The Great Boat Build

Cross-Curricular Unit

Year 3-4

Cross Curricular Unit: The Great Boat Build

Year 3 – 4

Inspired by the past. Designed for the future.

In The Great Boat Build, students *understand* how people across cultures and history have solved design challenges, *know* the scientific principles behind floating and movement, and *do* the work of creative, critical makers: testing, refining, and presenting their own ultimate ocean vessel.

1. Waka Hourua: Polynesian Powerboats

Focus:
Learning from traditional waka hourua design to spark initial creative thinking about building for purpose.

Activities:
- Storytelling and design
- Archimedes principle
- Model building.
- Create their own vessel.

Key Learning:
- Students develop understanding through observation, testing, and reflection.
- Traditional knowledge systems can demonstrate scientific ideas.
- Creative design begins with identifying problems and testing solutions.
- Visual learning and hands-on making support conceptual thinking.

2. Endeavour: Sailing into the Unknown

Focus:
Explore how Captain Cook's ship was designed for long-distance travel and compare it to the waka hourua.

Activities:
- Explore ship structure
- Compare lived experiences
- Compare ship design
- Modify original designs.

Key Learning:
- Structured writing strengthens communication of complex ideas.
- Exploration depends on both clever design and human resilience.
- Understanding history means seeing it from more than one point of view.
- Good design thinking involves learning from the past to improve future ideas.
- Historical inquiry deepens understanding of innovation.

3. Team New Zealand: Making Boats Fly

Focus:
Exploring how modern science and innovation disrupt traditional design rules in the America's Cup.

Activities:
- Investigate hydrofoils and lift.
- Analysis of your own race data
- Analysing trade-offs in design
- Modify original designs

Key Learning:
- Innovation builds on observation, experimentation, and iteration.
- Gathering and analysing data supports evidence-based thinking.
- Mathematical thinking supports real-world design decisions.
- Solving problems through design fosters creativity and resilience.
- Embracing innovation and calculated risk taking.

4. Designing With AI –Can You Build A Better Boat?

Focus:
Using AI critically as a partner in the design refinement process to create the ultimate sailing craft.

Activities:
- AI feedback and final reflection.
- Think about AI as a tool not a master
- Combining human and AI ideas.
- Presentation at the Great Boat Expo

Key Learning:
- Digital tools are most powerful when used critically and reflectively.
- Feedback and revision are part of the learning process.
- Practising critical evaluation of digital tools.
- Strengthening reflection and iterative improvement skills.
- Recognising human creativity and judgment as essential alongside technology.

Introduction:

In this unit, students embark on a journey across time and technology. By studying the remarkable waka hourua of the Pacific navigators, the sailing ship of Captain Cook, and the cutting-edge hydrofoiling boats of Team New Zealand at the America's Cup, students will explore how design, science, and clever thinking shape the way we travel across oceans. Rather than simply learning facts, students use what they discover to design, refine, and create their own ultimate ocean-going vessel, balancing speed, stability, supply needs, and innovation at every step.

Big Learning Statement

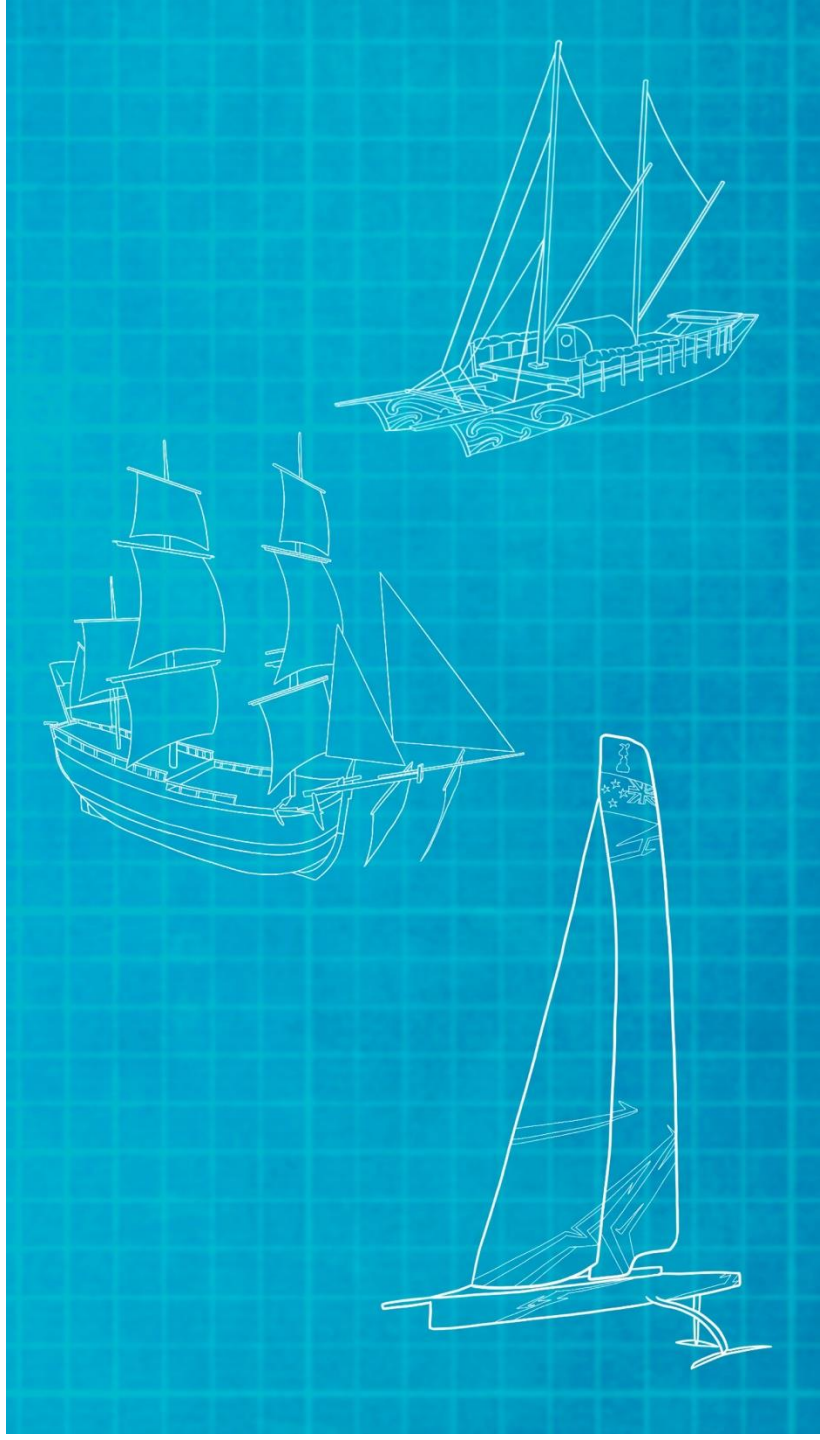
This unit grows critical thinkers, creative designers, and reflective innovators who use both traditional knowledge and modern tools to solve real-world challenges.

Cross-Curricular Connections

This unit integrates learning across several areas of the New Zealand Curriculum:

- **Technology:** Students plan, test, and refine their designs using materials and construction techniques from past and present.
- **English:** Students write creatively, explain their thinking clearly, and share ideas through discussion and presentation.
- **Mathematics:** Students measure and record data, calculate averages, and use graphs to analyse and compare design outcomes.
- **Science:** Students explore forces like buoyancy, drag, and lift, and apply them to boat design through hands-on experiments.
- **Digital Technologies:** Students use AI as a tool for design feedback, learning how to question, interpret, and improve digital suggestions.
- **Social Sciences:** Students examine how cultures across time explored the world using innovation, observation, and design.

Throughout, students also develop the Key Competencies essential to the New Zealand Curriculum, with a strong emphasis on critical thinking, collaboration, communication, and self-management.



The Great Boat Build Begins… with a Bath

Teacher Narration

"Today we're starting a big adventure. Welcome to The Great Boat Build - a unit where you'll discover how three of the world's most amazing boats were designed - and then go on to create your own. You're going to study three ships from three different times:

- the waka hourua from Polynesia in the 1300s,
- the Endeavour of Captain Cook in the 1700s
- the flying boats of Team New Zealand in the 2000s.

But before we do, we're going back in time to Ancient Greece - over 2,000 years ago - to meet a man who wasn't building boats. He was taking a bath!

The man was an incredible mathematician called Archimedes. He was sitting in his bath when he noticed something strange. As he sank into the water, the water level rose - and even spilled out over the edge. That simple splash gave him a brilliant idea: "If you want to know how heavy something really is," he thought, "look at how much water it pushes out of the way."

Water Displacement Mini-Demo

To observe how water is displaced when an object enters it, take a clear plastic cup or measuring jug filled with water. Place a sticky note on the side to measure the water level, then drop a marble into the jug.

