Break it Down

Teacher Resources
Year 3/4

Digital Ignition
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Introduction

The Ministry of Education have revised the Technology learning area to strengthen the positioning of Digital Technologies in The New Zealand Curriculum. The goal of this change is to ensure that all learners have the opportunity to become digitally capable individuals. This change signals the need for greater focus on our students building their skills so they can be innovative creators of digital solutions, moving beyond solely being users and consumers of digital technologies.

What is technology about?

Technology is intervention by design. It uses intellectual and practical resources to create technological outcomes, which expand human possibilities by addressing needs and realising opportunities.

Design is characterised by innovation and adaptation and is at the heart of technological practice. It is informed by critical and creative thinking and specific design processes.

Why study technology?

With its focus on design thinking, technology education supports students to be innovative, reflective and critical in designing new models, products, software, systems and tools to benefit people while taking account of their impact on cultural, ethical, environmental and economic conditions.

The aim is for students to develop broad technological knowledge, practices and dispositions that will equip them to participate in society as informed citizens and provide a platform for technology-related careers.

Strands

In **Technological Practice**, students examine the practice of others and undertake their own.

Students develop **Technological Knowledge** particular to technological enterprises and environments and in relation to how and why things work.

For the **Nature of Technology**, students develop an understanding of technology as a discipline and of how it differs from other disciplines. They learn to critique the impact of technology on societies and the environment and to explore how developments and outcomes are valued by different peoples in different times.

Learning pathways

Over the course of years 1–10, students learn in all five technological areas, developing their knowledge and skills in context. By offering a variety of contexts, teachers help their students to recognise links between technological areas.

Contents

Teacher Resource 1 (TR 1)

Bee-Bot the Story Teller

Description

This resource is to be used after Lesson 2 and before Lesson 3 in the Break it Down module, to allow students to choose and customise the story that they will tell using technology in Lesson 3. Students will write a story that is meaningful to them, illustrate the significant events in the story and personalise a blank Bee-Bot Jacket Template to represent the main character in the story. These materials will then be used in Lesson 3.

Alignment to the New Zealand Curriculum

Technology Learning Area	
Computational Thinking for Digital Technologies: Progress outcome 1	• In authentic contexts, students use their decomposition skills to break down simple non-computerised tasks into precise, unambiguous, step-by-step instructions (algorithmic thinking).

English Learning Area	
Listening, Reading and Viewing & Speaking, Writing and Presenting: Level 1	• Students will acquire and begin to use sources of information, processes, and strategies to identify, form, and express ideas.
Listening, Reading and Viewing & Speaking, Writing and Presenting: Level 2	• Students will select and use sources of information, processes, and strategies with some confidence to identify, form, and express ideas. • Students will organise texts, using a range of structures.

The Arts Learning Area	
Visual Arts: Level 1 & 2	• Students will share ideas about how and why their own and others' works are made and their purpose, value, and context. • Students will explore a variety of materials and tools and discover elements and selected principles.

Social Sciences Learning Area	
Social Studies: Level 1	• Students will gain knowledge, skills, and experience to understand that people have different roles and responsibilities as part of their participation in groups.
Social Studies: Level 2	• Students will gain knowledge, skills, and experience to understand how cultural practices reflect and express people's customs, traditions, and values.
Social Studies: Level 3	• Students will gain knowledge, skills, and experience to understand how people remember and record the past in different ways.

TR 1 - Lesson Details

Learning Objectives

Students will be able to:

- Understand the importance of sharing stories and expressing ideas.
- Select and retell a story that is of importance to them.
- Use decomposition skills to identify the main events of a story.
- Illustrate their ideas in a visual format.
- Identify the purpose, value and context of a story.

Materials

Ensure you have the following materials ready for your class:

[ ] 4x Story Event Card worksheets per group
[ ] 1x Bee-Bot Jacket worksheet per student
[ ] Notebooks for students
[ ] Scissors
[ ] Glue
[ ] Drawing and colouring equipment
[ ] Laminator (optional)

Time Allowance

- 30 - 60 minutes

Preparation

- Print enough copies of the Story Event Card and Bee-Bot Jacket worksheets for your class.

TR 1 - Lesson Plan: Option 1

Introduction / Learning Hook

1. Tell students an engaging, meaningful story of your own choosing. The story should be brought to life, and could be read from a book or dramatised with costumes, sounds, acting, etc.
2. Engage in a discussion with the class that explores why it's important to share stories and express ideas. Also, as a group, identify the purpose, value and context of the story that you selected.

Running the Lesson

1. Break the students into six groups.
2. Ask each group to choose a story that they would like to tell.
3. Direct students, either as a group or individuals, to write their story down in their workbooks.
4. Ask the students to decompose their story (break the story down into smaller parts) into a chronological sequence of important events.
5. Ask each group to identify four main events in the story.
6. Give each group four Story Event Card worksheets and ask them to plan out and illustrate the four main events of the story on each card. They could draw a character or a location to represent the event.
7. Ask the students if they remember Bee-Bot from Lesson 2.
8. Let them know that in Lesson 3, they will be programming Bee-Bot, like they did in Lesson 2, but this time Bee-Bot is going to be the main character of their story and will complete the journey of that character.
9. Give each student a Bee-Bot Jacket worksheet, showing them how the jacket will wrap around Bee-Bot to personalise it.
10. Ask students to decorate the jacket so that Bee-Bot will look like the main character of the story. They could consider distinguishing features of the character, or the costume that the character often wears.

