawaewae that could be used on big screens in the museum.

Create a display that covers the history of the local area.

Design and build a digital slideshow that can be used on the museum's website to advertise the exhibit.

Create an interactive exhibit or recreate local landmarks using a simulation such as Minecraft.

Create a photo essay of local heritage to be displayed on a looped TV screen or browsed on a tablet.

Click here to learn more about Designing and developing digital outcomes on Technology Online

Kia Takatū ā-Matihiko
Digital Readiness

Essential resources

Available at kiatakatu.ac.nz

Pīkau 6 CTDT:PO2
Programming with Sequence and Output

Pīkau 8 CTDT:PO3
Making the computer do the work: programming with loops

Pīkau 9 CTDT:PO4
Getting the programs right: the end-user, and fast algorithms

Pīkau 10 CTDT:PO5
Communicating well when programming

Pīkau 13 DDDO:PO2&3
Creating digital outcomes using digital images and digital photography

Pīkau 14 DDDO:PO2&3
Physical Computing

Pīkau 15 CTDT:PO3-5
Representing data in binary

Pīkau 16 CTDT:PO4-5
Human Computer Interactions Evaluation

Pīkau 17 CTDT:PO4-6
Comparing Algorithms

Pīkau 18 CTDT:PO4
Error Detection and Correction

Additional support resources

Inspiration

- Behind the scenes at Auckland museum: Creating and curating an exhibit.
- Behind the scenes at Te Papa.
- Gallipoli in Minecraft, Auckland museum.
- Christchurch Cathedral in Minecraft.
- What makes a good museum exhibit?
- The Geo-inquiry process.

Social Sciences

- Te Ara article about tūrangawaewae.
- Explore ways to develop understanding about heritage, why it's important, how 'our places' contribute to our concept of heritage and identity, and why heritage is worth preserving.
- Ministry of Education *Pūtātara:* A call to action website.
- Eastern Southland Gallery (Gore) resource.
- TKI video explaining what tūrangawaewae is in relation to a marae.
- Ihumātao.
- Parihaka.
- Bastion Point.
- Raglan land occupation 1978.
- NZ Wars: Stories of Waitara (Video - 44 mins).
- Napier Inner Harbour Te Whanganui-a-Orotū map. (*This map links to a book available through the Ministry of Education Down the Back of the Chair website*).
- The Whakarewa Trust: An example of a story that is important to part of the local population, but unknown by others.

Cultural responsiveness and appropriation of stories

- Auckland University: Using and copying cultural property and indigenous works.
- TKI cultural rights.
- Te Ara Encyclopedia article on Māori and Museums.
- How do museums facilitate and express that which is essential to Māori – their values, concepts, culture, and worldview? How will they do so in the future?
- The Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples.

Useful resources

- Gamefroot: A NZ designed, cloud-based environment for programming 2D games.
- Scratch: Free, online programming language designed for 8-16 years.
- Code Club Aotearoa: Coding Clubs run nationally for 9-13 year olds.
- Hour of Code: Hour long activities to support learning to code.
- Poster My Wall: Create amazing posters, videos and graphics.
- Do ink: Animation and drawing app.
- CS Unplugged: How binary digits work.
- CS Unplugged: Error detection and correction - Quick card flip magic.
- CS Unplugged: Searching Algorithms.
- Values from the Technology Learning Area.
- How Stuff Works.
- An example of an older way of storing information needing to be updated.

Simplifying the terms

Algorithm:
Step-by-step instructions (algorithm) need to give the same outcome every time they are followed. Instructions need to be able to be followed by anyone without any input from others ie precise and unambiguous.

Attributes:
Broad descriptors of what is intended (safe, work well etc), not measurable like specifications.

Concepts:
Ideas created that solve a defined problem. Can be drawn, 3d modelled, discussed.

Context:
Where you are working, the physical and social place/environment. Every solution has a context, which is the place, situation, users, and environment that the outcome is developed for. The context for a garden chair, for example, could be 'outside on the lawn, used by family members aged from 3-65 years.'

Controlled transformations:
What happens, and what changes in the middle of a system, as a result of an external action. When you set an alarm to wake you on your phone, you change settings in the software, but it is the controlled electronic 'black-box' (unknown/unseen) systems inside the phone circuits, that enable it to be changed.