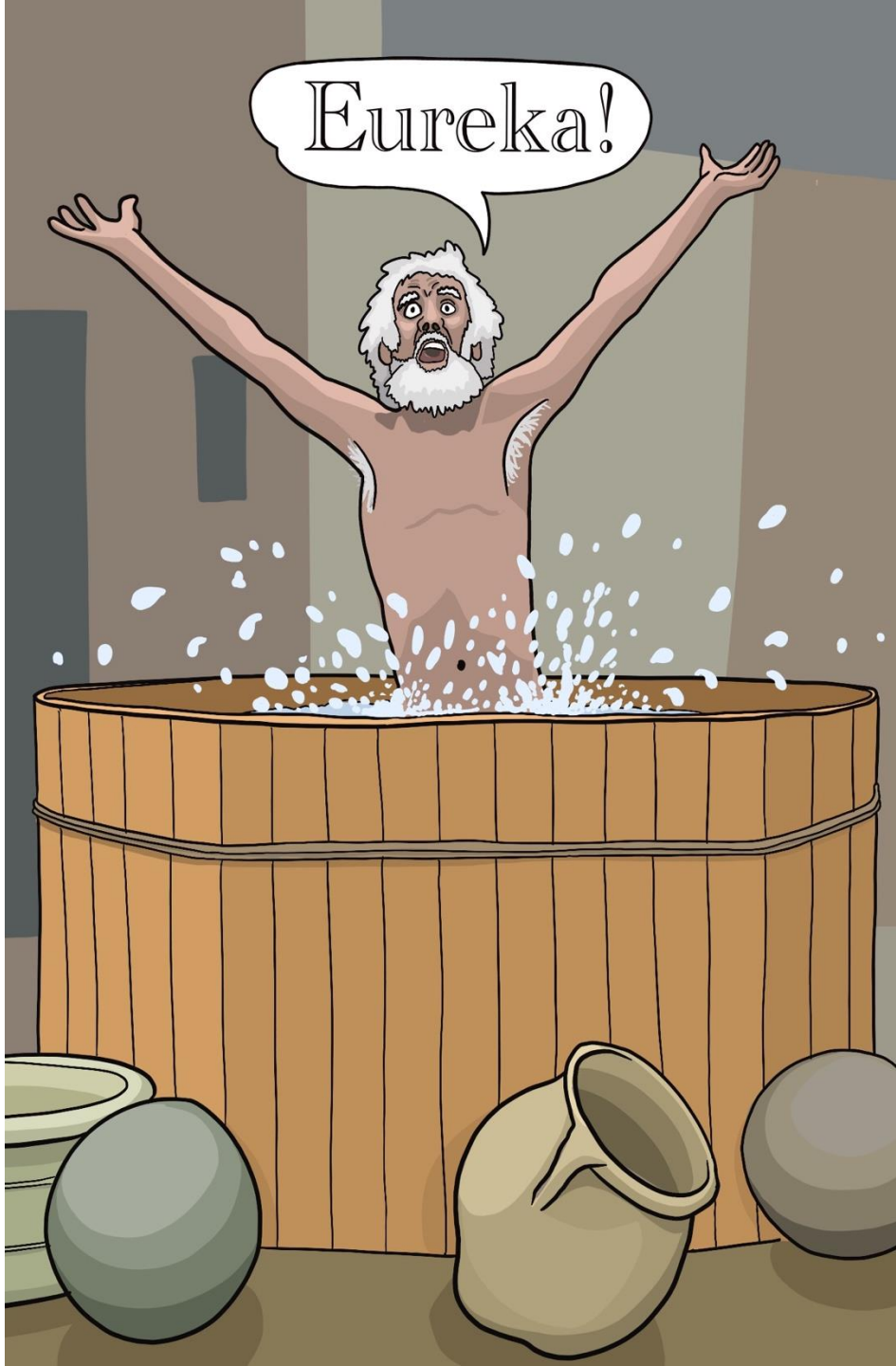
Observe: What happened to the water level?

Mark again: Add the second marble. What happened?

Teacher Prompt:

"You didn't add any water - but the level rose. Why?

That's displacement - the marble pushed water out of the way."



““Legend has it that Archimedes was so excited about his discovery, he jumped out of the bath and ran through the streets shouting ”Eureka!” which means ”I’ve found it!” He may not have remembered to first put on his toga …

Archimedes later discovered his idea could also explain why things float. When you put something in water, it pushes water out of the way. If it pushes enough water aside - the same weight as the object - the water pushes back and holds it up. That’s what makes things float! But if it doesn’t push enough water away, it sinks.

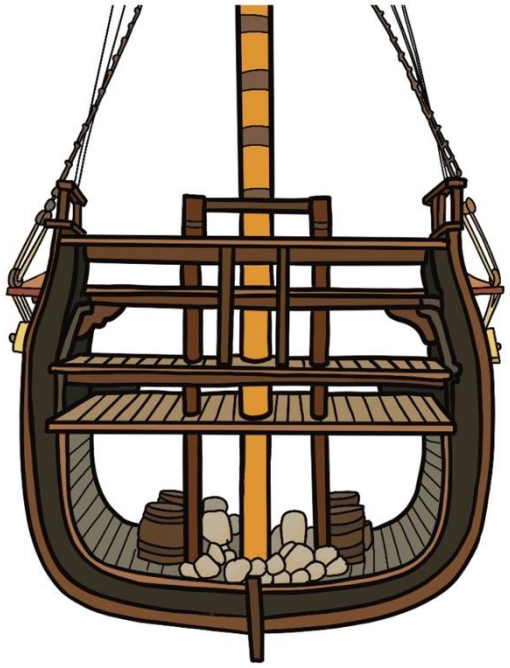
> *"Imagine lying on a big boogie board in the sea. It holds you up because it’s long and wide and pushes lots of water out of the way. But if the boogie board was tiny, it wouldn’t push enough water aside - and you’d sink!”*

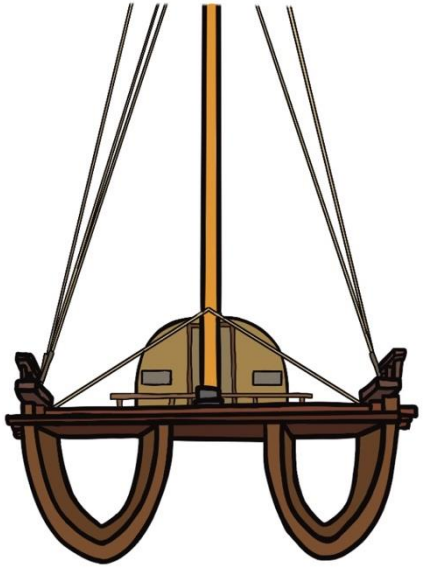
This is called Archimedes’ Principle, and it’s still the science behind floating today. Whether it’s a carved wooden waka, a ship made of wood and iron, or a carbon-fibre foiling yacht, all of them either use Archimedes’ Principle - or try to cheat it.

Let’s take a look at the three incredible ships we will be studying:

Click on the link for an introduction to the three vessels:

Click here





Introductory Activity:

Teacher Narration

“You’ve just seen three amazing boats, but here’s the big question: how do any of them float at all? The answer goers back to that old Greek streaker Archimedes and his bath.

A boat will stay buoyant (or continue to float) as long as it weighs less than the amount of water it displaces (or moves out of the way when it settles).

The hull is the body of a boat. Its shape depends on what the boat is designed to do. Boats whose bottoms are flat spread their weight out over a larger area, so they can hold more weight before weighing more than the water they displace.

Today, you’re going to build your own tiny versions of the hull of a waka hourua and one shaped like the Endeavour. Then you’ll test how many marbles each one can hold before it sinks. This is your chance to be a boat designer and a scientist at the same time. Ready to build and sink some ships? Let’s go!"

Resources Needed

Aluminium foil sheets x 2

About 20cm x 20cm

Tub of water

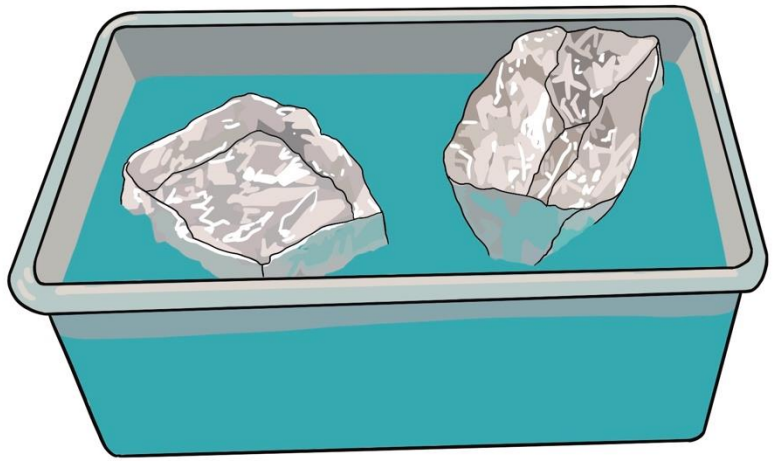
Worksheet

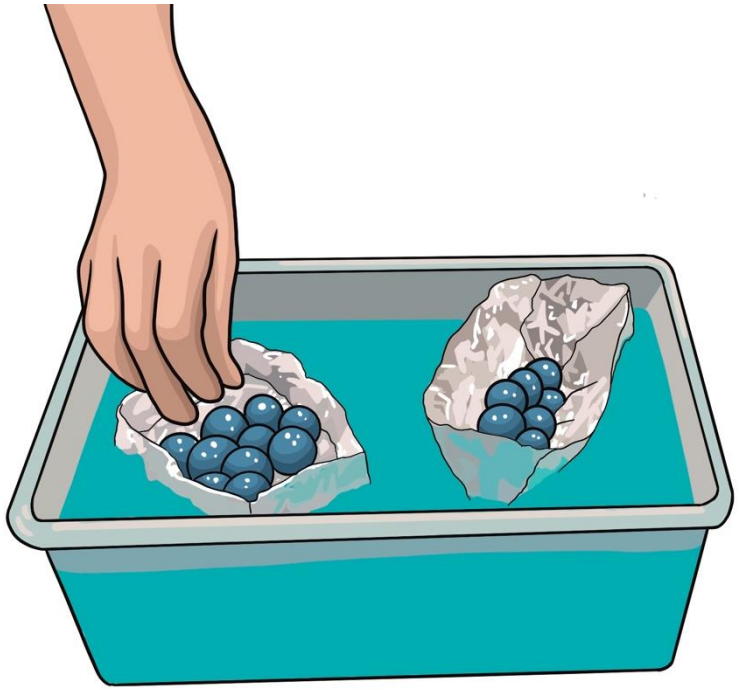
Small weights

Marbles or coins or buttons

Towels, paper towels

for spillages





Learning Goal:

To understand how boat shape affects buoyancy, and how historical vessels used displacement to float.