    Note: in Lesson 3, each Bee-Bot can only wear one jacket at a time, so students will have to select one jacket to be used in the lesson.
11. Get students to cut out the story event cards, and the Bee-Bot jackets. Have them assemble the Bee-Bot jackets ready for Lesson 3.
12. (Optional) Laminate the story event cards so that they are more durable for use in the lesson.
13. Store the story event cards and jackets somewhere safe in preparation for Lesson 3.

Extension Activities

- Prior to this lesson, students ask a member of their family/whānau to tell them a story from their history (either their personal or cultural history). Students can record or write up the story and re-tell it to the class. Students may choose to use these stories in the activity above or they can use their experience to inform their discussion of the importance of telling and sharing stories.

Conclusion

1. Ask students to share the stories that they chose to illustrate, and to share why those stories are meaningful to them.
2. Discuss the importance of sharing and telling stories, and the ways that stories can be used to pass on cultural knowledge.
3. Discuss the pros and cons of different ways they have told the same story (writing the story down as opposed to illustrating events from the story).
4. Discuss different ways that technology has been used to keep stories alive (students may consider film and animation to bring stories to life, the comparative ease of sharing of stories over the internet, the invention of the printing press, the use of recording technology to capture oral history).

TR 1 - Lesson Plan: Option 2

Introduction / Learning Hook

1. Either tell students one of the stories provided (see resources below), or have students come up with their own way to tell one of the stories (this option may be preferable if students are familiar with the stories and want to tell a version that they have heard before). The story can be brought to life by reading it aloud or dramatising it with costumes, sounds, acting, etc.

   Note: The provided stories have been chosen as examples of traditional Māori stories and cultural knowledge. Other versions of these stories exist, and these other versions can also be told if preferred.

2. Engage in a discussion with the class that explores why it's important to share stories to preserve cultural history and express ideas. Also, as a group, identify the purpose, value and context of the story that you selected.

Running the Lesson

1. Divide the students into six groups.
2. Explain to each group that they are going to find a new way to tell the story that they have just heard.
3. Direct students, either as a group or individuals, to write the story down in their workbooks.
4. Ask the students to decompose their story (break the story down into smaller parts) into a chronological sequence of important events.
5. Ask each group to identify four main events in the story.
6. Give each group four Story Event Card worksheets and ask them to illustrate one of the four main story events on each card. They could draw a character or a location to represent each event.
7. Ask the students if they remember Bee-Bot from Lesson 2.
8. Let them know that in Lesson 3, they will be programming Bee-Bot, like they did in Lesson 2, but this time Bee-Bot is going to be the main character of their story (Māui or Tāne) and will complete the journey of that character.
9. Give each student a Bee-Bot Jacket (pg , showing them how the jacket will wrap around Bee-Bot to personalise it.
10. Ask students to decorate the jacket so that Bee-Bot will look like the main character of the story. They could consider distinguishing features of the character. Note: in Lesson 3, each Bee-Bot can only wear one jacket at a time, so students will have to select one jacket from their group to be used in the Lesson.
11. Get students to cut out the story event cards, and the Bee-Bot jackets. Have them assemble the Bee-Bot jackets ready for Lesson 3.
12. Store the story event cards and jackets somewhere safe, in preparation for Lesson 3.

Conclusion

1. Discuss the importance of sharing and telling stories, and the ways they can be used to pass on cultural knowledge.
2. Discuss the pros and cons of different ways the same story has been told (sharing the story orally with the class, writing the story down and illustrating events from the story).
3. Discuss different ways that technology has been used to keep stories, cultural knowledge and oral traditions alive (students may consider film and animation to bring stories to life, the comparative ease of sharing of stories over the internet, the invention of the printing press, the use of recording technology to capture oral history).

Story 1

Tāne me Ngā Kete O Te Wānanga (Tāne and the baskets of knowledge)

Have you heard the story of how Tāne, the God of forests and all the animals that live in them, brought knowledge to the world? Tāne was one of the children of Rangi, the sky father and Papa-tū-ā-nuku, the earth mother. He was part of many important events, including separating the sky from the earth to let light into the world and creating the first woman. He gave us the gift of the three baskets (kete) of knowledge.

- The first basket was called **te kete tuauri**, (the basket of peace, love and all things good).
- The second basket was called **te kete tuatea**, (the basket of warfare, black magic, agriculture, tree or wood work, stone work and earth works).
- The third basked was called **te kete aronui**, (the basket of magic spells, stories and poems, ideas, and all types of ceremonies).

To get the baskets of knowledge, Tāne had to rise up to the twelfth heaven, to Te Toi-o-ngā-rangi, and ask for them from the Supreme God, Io-matua-kore himself.

At each of the heavens there were ceremonies, and tests that Tāne had to pass. Tāne also had lots of problems with his older brother, Whiro, who believed that as he was the elder brother, the baskets should be his, not Tāne's. To stop Tāne from getting the baskets, Whiro sent plagues of insects, reptiles and carrion-eating birds to attack Tāne. Tāne would have been beaten if the winds had not come to save him. The winds blew the birds and insects back down to earth where they remain today.

When Tāne reached the top of all the heavens (the twelfth heaven), Toi-o-ngā-rangi, he was welcomed by Io and was given the three baskets of knowledge as well as two sacred stones. The stones, or whatukura, (eyes of knowledge) held the power of knowledge and added mana (prestige) to the teaching and learning of knowledge.