Debugging:
When errors (bugs), are corrected in the instructions it is called 'debugging'. Debugging is as much an 'attitude' as a process. It is a natural part of the process of programming, and success comes with finding and fixing bugs, not generating error-free instructions on your first attempt.

Design concepts:
Ideas created in response to a need.

Develop:
The process used to produce an outcome.

Digital outcome/content:
Something that can be stored or manipulated in a digital format. If it can be captured in a digital file (stored on a digital device), it is a digital outcome.

End-user:
An end-user is whomever will be using, or will be affected by, the completed outcome. The end-user should be able to use the completed outcome independent of the creator.

Fit-for purpose:
Ongoing development and refinement attempts to ensure the outcome performs as intended, it does what it is supposed to do.

Functional modelling:
Functional modelling is used to evaluate design ideas and interim steps.

Input (computational thinking):
Any way that a human can communicate with a computer (e.g. clicking the mouse, pushing a button). Information fed into a set of instructions (e.g. the temperature from a sensor).

Input (design & developing digital outcomes):
What the creator brings to the final outcome. Examples include images, choice of typeface, image manipulation etc.

Intervention by design:
How humans create outcomes to solve problems (improve or damage our world) e.g. Cars are faster/easier than walking, a glass holds water to drink from that can be cleaned and reused.

Key stages:
Significant steps taken that are required to have a completed/fit for purpose outcome.

The made world:
Any related issues that affect or influence anything changed, implemented, or produced by humans that isn't naturally occurring.

Manipulate:
Using specific applications to take input and change, or use, as part of a new output.

Model/modelling:
A physical representation of a technological solution that enables a solution's feasibility to be tested/predicted, usually made in substitute materials like card, paper etc.

The natural world:
That which exists from nature, has not had human intervention.

Need:
Requirement of person, group or place/environment. There are many potential outcomes that could be made to solve the identified issue/problem. What is needed and why is it needed?

Opportunity:
A new situation or a place where a technology could be useful and successful.

Output (computational thinking):
Any way that a computer can communicate with a human (e.g. words on a screen or a sound), or something that happens as a result of a set of instructions being run (e.g. the heater turns on).

Output (design & developing digital outcomes):
The digital outcome created e.g. a photo or sound file.

Simplifying the terms

Performance:
What materials do in certain situations.

Performance properties:
How a material behaves in certain environments and under certain processes determines how it is used (e.g. butter melts in moderate temperatures, timber doesn't). You can easily cut through butter with a blunt knife and you need a saw and more effort to cut timber. You can therefore make a chair out of timber, you couldn't make a chair out of butter.

Planning:
Why we keep records to manage resources, progress, reflect on decision making. Records explain decisions, suggest new directions, can answer outside questions.

Planning tools:
Visual and organisational, flow charts, lists etc.

Potential outcomes:
Design concepts aim to describe the nature of potential outcomes.

Product:
A human made product is one you can hold/touch/see.

Properties:
Why materials behave the way they do.

Prototype:
Literally, "creating the first of a kind":

A physical representation, made in the actual materials to test function and feasibility. Prototyping is used to evaluate the fitness for purpose of systems and products that have been developed.

Retrieved:
Accessing stored information.

Reuse:
There are opportunities to find a new use for something. The outside part of an old pen has the opportunity to be used as a straw or to support a pot-plant to grow straight. An old ipad can be used as a digital photo display.

The social world:
Involving human relationships.

System (designing & developing digital outcomes):
Anything that can take an input and manipulate it to produce an output.

System (general technology):
The way something works, like communication, transport, collaboration.

Technological challenge:
A problem that can be solved by designing and developing technology.

Technological change:
How outcomes change over time, and how those changes affect human behaviour.

Technological impact:
The positive and negative effects of technology on society and/or the environment, and of society and/or the environment on technology.

Technological outcome:
What the student creates, either a product or a system. Technological outcomes can be categorised as products and systems but distinguishing between the two is not always straightforward. It depends on how you look at the outcome concerned.

For example, you could describe a cell phone as a technological system, comprising interconnected components that work together to achieve a purpose. But you could also describe the same phone as a technological product, focusing on the materials used in its manufacture and not on the many interconnected components inside it.

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