Instructions:

1. Build a Waka Hull

Shape one foil square into a long, narrow canoe with flat sides (remember the waka hourua has two of these hulls lashed together).

2. Build an Endeavour Hull

Shape the second foil square into a deeper, rounder bowl to represent the Endeavour's heavy hull.

3. Prediction:

Which kind of hull will be the most stable as you add weights?
Which hull shape can hold the most weight before it sinks?

4. Test The Buoyancy

- Set the boat in the water. Make sure it's seaworthy and hasn't sprung any leaks.
- Start adding weights. Watch carefully: is the boat starting to lean? Help the boat stay upright by adding weights to a different part of the boat.
- As you add weights, notice whether the boat changes shape, tilts strongly to one side, or springs a leak.
- Keep adding weights until the boat sinks.

5. Record Your Results

Which design floated best? Which one held more marbles before sinking?

Discussion:

- Why did one boat hold more weight than the other?

  Answer: *When you placed your boat in the tub, it pushed some water out of the way and took that water's place. Boats whose bottoms are flat spread their weight out over a larger area, so they can hold more cargo before weighing more than the water they displace.*

- How is this like the real waka hourua and the Endeavour?

  Answer: The waka hourua has two hulls spaced apart, which helps spread the weight and keep it stable on the ocean. It floats higher and travels faster. The Endeavour has one deep hull that carries more weight, but it sits lower in the water and moves more slowly. They both float using Archimedes' Principle - just in different ways.

- How does the Team New Zealand boat bend the rules?

  Answer: "What if you didn't want to float at all? What if you could lift the whole boat out of the water? That's what Team New Zealand does. They cheat Archimedes' Principle - but only after they've got up enough speed for the foils to lift their waka-shaped hull up out of the water.

Pulling It Together: Why This Matters

"This unit is about boat design. But really, it's about clever thinking. The waka builders didn't know about Archimedes, but they understood the ocean. They used observation, experience, and knowledge passed down through generations. The Endeavour was built with timber, iron, and science. Team New Zealand uses carbon fibre and computers. But every single one of them is connected by the rules of the ocean, by the cleverness of design, and by the story that began with a man in a bath.

So, let's start our Great Boat Build."

Tinfoil and Marbles Worksheet

Name: …… Date: ……

1. Prediction:

Which foil boat do you think will float better with marbles inside it? Circle one:

WAKA HULL or ENDEAVOUR HULL

Why do you think that?

……

2. Hull Design:

Make a sketch of the shape of your tinfoil hulls – the waka and the Endeavour.

3. Record Your Results

	Number of marbles before sinking
Waka Hull	
Endeavour Hull	

4. Reflection

Which boat held more marbles before sinking? Why do you think that happened?

……

……

How is this like the real waka hourua and Endeavour?

……

……

How do Team New Zealand's America's Cup boats avoid Archimede's principle about floatation?

……

……

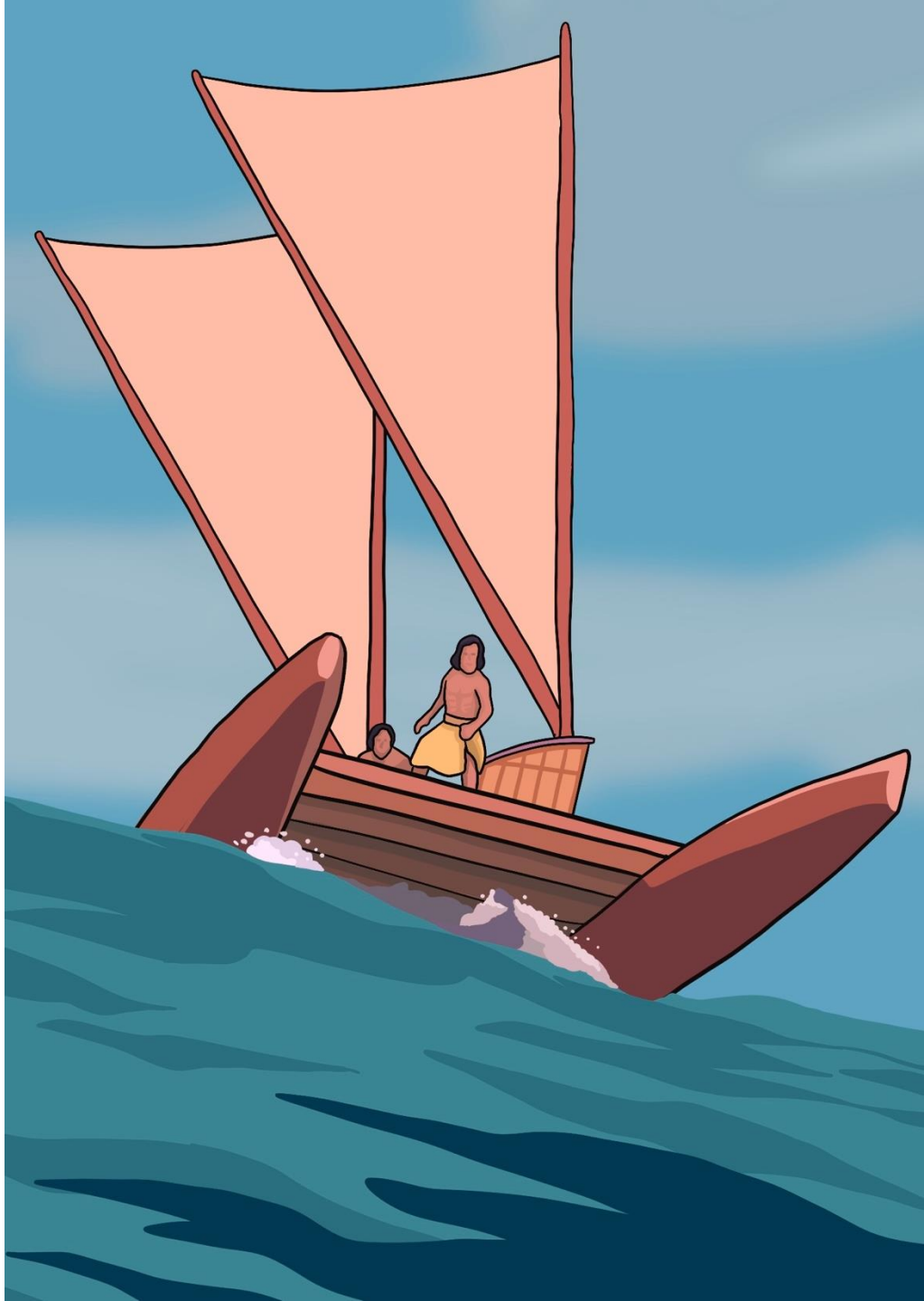
Lesson One: Waka Hourua - Polynesian Powerboats

Introduction

More than 700 years ago, Polynesian navigators explored the vast Pacific Ocean with precision and skill. Their double-hulled canoes, waka hourua, were masterpieces of engineering, perfectly suited for the challenges of open-sea voyaging. This lesson introduces students to the brilliance of waka hourua and invites them to take their first step in designing their very own ultimate ocean-going vessel.

Learning Objectives:

- Understand key design principles behind Polynesian waka hourua.
- Apply scientific ideas about stability and buoyancy.
- Create, test, and refine their own ocean-going vessel design.
- Reflect on the innovation and problem-solving that are part of the student's DNA.



Resources Needed

Introductory Videos

from maatauranga.co.nz

Worksheet

Waka diagram for labelling

Hull Materials

Cardboard, plastic bottles, wood

Mast Materials

Skewers, straws, sticks

Sail Materials

Cloth, paper,

Lashing Materials

String, twine

Adhesives

Glue and tape

Harakeke

See harvesting harakeke notes

Water tubs

For floatation tests

Teacher Background

Why Waka Hourua Were Special

The waka hourua were not just boats - they were sophisticated, high-performance vessels built for crossing the biggest ocean on Earth. Every design choice - from hull shape to sail design - reflected a deep understanding of the ocean and a focus on survival, speed, and innovation. Six key features made these vessels successful:

1. Double Hull Design
Two hulls gave waka hourua incredible stability, even in rough seas. They moved smoothly and resisted capsizing by distributing weight evenly.

2. Wide Beam
The wide space between hulls made the waka hard to tip over and provided balance for carrying heavy supplies, crew, and animals.

3. Flexible Construction
Waka were lashed together with natural fibres instead of being nailed. This allowed the vessel to flex and move with the waves, strengthening its durability during long ocean voyages.

4. Lightweight and Strong Materials
Built from native timbers and natural fibres, waka were light for speed but strong enough for endurance.