When Tāne finally reached earth again, he placed the baskets and stones in a special house of knowledge - whare kura – which he had built before his journey to the heavens. Whiro demanded that he should be the one to take care of the treasures. But Tāne and his friends wouldn't let Whiro do this and sent him to the underworld forever. He still lives there and continually tries to cause trouble for the gods and mankind. Tāne-te-wānanga-ā-rangi (Tāne, bringer of knowledge from the sky) was left on earth to keep order amongst the people and animals.

Adapted from:
https://ojs.aut.ac.nz/te-kaharoa/index.php/tekaharoa/article/download/135/126 and
https://www.knowledge-basket.co.nz/about/knowledge-basket-legend/

Story 2

Te Ika-a-Māui
(Māui and the giant fish)

Māui dreamed of the day that he could go fishing with his older brothers. Each time his brothers returned from a fishing trip Māui would ask, “Next time, can I come fishing with you?”

But Māui’s brothers always made excuses, such as, “No you’re much too young to come fishing with us. We need all the room in our waka for the many fish that we catch.”

Secretly Māui hatched a plan to prove he was a great fisherman. One night, when Māui was alone, he began weaving a strong fishing line from flax. As he wove he recited an old karakia (prayer) to give his fishing line strength.

When he was finished, Māui took a jawbone which his ancestor Murirangawhenua had given him, and bound it securely to the line. Early the next morning, Māui took his fishing line and hid in the hull of his brothers’ canoe.

It wasn’t until the brothers were far out at sea and had filled the bottom of their canoe with fish that Māui came out of hiding. Then he took out his magic fishhook and threw it over the side of the canoe, chanting powerful prayers as he did so.

The hook went deeper and deeper into the sea until Māui felt the hook had touched something. He tugged gently and far below the hook caught fast. It was a huge fish! Together with his brothers, Māui brought the fish to the surface.

“This is the fish that our grandmother, Murirangawhenua, said would be gifted to our community,” Māui said. “Guard our fish, and I’ll soon return with our people.”

The brothers agreed to stay to guard the fish, and Māui headed back to Hawaiki. However as soon as Māui had gone, the brothers began chopping greedily at the giant fish, taking huge pieces of it as for themselves.

When Māui returned, his people were amazed to see the giant fish.

“Māui is the best fisherman ever,” they said with amazement.

As they got closer, the brothers were seen still chopping and arguing over which part of the fish was theirs. The people saw them for the greedy brothers that they were. They were so greedy that they had chopped huge gullies and mountains from the fish’s flesh.

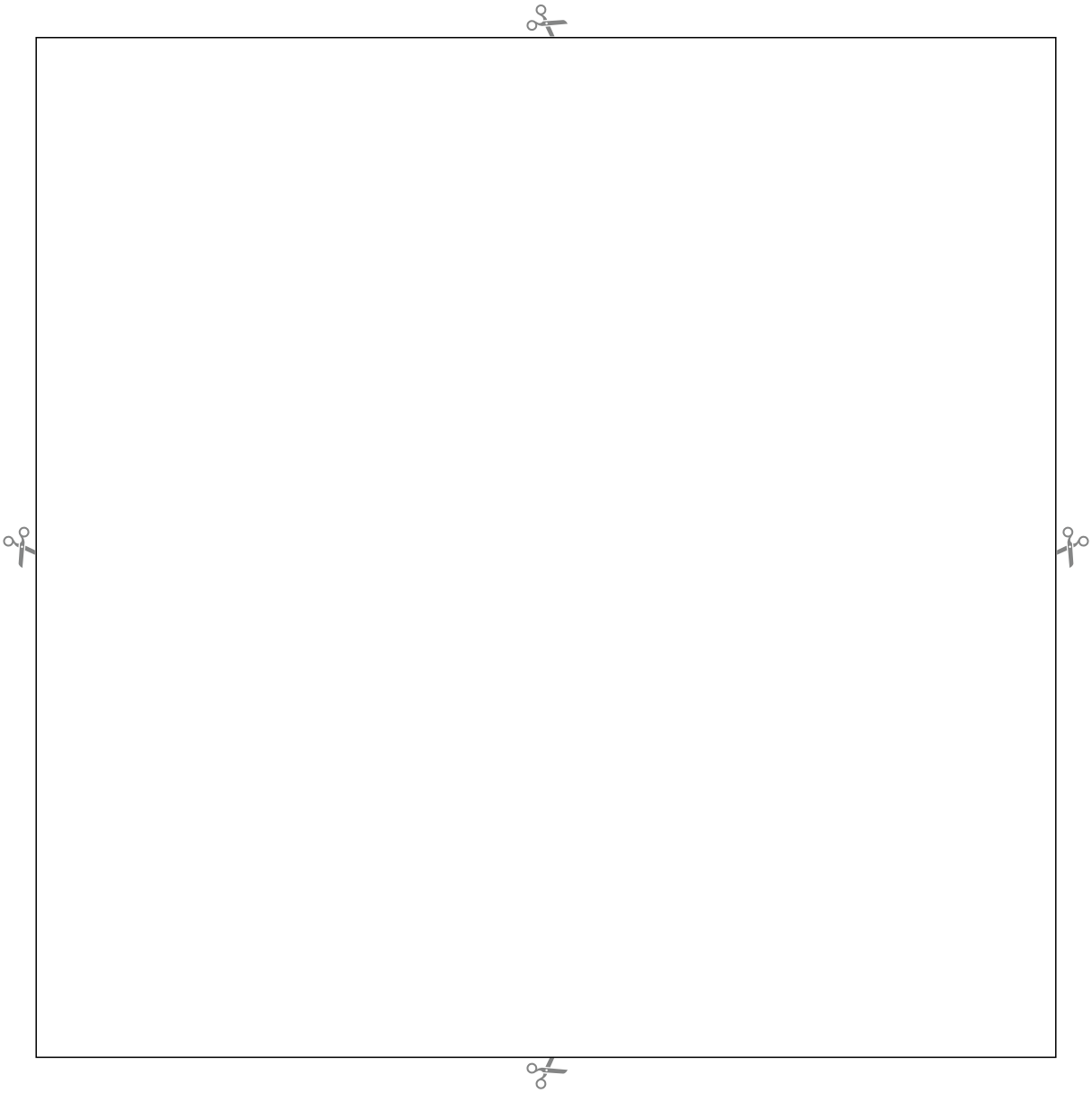
Over many hundreds and thousands of years, these gullies and mountains became part of the landscape of Aotearoa as we know it today. Birds, plants, animals and the people of Hawaiki populated the giant fish of Māui. And in time Māui’s giant fish became known as the North Island of Aotearoa, and Māui’s canoe the South Island.