5. Strong, Flexible Sails
Waka used sails mounted on spars, designed to catch and use the wind efficiently, allowing for long-distance voyaging and manoeuvrability.

6. High Freeboard (Raised Hulls)
High hull sides kept water out and protected the crew during rough sea conditions.

Suggested Teacher Talking Points

- "These weren't rough rafts — they were the high-tech vessels of their day."
- "Every part of a waka hourua was carefully designed to work with the ocean, not against it."
- "Today, we are going to learn from their brilliant thinking and start designing our own great voyages."

Click here

Activity 1: The Waka Hourua

Teacher Narration

"Imagine you are on an island - standing on the edge of the ocean. Before you lies nothing but endless water - thousands of kilometres wide. You know there are lands on the other side of the horizon, but how are you going to get there?

Your mission in this Unit is to build the perfect boat! Using knowledge passed down from your ancestors, you are going to become inventors, explorers, and problem-solvers. You'll learn from the clever thinking of Polynesian navigators, from the tough ships of the first European explorers, and from today's super-fast foiling boats of Team New Zealand. Then you'll design your own ultimate vessel to sail into the future.

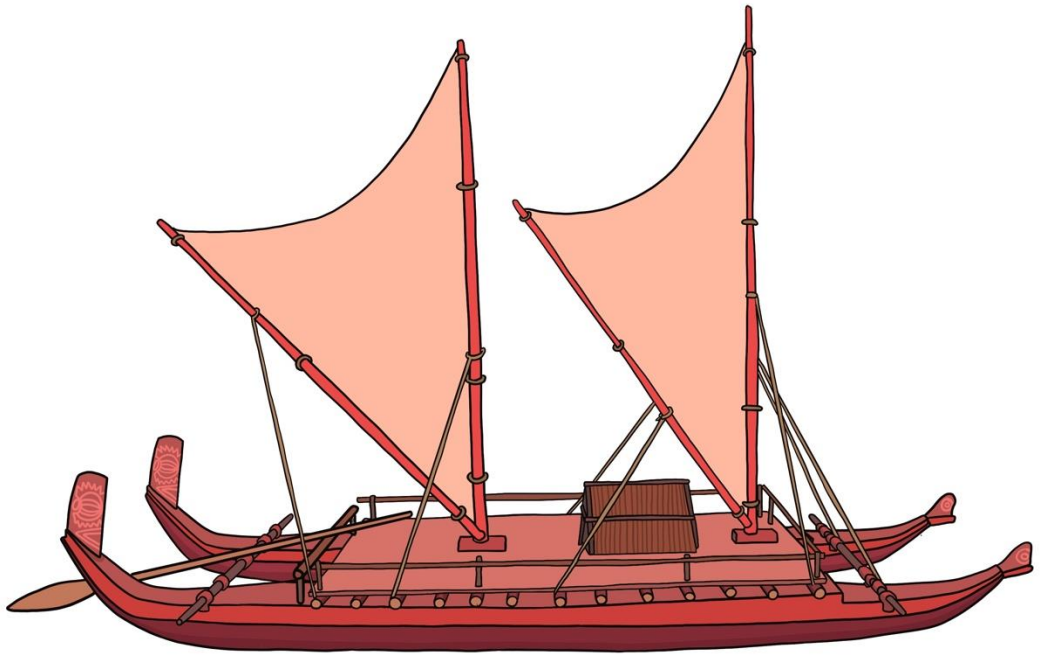
And we're going to start with one of the great inventions in human history: the waka hourua. These weren't ordinary boats. They were powerful, smart, flexible machines - designed perfectly for survival and speed across some of the roughest seas on Earth.

Now we're going to watch a short video that takes us inside the amazing thinking behind these vessels. As you watch, think about this question:

> *'If you had to cross an ocean today with no engine and no GPS, what would you need your boat to do?'*

Let's dive into the story of the waka hourua: High Tech Travel."

Click on the link to watch "Waka Hourua: High Tech Travel."



Label Your Waka Hourua

Instructions

Your job is to label the important parts of the waka and learn what each part does.

Label These Parts

Te Reo Māori	English Word	What it Does
Hoe tere	Steering paddle	A big paddle at the back used to steer the waka and help it turn.
Pou tāhū	Mast	A tall pole that holds up the sail.
Whare	House	A small hut or shelter on board where people or supplies can stay dry.
Hiwi	Hull	The main body of the waka that floats in the water.
Taura	Rope	Strong rope used to tie parts of the waka together or hold the sail in place.
Raho	Raised sides	The tall edges of the hull that help stop water from splashing in.
Papa	Deck	A flat area where people can stand, walk, or sit on the waka.
Rā	Sail	A large mat or cloth that catches the wind to move the waka forward.

Teacher Prompts During Labelling

- "Why do you think the waka needs two hulls instead of just one?"
- "Why is it important that the ropes can bend and move a little?"
- "How does the sail help the waka move even without an engine?"
- "Where would you stand if you needed to steer the waka?"
- "Which part of the waka would you want to be the strongest if you were at sea?”

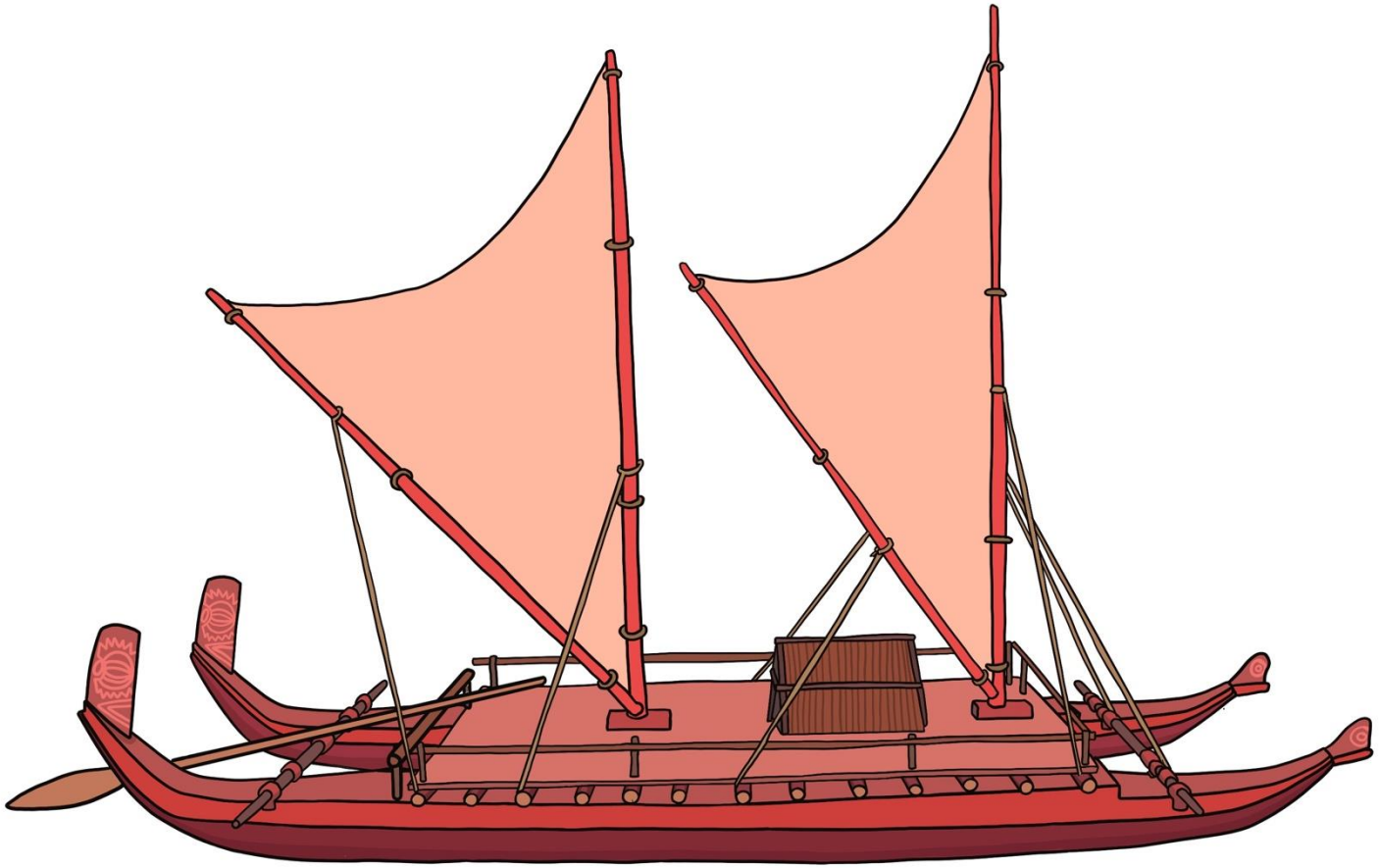
Reflection Questions After Labelling

- What part of the waka do you think is the most clever?
- What smart ideas from waka hourua could we still use in boats today?

Label Your Waka Hourua Worksheet

Name: …… Date: ……

Te Reo Māori	English Word
Hoe tere	Steering paddle
Pou tāhū	Mast
Whare	House
Hiwi	Hull
Taura	Rope
Raho	Raised sides
Papa	Deck
Rā	Sail



Activity 2: Build Your Model Waka Hourua

Step-by-Step Instructions

1. **Make Two Hulls**
   Cut and shape two long strips of a material that floats. These are the waka's two hulls.

2. **Connect the Hulls**
   Use small sticks or straws across the hulls as beams (papa). Tie or tape them carefully so the hulls are spaced apart and steady.

3. **Add the Deck**
   Cut a flat piece of cardboard and attach it across the top of the beams. This is where people and supplies would go.

4. **Make the Sail**
   Cut a triangle or rectangle from paper. Tape it to a straw or skewer as the sail pole (hoe ra). Attach it upright on the deck.

5. **Strengthen**
   Tie important parts together. Think about flexibility: the waka must move a little with the waves, not snap apart!

6. **Test Your Waka (Optional)**
   Float your waka in a tub of water. Blow gently on the sail. Does it move? Does it stay balanced?

Digital Option: Tinkercad or Minecraft Design

Instead of building with materials, students could model their waka hourua in Tinkercad or Minecraft. Label the key parts in their digital designs.

Teacher Prompts During Building

- "Why do you think two hulls help the waka stay balanced?"
- "Where is the best place to put your sail?"
- "If your waka tips over, what could you change to make it steadier?"
- "If the wind is too strong, how could you change your sail?"
- "Would you want your waka to be heavy or light? Why?"

Reflection Questions After Building

- What part of your waka was the hardest to build?
- How did you solve any problems you faced?
- If you could rebuild it, what would you change?
- How did your design show clever thinking, like the real waka hourua builders?

Teacher Notes:

Celebrate all designs — even ones that "fail" — because real explorers had to test and rebuild many times. Reinforce that the goal is problem-solving and creativity, not perfect models.

Activity 3: Design Your Ultimate Ocean Explorer
Phase One

Teacher Narration:

"Now that we know what ancient voyagers needed to survive at sea, it's your turn to imagine. Your boat doesn't have to look like a waka hourua, or Captain Cook's ship, or a flying boat. It can be anything: traditional, modern, futuristic, even magical! But it must be clever. It must solve the real problems of travelling far across oceans: staying afloat, moving through wind and waves, carrying supplies, and keeping your people safe. You are the designer. Dream big. Think smart. Build something bold."

Teacher Notes:

Celebrate every idea, even wild, creative ones, especially when they show problem-solving. Remind students that the best explorers and inventors often dreamed of impossible things before they became real. Some students may still design waka hourua or Endeavour-like ships — and that's great too. Encourage a wide range: underwater homes, flying ships, solar-powered canoes, anything.

Instructions

1. Imagine First

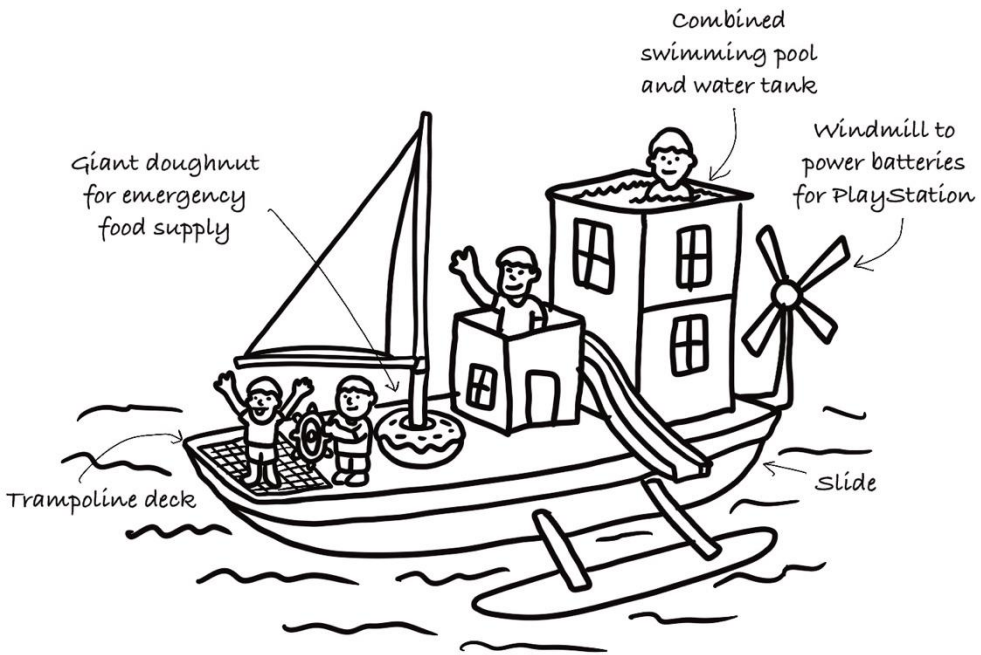
Close your eyes. Picture yourself setting off across an endless ocean.
What kind of boat or vessel would you want under your feet?

2. Sketch Your Vessel

Draw the side view and top view.
Add anything you need: sails, motors, wings, paddles, balloons, animal helpers — anything that solves the problems!

3. Label Your Boat's Important Parts

Make up your own names for the parts if you want to!
Explain in a few words what each part does.



Answer the Voyager's Challenge Questions:

Problem to Solve	Your Solution
How will you stay balanced and not tip over?	_____
How will you move across the ocean?	_____
How will you store food and water?	_____
How will you steer and change direction?	_____
How will you keep your people safe from storms and big waves?	_____
What materials will you use?	_____

Teacher Prompts During Designing

- "Where will you sleep? Eat? Go to the toilet?"
- "Could your vessel float, fly, dive, or do something else?"
- "How would your vessel survive a giant storm?"
- "If you had to live on your vessel for months, what would you need?"
- "Could you invent something no one has ever thought of before?"

Reflection Questions After the First Design

- What makes your vessel different from anything we've learned about so far?
- Which problem did you solve in the cleverest way?
- If you could change one thing to make your design even better, what would it be?

Design Your Ultimate Ocean Explorer Worksheet
Phase One

Name: ……. Date: …….

1. Think About the Problems

Ask yourself:

- How will I float?
- How will I move?
- How will I carry food and water?
- How will I find my way?
- Where will I sleep?
- Where is the toilet?
- Who's coming with me?

2. Sketch Your First Design

Draw side view and top view.

Invent your own shapes, sails, supports, even new materials if you like!

Label all the important parts (invent your own part names if needed).

It's okay if your boat is strange. The goal is smart ideas, not neatness.

What is your boat made for?

……

……

What is one problem your boat solves really well?

……

……

What do you still need to figure out?

……

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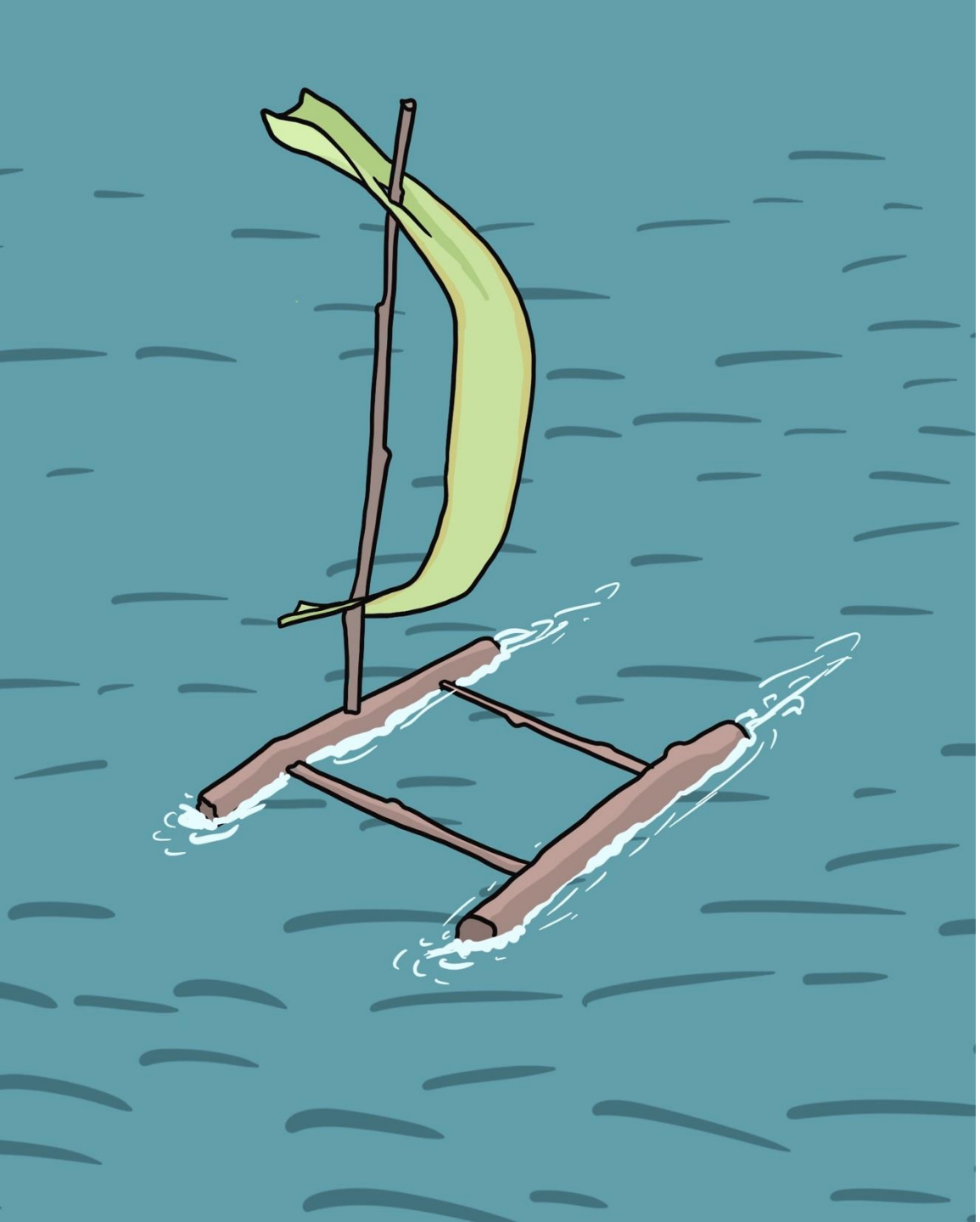