This is the story of Māui and the giant fish..

Adapted from:
http://eng.mataurangamaori.tki.org.nz/Support-materials/Te-Reo-Maori/Maori-Myths-Legends-and-Contemporary-Stories/Maui-and-the-giant-fish and https://www.newzealand.com/au/feature/the-legend-of-new-zealand/

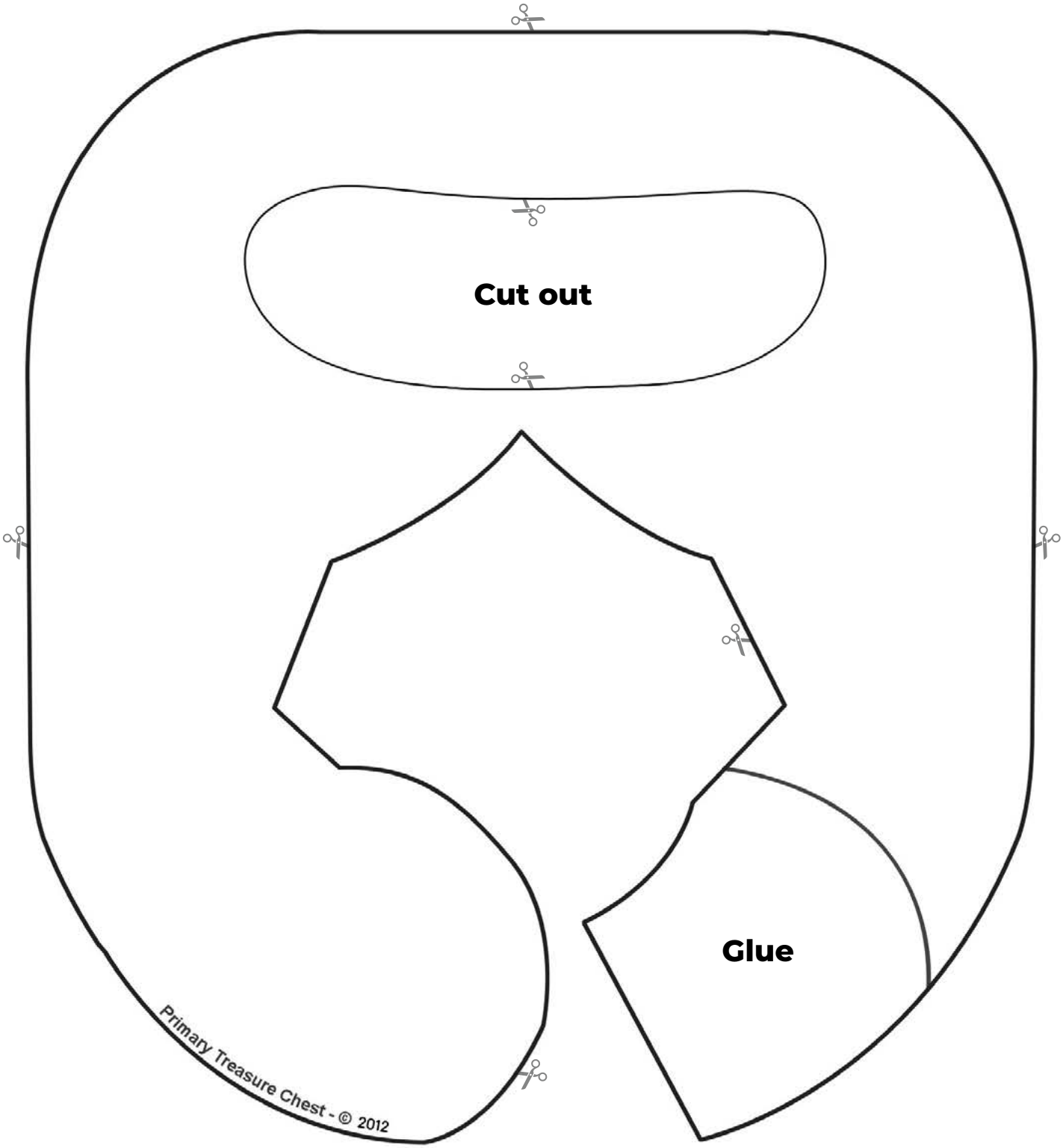
Student Worksheet: Story Event Card

Draw one of your main story events in the square below.
Each group should have 4 main story events.



Student Worksheet: Bee-Bot Jacket

Decorate your Bee-Bot jacket.



Teacher Resource 2 (TR 2)
Let's Make a Hāngi (Me Mahi Hāngi Tātau)

Description

In this activity, students will practice writing and debugging algorithms to direct someone to collect vegetables for a hāngi. Students will also discuss what a hāngi is, and its cultural significance.

Alignment to the New Zealand Curriculum

Technology Learning Area	
Computational Thinking for Digital Technologies: Progress outcome 1	• 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 give these instructions, identify any errors in them as they are followed, and correct them (simple debugging).
Computational Thinking for Digital Technologies: Progress outcome 2	• 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.

English Learning Area	
Listening, Reading and Viewing & Speaking, Writing and Presenting: Level 1	• Students will acquire and begin to use sources of information, processes, and strategies to identify, form, and express ideas.

Social Sciences Learning Area	
Social Studies: Level 1	• Students will gain knowledge, skills, and experience to understand that people have different roles and responsibilities as part of their participation in groups.
Social Studies: Level 2	• Students will understand how cultural practices reflect and express people's customs, traditions, and values.

TR 2 - Lesson Details

Learning Objectives

Students will be able to:

- Recognise the Māori names for core vegetables in the hāngi.
- Break a problem into smaller parts (decomposition).
- Write an algorithm (a set of clear and simple, step-by-step instructions to solve a problem).
- Identify when an algorithm produces an unexpected result (a bug).
- Understand that a bug is a normal part of writing algorithms.
- Understand that debugging is how we find and fix a bug in an algorithm.
- Complete the process of debugging:
  a) Start at the beginning of the algorithm.
  b) Follow the algorithm step-by-step until you find a step that produces a result you didn't expect.
  c) Correct the step.
  d) Start at the beginning again and repeat these steps until the algorithm does what you were expecting.

Materials

Ensure you have the following materials ready for each student:

[ ] 1x Choose Your Ingredients worksheet
[ ] 1x Collect the Food worksheet
[ ] 1x It's Time to Debug! worksheet

Time Allowance

- 30 minutes

Preparation

- Print worksheets.
- Ensure that you are familiar with the definitions of relevant terms (see the glossary provided).
- You may find it useful to read some background information on hāngi before introducing this lesson to your students. For your convenience, we have provided some links for information on hāngi in the Lesson Resources below.
- **Optional:** arrange for access to computers connected to the internet for students to play the interactive Let's make a hāngi game (link below).

TR 2 - Lesson Plan

Introduction / Learning Hook

1. Ask students what they already know about hāngi. You may like to start with asking them who has had a hāngi before and for what occasion. Some students may have already helped in the preparation of a hāngi.
2. As a group, consider the types of food that are cooked in hāngi. Take this opportunity to teach or remind students the Māori names for hāngi ingredients.
3. Further discussion could include the important Māori cultural beliefs and practices that are associated with food and hāngi.
4. Discuss the process of preparing a hāngi with students, getting students to identify (or explain) some of the main steps to prepare a hāngi.

   Consider:

   - The kind of preparation required,
   - The importance of the sequence of events in the preparation of a hāngi,
   - The way that everyone joins in to help with the preparations,
   - The types of occasions where hāngi are prepared.

5. (Optional): Get students to play the interactive computer game 'Let's make a hāngi' to familiarise themselves with the process and steps required to make a hāngi.

   Link to Let's make a hāngi: http://wicked.org.nz/Interactives/Maori-themed-interactives-in-English/Hangi
6. Explain that breaking the process of cooking a hāngi into smaller parts is an example of decomposition and remind students of the definition of decomposition.

Running the Lesson

1. Give each student a copy of each worksheet
   (Choose Your Ingredients, Collect the Food, and It's Time to Debug!).
2. Ask students to complete the Choose Your Ingredients worksheet (drawing a line to match hāngi ingredients with their pictures).
3. When students have completed the activity, go through the answers to the activity with them, ensuring that they can recognise each ingredient and reminding them of the Māori names for the ingredients.
4. Ask students to complete the Collect the Food worksheet. In this activity, students must write an algorithm to direct their character around the garden to collect the ingredients for the hāngi. Students are only allowed to give four different instructions: "Forwards", "Backwards", "Turn left", and "Turn right".

   The instructions must be written using these symbols:

   ↓ (back), ↑ (forward), ↰ (left), ↱ (right).

The solution is as follows:

5x (forward), **1x** (turn right), **2x** (forward), **1x** (turn right), **2x** (forward), **1x** (turn left), **1x** (forward), **1x** (turn right), **3x** (forward), **1x** (turn left), **2x** (forward), **1x** (turn left), **5x** (forward).

5. After students have completed this activity, have students swap their sheet with another student to test and debug each other's algorithm. Each student must exactly follow the algorithm provided to them and determine the path that the algorithm describes. It may help them to draw the path on the worksheet as they follow each step of the algorithm. They must determine whether the algorithm gets them to the final square.

6. If the algorithm does not direct them to the final square, then the student has found a bug! In this case, the two students must go through the process of debugging together to correct the algorithm, using the It's Time to Debug! worksheet.

   The process of debugging is:
   a) Start at the beginning of the algorithm.
   b) Follow the algorithm step-by-step until you find a step that produces a result you didn't expect.
   c) Correct the step.
   d) Start at the beginning again and repeat these steps until the algorithm does what you were expecting.