Harvesting Harakeke

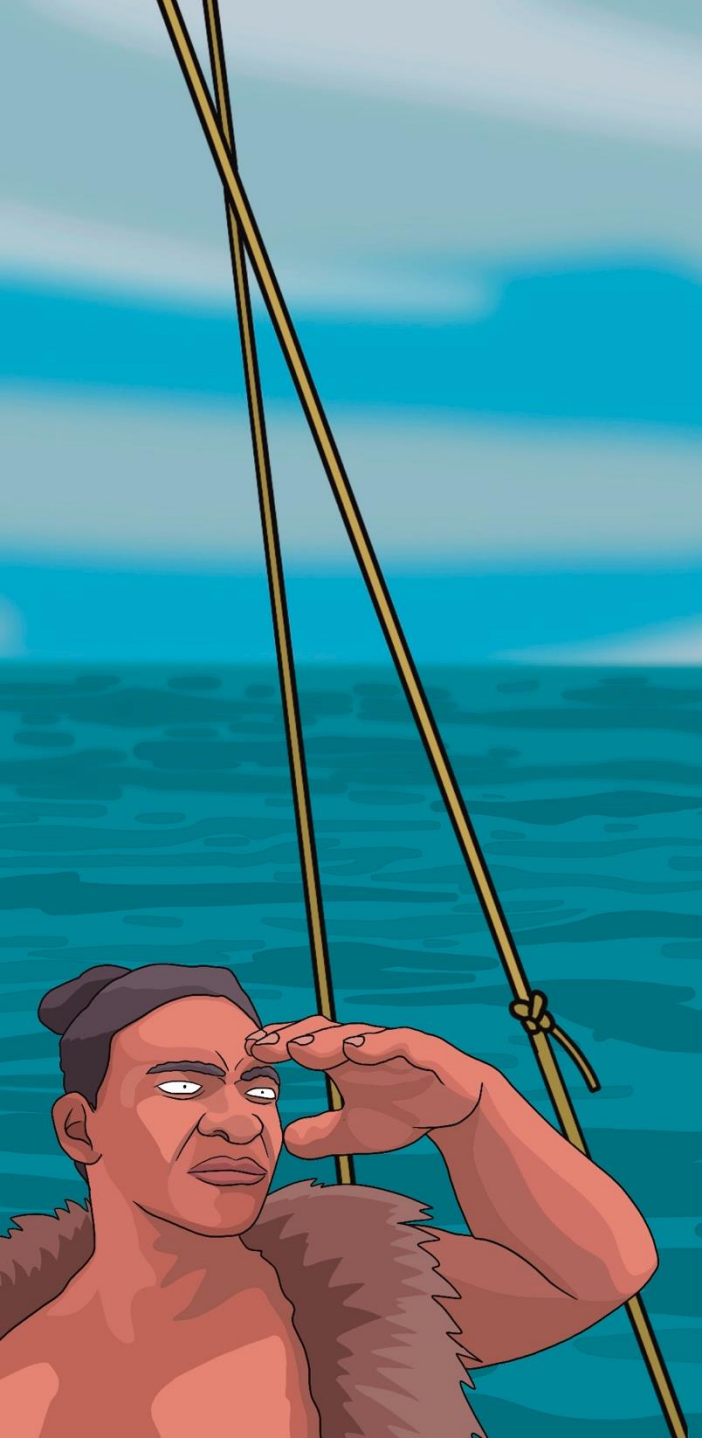
Māori maintain many tikanga (protocols) to nurture harakeke. The protocols differ by iwi, but some, like those below, were commonly followed:

- Weavers say a karakia (prayer) before cutting the first blade of harakeke.
- Harvesting is not permitted at night or in rain.
- Customarily, pregnant or menstruating women do not harvest.
- Weavers always cut on the diagonal, away from the plant's heart and from top to bottom.

  This helps rainwater drain away and prevents the heart from being flooded and dying.

Tricky Words

Word	Meaning
Waka Hourua	A double-hulled sailing canoe used by Polynesians for long ocean journeys.
Hull	The main part of a boat that floats on the water.
Deck (Papa)	A flat surface connecting the two hulls where people and supplies sit.
Kiato (Crossbeam)	A strong wooden beam that ties the two hulls together.
Pou Manawa (Mast)	A tall pole that holds up the sail.
Ra (Sail)	A big cloth or mat that catches the wind to move the waka.
Hoe Urungi (Steering Paddle)	A large paddle used to steer and control the waka.
Raho (Raised sides)	The tall edges of the hulls that help keep water out.
Voyage	A long journey across the sea.
Lashings	Strong ropes used to tie parts of the waka together.
Navigator	A person who finds the way across the ocean using stars, waves, and birds.
Balance	Keeping the waka steady and upright in the water.
Supplies	Food, water, and tools needed for a long trip.



Learning Intentions and Key Competency Overview

This overview outlines the learning intentions, success criteria, and key competencies for the lessons in *The Great Boat Build* Unit. Use it as a planning and reflection tool.

Lesson One: Waka Hourua - Polynesian Powerboats

Learning Intentions

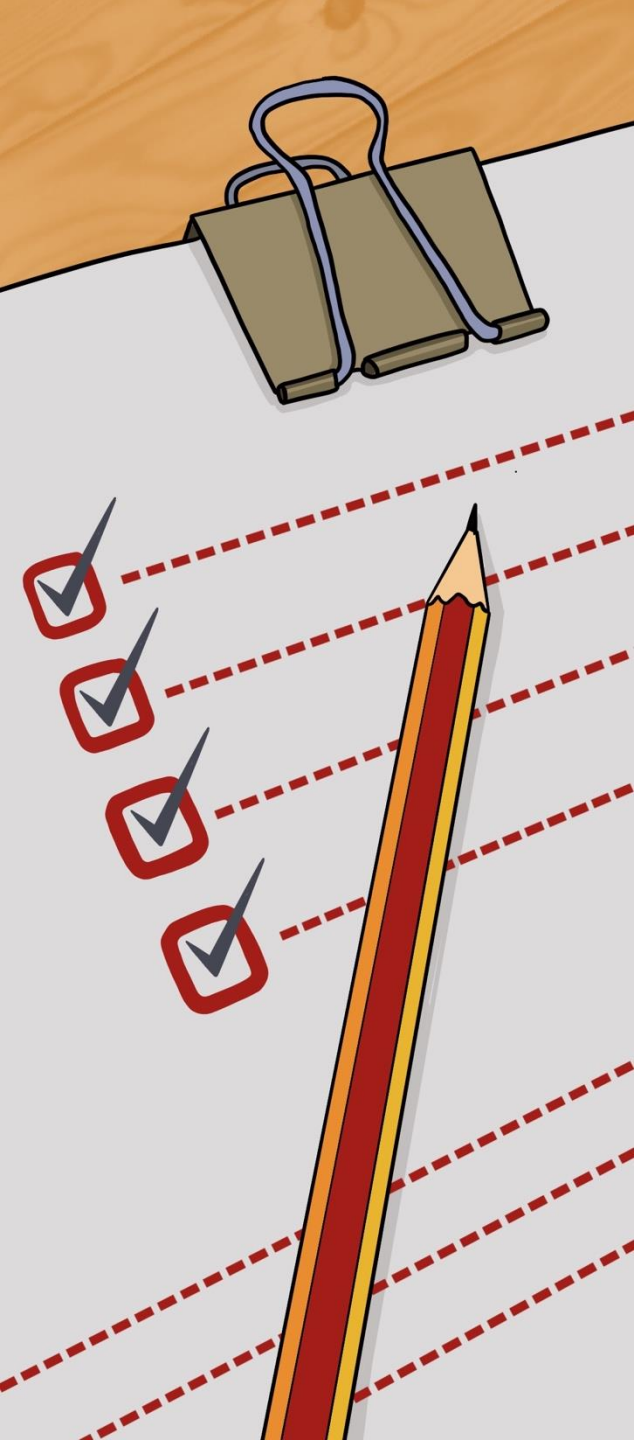
- Understand the key design principles behind Polynesian waka hourua.
- Explore how shape and structure influence buoyancy and stability.
- Begin designing an original boat for ocean exploration.

Success Criteria

- I can describe at least two features of waka hourua that help with ocean travel.
- I can build and test a model hull using materials and reflection.
- I can sketch a boat design and explain why I chose each part.

Key Competency Integration

- *Thinking:* Generating and testing ideas based on scientific observation.
- *Managing Self:* Following multi-step design processes independently.
- *Participating and Contributing:* Engaging in class discussions and building activities.
- U*sing Language, Symbols, and Texts:* Labelling diagrams, using te reo Māori terms, and expressing ideas in writing or visuals.



Assessment

This rubric assesses how well students observe, design, solve problems, reflect, and communicate.

- Prioritise problem-solving and creativity over technical perfection.
- Celebrate original thinking, even if drawings are rough or models don't fully work.
- Encourage students to reflect honestly — mistakes and changes are part of real design journeys.
- Value both students who build on the waka hourua ideas and those imagining something new.