Conclusion

1. Ask students to discuss what happened when they found a bug in the algorithm.

2. Ask students whether it was helpful to have someone else check their algorithm for them, and if it was, why that might be. Discuss the importance of collaboration and problem solving in getting to the best possible outcome.

TR 2 - Lesson Resources: Relevant Links

Useful Links	
General information about hāngi	• https://www.newzealand.com/au/feature/maori-hangi/ • http://assessment.tki.org.nz/Assessment-tools-resources/Assessment-tool-selector/Browse-assessment-tools • http://www.maori.cl/Hangi.htm
Images of hāngi	• https://www.newzealand.com/au/feature/maori-hangi/ • http://www.nzhistory.net.nz/media/photo/the-hangi
Instructions on how to prepare a hāngi	• http://www.nzmaths.co.nz/node/474
Let's make a hāngi: An interactive game on hāngi preparation	• http://wicked.org.nz/Interactives/Maori-themed-interactives-in-English/Hangi

Student Resources: Glossary

Let's learn some new words!

Glossary	
Algorithm	A set of clear and simple, step-by-step instructions to solve a problem.
A Bug	When an algorithm produces an unexpected result.
Debugging	A process of how to find and fix a bug in an algorithm. This process is: a) Start at the beginning of the algorithm. b) Follow the algorithm step-by-step until you find a step that produces a result you didn't expect. c) Correct the step. d) Start at the beginning again and repeat these steps until the algorithm does what you were expecting.

Student Worksheet: Choose Your Ingredients

Match the hāngi ingredients to their pictures.

Te heihei (Chicken)	
Rīwai (Potatoes)	
Paukena (Pumpkin)	
Kumara (Sweet Potatoes)	
Kāreti (Carrots)	

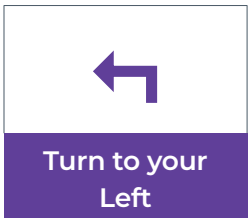
Student Worksheet: Collect the Food

Create an algorithm to get to the preparation area.

Use these symbols:

Take a step Forward

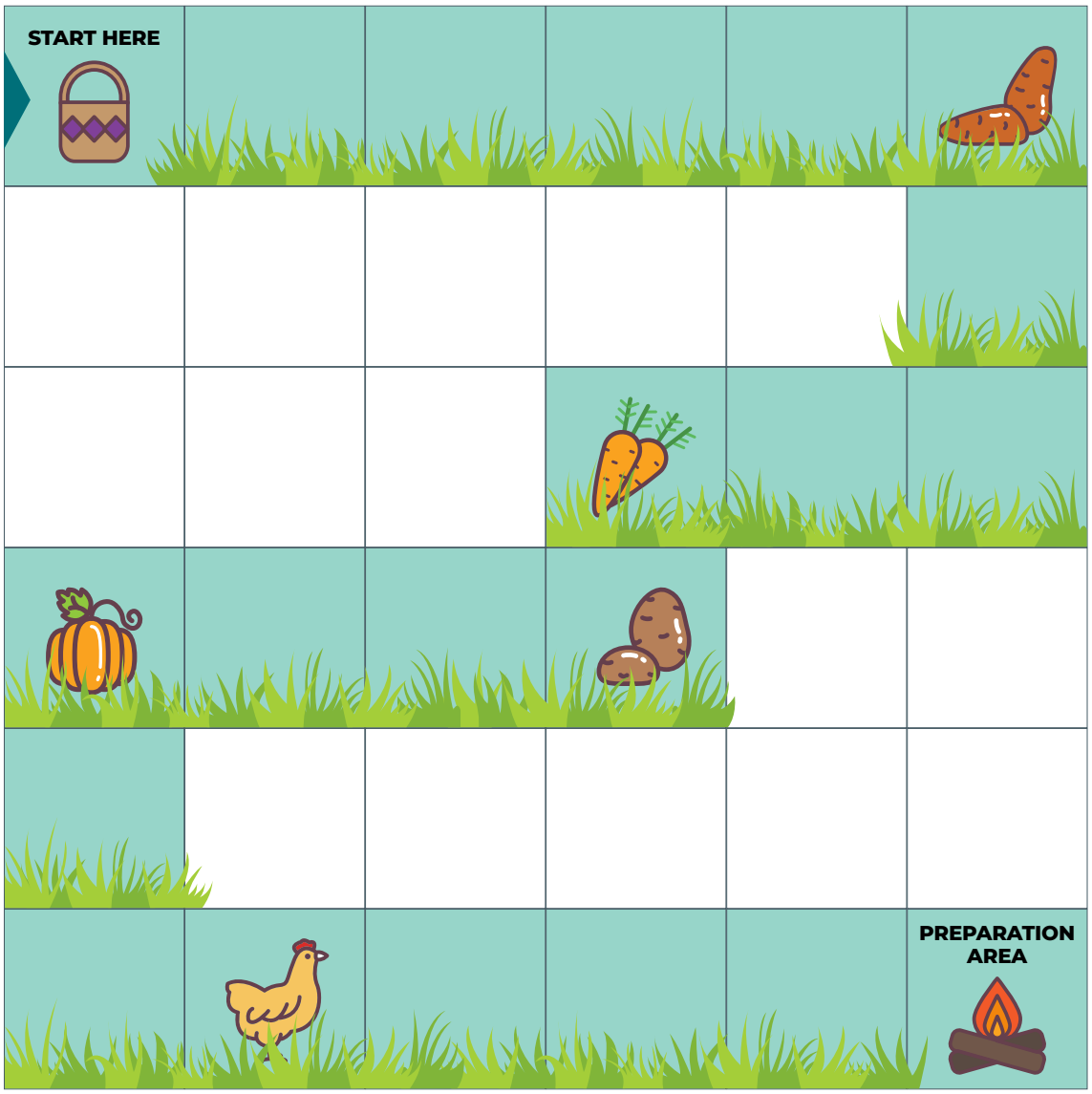
Take a step Backwards



Turn to your Left

Turn to your Right

Hint: Turning left or right does not move you to a new square.