Category	Developing	Achieving	Excelling
Observation and Understanding	Student labels some parts of the waka hourua correctly but misses key ideas about why they matter.	Student correctly labels key parts and explains why they are important for voyaging.	Student identifies and explains parts clearly and makes deeper connections to why design choices mattered for survival.
Problem-Solving	Student shows limited thinking about how to solve problems like balance or supplies.	Student identifies problems and proposes reasonable solutions in their own vessel design.	Student shows creative and thoughtful solutions, demonstrating flexible and resilient thinking like real voyagers.
Creativity and Innovation	Student's design is basic and closely copies examples.	Student's design includes original ideas and personal touches based on what they have learned.	Student's design is highly imaginative, daring, and shows creative new thinking beyond the examples studied.
Reflection and Adaptation	Student struggles to explain why their design choices were made.	Student reflects on what works and what they might change.	Student thoughtfully evaluates strengths and weaknesses and suggests smart improvements.
Presentation and Communication	Student presents basic ideas but explanations are brief or unclear.	Student clearly presents ideas visually and verbally, with basic labels and explanations.	Student presents ideas clearly, confidently, and uses strong explanations or storytelling to bring their design to life.

Lesson Two: The Endeavour: Sailing into the Unknown

In this lesson, students step aboard Captain James Cook's Endeavour and explore what it meant to sail into unknown oceans in the 18th century. Through reading, writing, hands-on activities, and design thinking, they will experience the challenges of life at sea through different eyes: a young British ship's boy and the Tahitian navigator Tupaia. Students will investigate the ship's design, understand daily survival needs, and use their new knowledge to strengthen their own ultimate explorer vessel designs.

Learning Objectives:

- Understand the purpose and challenges of the Endeavour's first voyage to Aotearoa.
- Analyse the design features of the Endeavour that supported long-distance exploration.
- Pack their own pantry for a long voyage at sea.
- Compare life at sea for British sailors and Polynesian navigators.
- Interpret daily experiences aboard the Endeavour through creative writing.
- Apply learning about survival and ship design to improve a personal explorer vessel design.
- Communicate observations and ideas through discussion, labelling, and diary writing.

Materials Needed

Video

Tupaia and the Endeavour

Click here

Reading Material

Printed copies of *Cabin Boy Letter home.*

Worksheet

Endeavour labelling exercise.

Worksheet

Ultimate Ocean Explorer design

Introduction

Teacher Narration

”So last time we were exploring how Polynesian navigators were voyaging across the Pacific in their great double-hulled waka hourua. They sailed by the stars. They read the ocean swells. They studied the sea and the birds and sailed all the way to Aotearoa.

It was 500 years before another voyager arrived in the Pacific. It came from the other side of the planet: Great Britain. The ship was called the Endeavour. It had sailed off the edge of all the maps of the world - so it was a bit like a Mars Rover for the sea, sailing out into the unknown.

But Captain James Cook wasn’t silly. He knew the best way to explore was to ask the locals for directions. And that’s how he met a Tahitian prince called Tupaia. He had grown up with the ocean. He had the knowledge of generations of Pacific sailors in his head. Now, he was sailing with Captain Cook - two worlds meeting on one ship, heading for Aotearoa.”

Click here

Click on the link for an introduction to Tupaia and the Endeavour and their voyage to Aotearoa:

Teacher Background

Tupaia

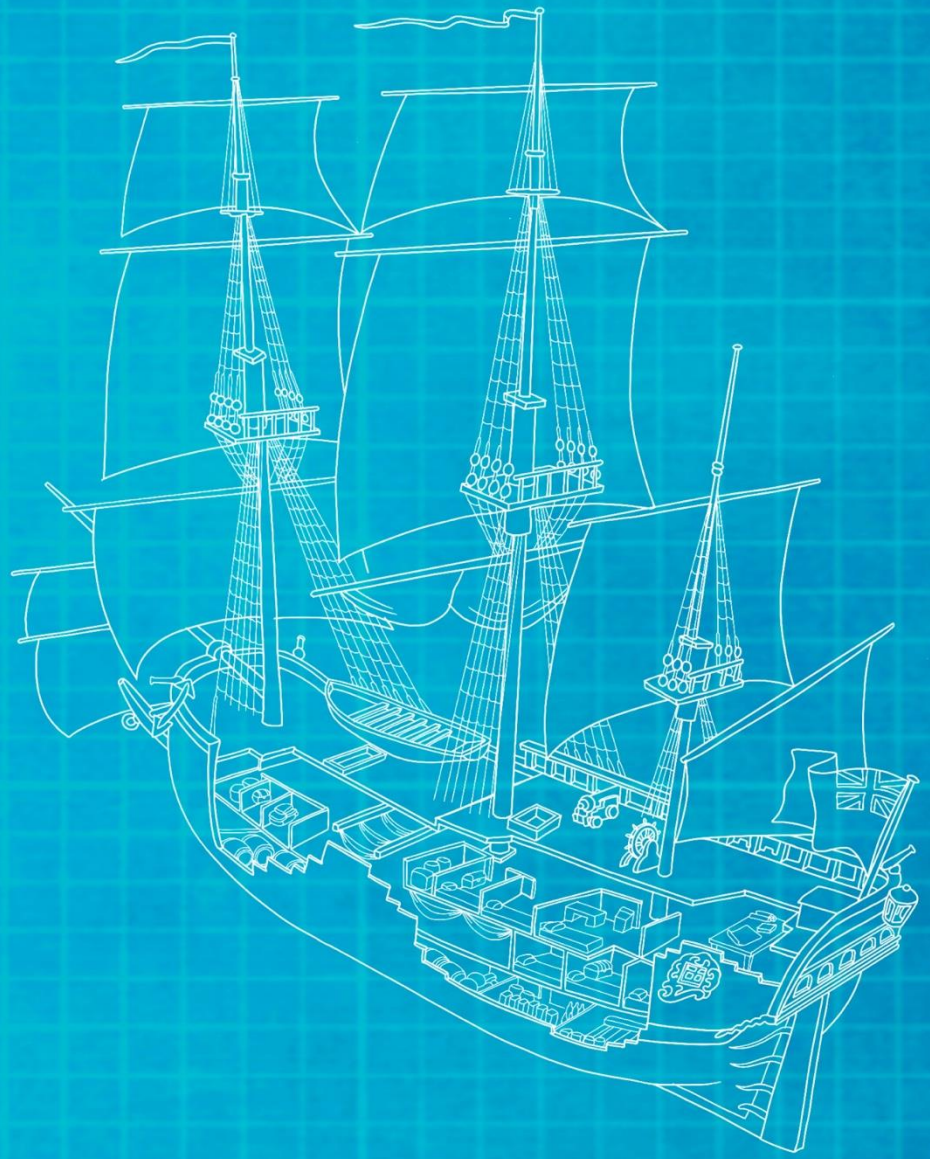
Born in Ra'iātea, an island in what's now called French Polynesia, Tupaia trained from a young age to become a priest and navigator, learning how to sail thousands of kilometres using only the stars, waves, clouds, and birds. He had never used a compass or a map - and he didn't need to. He carried a mental map of more than 130 Pacific islands in his head.

When the Endeavour arrived in Tahiti in 1769, Tupaia met Captain Cook. He saw that these newcomers didn't understand the ocean in the way he did, so he guided the Endeavour across the Pacific. Tupaia helped translate between Māori and the British when they reached Aotearoa. People listened to Captain Cook. But Tupaia knew how to listen to the sea.

Captain James Cook

The son of a farm labourer in England, James cook wasn't born rich. He worked hard, became a sailor, and learned how to draw maps better than anyone else in the Royal Navy. The British government gave him command of a ship called the Endeavour. His job: to sail across the world, find new lands, make scientific discoveries, and map the stars.

Cook believed in science, careful planning, and keeping his crew healthy — he made them eat pickled cabbage and citrus fruit to stop scurvy. Cook didn't understand everything about the people he met. He came with power, and sometimes, that caused harm. But he also came with curiosity, and he wrote down nearly everything he saw. He was like a space commander, leading a team to places they'd never been, with tools, questions, and a telescope instead of computers.



The Endeavour

The Endeavour wasn't a fancy ship. It didn't have cannons or comfy cabins. It was built to carry coal! But Captain James Cook chose it for a big reason: it was tough, wide, and stable; good for exploring unknown seas without tipping over in rough weather.