Use the space below to write out your algorithm.

Student Worksheet: It's Time to Debug!

Rewrite the debugged algorithm below.

Teacher Resource 3 (TR 3)
Algorithm Marks the Spot

Description

In this game, each student hides an object somewhere within the room and then writes an algorithm for someone else to follow to find their hidden object. Children then swap 'maps' and go on an adventure to find the 'hidden treasure'.

Alignment to the New Zealand Curriculum

Technology Learning Area	
Computational Thinking for Digital Technologies: Progress outcome 1	• 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 give these instructions, identify any errors in them as they are followed, and correct them (simple debugging).
Computational Thinking for Digital Technologies: Progress outcome 2	• In authentic contexts and taking account of end-users, students give, follow and debug simple algorithms. They use these algorithms to create simple programs involving outputs and sequencing (putting instructions one after the other) in age-appropriate programming environments.

English Learning Area	
Listening, Reading and Viewing & Speaking, Writing and Presenting: Level 1	• Students will acquire and begin to use sources of information, processes, and strategies to identify, form, and express ideas.
Listening, Reading and Viewing & Speaking, Writing and Presenting: Level 2	• Students will select and use sources of information, processes, and strategies with some confidence to identify, form, and express ideas.
Speaking, Writing and Presenting: Level 3	• Students will integrate sources of information, processes, and strategies with developing confidence to identify, form, and express ideas. • Students will use language features appropriately, showing a developing understanding of their effects.

TR 3 - Lesson Details

Learning Objectives

Students will be able to:

- Break a problem into smaller parts (decomposition).
- Write an algorithm (a set of clear and simple step-by-step instructions to solve a problem).

Extension Learning Outcomes

Students will be able to:

- Identify when an algorithm produces an unexpected result (a bug).
- Understand that a bug is a normal part of humans trying to get computers and digital devices to do what they want.
- Understand that debugging is how we find and fix a bug in an algorithm.
- Complete the process of debugging:
  a) Start at the beginning of the algorithm.
  b) Follow the algorithm step-by-step until you find a step that produces a result you didn't expect.
  c) Correct the step.
  d) Start at the beginning again and repeat these steps until the algorithm does what you were expecting.

Materials

Ensure you have the following materials ready for your students:

[ ] Loose leaf paper and pencils
[ ] 1x treasure per child
Note: These can be any object (e.g. different coloured counters, pencils, etc.). Treasures should be distinct so that students can tell them apart.

Time Allowance

- 35 minutes + 15 minutes (Debugging Extension)

Preparation

- Get the treasures ready for each student to hide.
- Ensure that you are familiar with the definitions of relevant terms (see the glossary provided).

TR 3 - Lesson Plan:

Introduction / Learning Hook

1. Introduce a fun and engaging scenario that requires students to hide and find some *hidden treasure*. This can be as basic or as imaginative as you'd like, for example, you could explain that you've been chased to a deserted island by pirates and you need to hide your treasure, or you could read story about pirates, get the students to make paper pirate hats and then explain that they need to hide some treasure.

Running the Lesson

1. The students' first task is to hide their treasure.

   Note: Give children appropriate boundaries and cautions for the space in which you are carrying out the exercise.

2. Explain to students that they need to write instructions (an algorithm) for how someone could find their treasure.
3. Remind students that an algorithm is a set of clear and simple step-by-step instructions to solve a problem.
4. Highlight that they will need to include their names on the piece of paper and a start location in their algorithm. Students could also include a description of their treasure so that other students can make sure that they have found the correct treasure.
5. Allow students time to write their algorithm.
6. Students should swap completed algorithms with each other and then follow the algorithm to find the hidden treasure.

Extension Activities

1. If students can't find the hidden treasure, ask them to find the person who wrote their algorithm.
2. Remind students that a bug is when an algorithm produces an unexpected result and that finding bugs is a normal part of writing algorithms. Additionally, debugging is how we find and fix a bug in an algorithm.
3. In pairs, get the students to complete the process of debugging:
   a) Start at the beginning of the algorithm.
   b) Follow the algorithm step-by-step until you find a step that produces a result you didn't expect.
   c) Correct the step.
   d) Start at the beginning again and repeat these steps until the algorithm does what you were expecting.

Conclusion

1. Ask students why it was important to write clear and simple instructions. Discuss which instructions students found easy to follow, and which students found confusing. Troubleshoot ways that students could have given clearer instructions.
2. Ask students to discuss what happened when they found a bug in the algorithm.
3. Ask students whether it was helpful to have someone else check their algorithm for them, and if it was, why that might be. Discuss the importance of collaboration and problem solving in getting to the best possible outcome.

Additional Resources

Resource & Link	Description
Blue Bot & Bee-Bot App https://www.bee-bot.us/downloads.html https://itunes.apple.com/nz/app/bee-bot/id500131639?mt=8 https://itunes.apple.com/is/app/blue-bot/id957753068?mt=8 https://play.google.com/store/apps/details?id=air.BlueBot&hl=en_GB	The Blue-Bot and Bee-Bot Apps are free apps available on both Apple and Android tablets. They make use of both of the Bot's keypad functionality and enable children to improve their skills in directional language and programming through sequences of forwards, backwards, left and right 90 degree turns. The apps have been developed with 12 levels encouraging progression. Each level is timed and the faster it is completed the more stars you get! The levels are set in an engaging garden scenario and will appeal from age 4 upwards.
CS Unplugged **Rescue Mission** https://www.csunplugged.org/en/topics/kidbots/unit-plan/rescue-mission/	This is a starter lesson that explores why it is important to give very clear instructions. Students will write an algorithm to guide each other through a grid and use Peer Programming to test it.
Program a Bee-Bot https://www.csunplugged.org/en/topics/kidbots/programming/program-bee-bot	This lesson allows students to practice programming via a website game that requires the same skills that the students learned when programming Bee-Bot.
Additional Resources https://www.csunplugged.org/en/	CS Unplugged is a website with a wealth of resources (beyond what we've listed above) that you may want to explore with your students.
Curriculum Examples **Computational Thinking** http://technology.tki.org.nz/Technology-in-the-NZC/CT-Progress-outcomes-exemplars-and-snapshots **Designing and Developing Digital Outcomes** http://technology.tki.org.nz/Technology-in-the-NZC/DDDO-Progress-outcomes-exemplars-and-snapshots	The Ministry of Education (Te tāhuhu o te Mātauranga) provides exemplars of work in areas of technology for both computational thinking and designing and developing digital outcomes.

Resource & Link	Description
Code.org **Unplugged** https://code.org/curriculum/unplugged	Code.org has compiled a list of lessons that teach the fundamentals of computer science, with or without access to computers. These lessons can be used as a stand-alone course or as complementary lessons for any computer science course.
Courses https://studio.code.org/courses?view=teacher	Code.org offers courses for students in grades K-12 and professional learning for teachers. You can sign up for free and complete the courses at your own pace. It also includes online Teacher Communities so that you can take the journey with like-minded teachers.
For Students https://studio.code.org/projects/public	The projects tab of the Code.org site allows students to write a new game for others to play, or to play games made by students all over the world.
Hour of Code https://code.org/learn	Code.org's Hour of Code initiative provides a number of interactive coding tutorials for students of all ages. These tutorials build interactivity through the use of platforms and characters that students will be familiar with and interested in (such as Minecraft, Star Wars, Moana and Frozen.) Tutorials come in a number of languages, including Te Reo Māori, and some tutorials also deliver cultural content (such as Gamefroot's Mihi Maker).
GameFroot **Mihi Maker** http://make.gamefroot.com/#/activity/mihi-maker	As part of the Hour of Code, Gamefroot has created an interactive tutorial that both teaches students the fundamentals of coding, but also walks them through the creation of a pēpeha. This tutorial incorporates Te Reo Māori throughout.
ScratchJr **Mobile App** https://itunes.apple.com/au/app/scratchjr/id895485086?mt=8	ScratchJr is a free app on both Apple and Android tablets. It includes many pre-programmed lessons that allows children to program their own interactive stories and games. By snapping together graphical programming blocks, children can make characters move, jump, dance, and sing. In the process children learn to solve problems, design projects, and express themselves creatively on the computer. They also use math and language in a meaningful and motivating context, supporting the development of early-childhood numeracy and literacy. If your class does not have access to tablets, you can still access free resources through the Scratch Website (below), however, it is a more advanced version.
Website Tutorials https://www.scratchjr.org/	The ScratchJr website offers a range of activities that gives you and students a quick way to learn how to do new things with ScratchJr.
Pre-programmed Lessons https://scratch.mit.edu/	The Scratch App and website has pre-programmed lessons that allows students to create digital stories, games, and animations. It also allows them to share their creations with others.
Teacher Resources https://www.scratchjr.org/teach/curricula/animated-genres	ScratchJr offers curricula that introduces computer science concepts to children, while allowing them to practice critical thinking and problem-solving skills. Lessons cover topics like programming, expressing through technology, and user-centred design.

Resource & Link	Description
ScratchJr continued... **Video Tutorials** https://scratch.mit.edu/help/videos/	The Scratch website has a series of video tutorials that take you through a full range of skills needed to use Scratch.
Additional Tutorials https://scratch.mit.edu/studios/1817151/	The Scratch website offers a range of tutorials created by users.
Disney **Moana: Wayfinding with Code** https://partners.disney.com/hour-of-code/wayfinding-with-code	Disney has created a Moana-themed, gamified coding tutorial to introduce students to the fundamentals of computer programming. These tutorials can be used as part of an Hour of Code initiative, and are available in over 180 languages, including Samoan Polynesian.
BBC **Bitesize Computing** https://www.bbc.com/education/subjects/z34k7ty	The BBC Bitsize Computing website provides lessons in computers in society, binary and data representation, hardware, software, networks, databases and programming.

Glossary	
Decomposition	Breaking a problem into smaller parts.
Algorithm	A set of clear and simple, step-by-step instructions to solve a problem.
A Bug	When an algorithm produces an unexpected result.
Debugging	A process of how to find and fix a bug in an algorithm. This process is: a) Start at the beginning of the algorithm. b) Follow the algorithm step-by-step until you find a step that produces a result you didn't expect. c) Correct the step. d) Start at the beginning again and repeat these steps until the algorithm does what you were expecting.