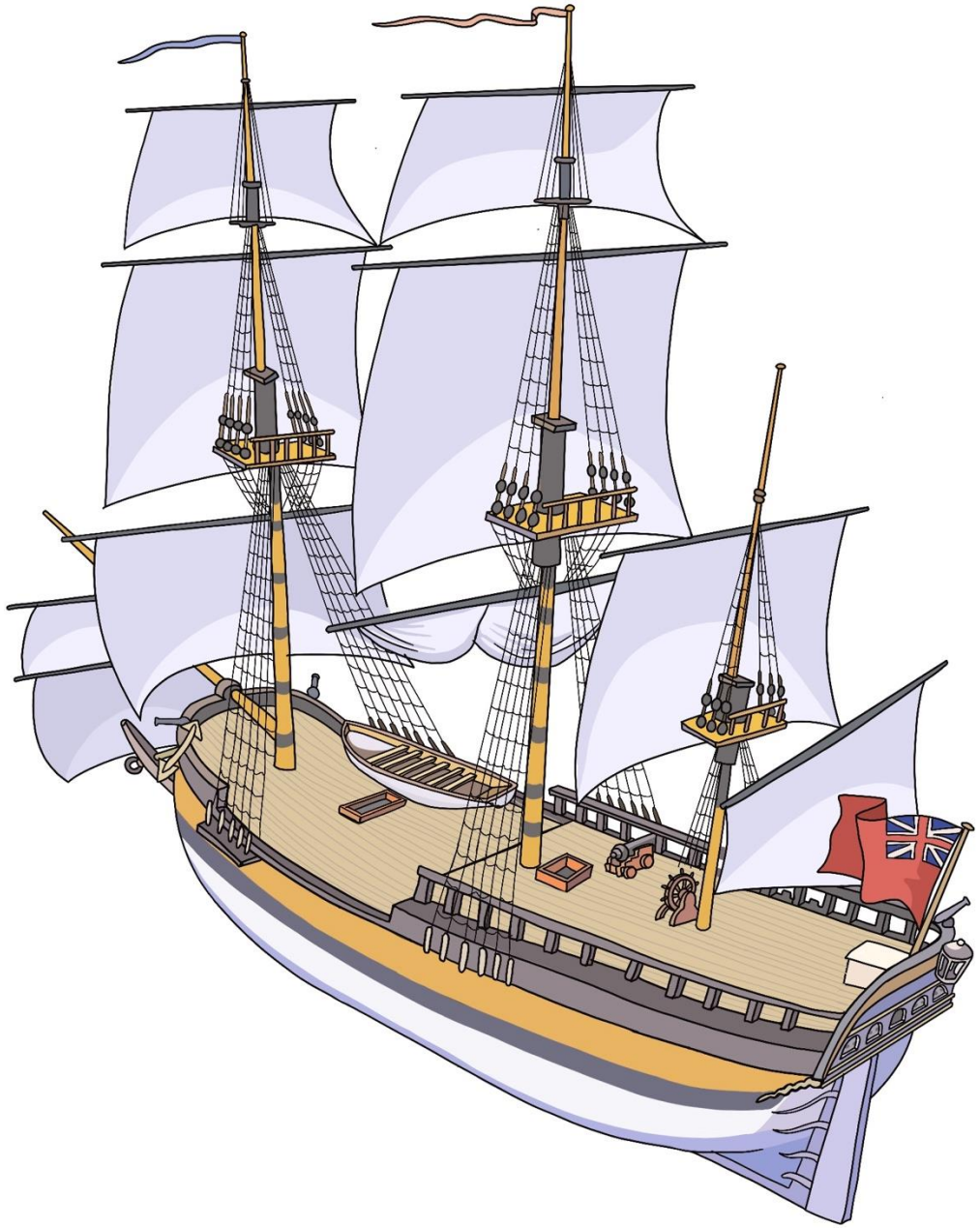
Before it became famous, the Endeavour was called the Earl of Pembroke. It was a bark - a slow but strong ship with three big masts and 22 sails. It wasn't built to go fast. It was built to survive.

In 1768, the Endeavour was packed with scientists, artists, sailors, and supplies. It became one of the first ships ever used as a research vessel. The crew were sent to watch the stars and discover new plants, animals, and lands. It was like a moving science lab - filled with telescopes, jars, pens, and paper.

The ship's journey took it from England to South America, to Tahiti, to Aotearoa, and on to Australia and Indonesia. It sailed more than 48,000 kilometres without engines - just wind and clever sailing.

Inside, it was crowded and dark. People slept in hammocks. The air smelled of animals, biscuits, and tar. But the Endeavour kept going - through reefs, storms, and long months at sea - until it returned to England, full of drawings, samples, and stories.

Today, the Endeavour is remembered as one of the most important ships in history - not because it was beautiful, but because it was smart, sturdy, and ready for discovery.

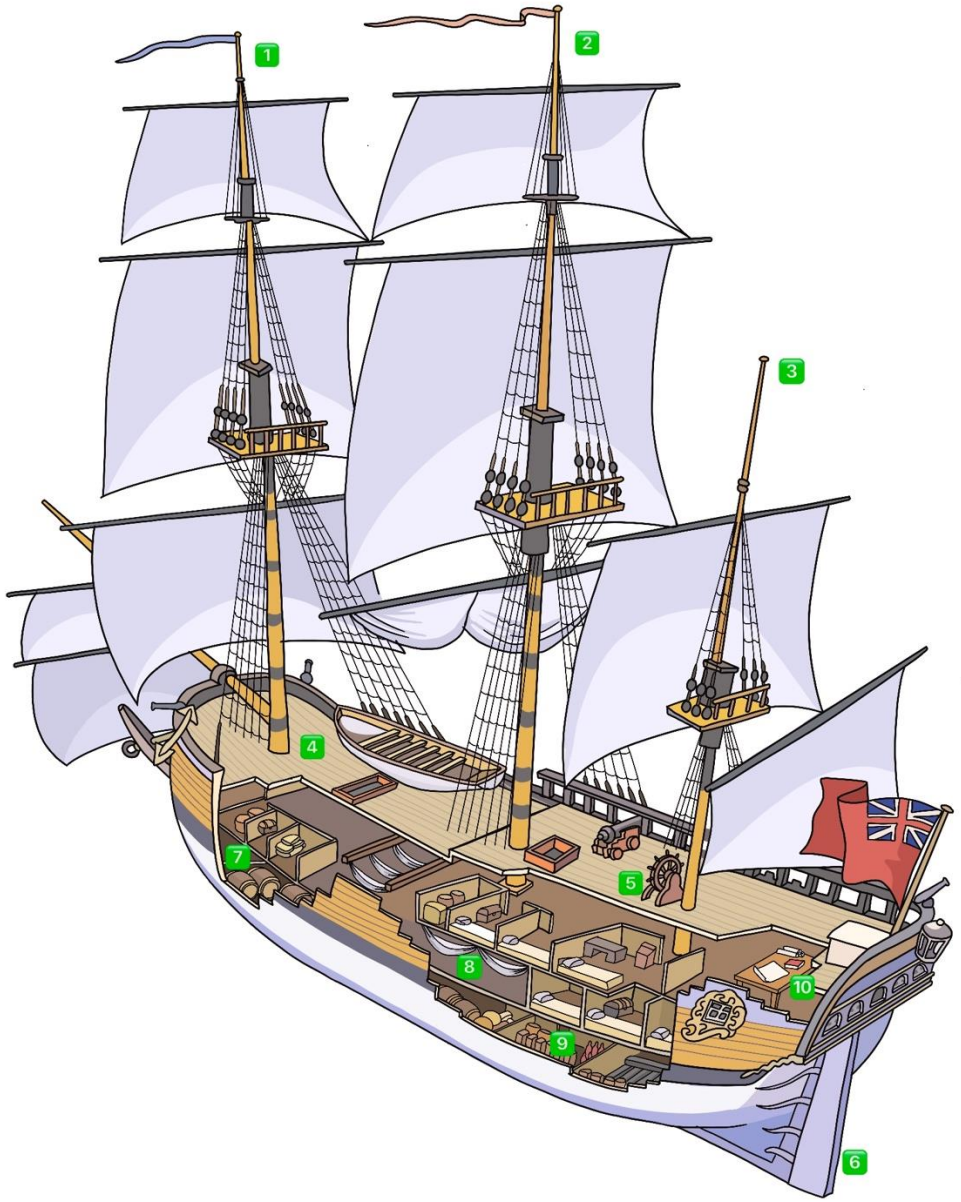


Activity 1: The Endeavour

Teacher Narration

“The ship that carried Captain Cook and Tupaia to New Zealand was called the Endeavour. It wasn’t a warship. It wasn’t fast. It was chosen not for speed or strength — but for cleverness. It’s a floating science lab, loaded with tools for exploring the unknown. So, let’s compare this remarkable ship to the waka hourua. Highlight or circle the most important differences that would make a big change to how the boats sailed and lived on.”

Feature	Endeavour	Waka Hourua
Type of Boat	Monohull (one hull)	Catamaran (two hulls)
Length	About 30 metres (like two big buses)	About 20 metres (like a school hall)
Width (Beam)	About 9 metres wide	About 6 metres between hulls
Draught (how deep it sits in water)	About 4 metres deep	About 1 metre deep
Weight	About 370 tonnes	Estimated 10 tonnes
Ballast (heavy weight in the bottom of the boat)	About 12 tonnes of pig iron (big rough chunks of heavy metal)	No ballast needed
Number of Hulls	1 hull	2 hulls (double canoe)
Number of Masts and Sails	3 masts with 22 sails	1 or 2 masts with large sails
Crew Size	About 90 people	About 30 people
Food Supplies	Salted meat, hard biscuits, dried peas, pickled cabbage, beer, lime juice	Fresh fish, taro, coconuts, dried breadfruit, water in gourds
Navigation Tools	Sextant, charts, clocks	Stars, ocean swells, birds, clouds
Animals Onboard	Goats, chickens, pigs	Dogs, pigs, chickens
Living Conditions	Cramped, dark, smelly, many rats	Open air, cleaner but exposed to storms
Main Purpose	Scientific discovery and mapping	Migration, exploration, trading
Keel	Strong wooden keel running along the bottom for balance and steering	No keel — balance comes from double hull design
Construction	Built with wooden planks, iron nails, bolts, and fittings	Built with wooden parts tied and pegged together using natural rope



Instructions:
This is a cutaway diagram of the Endeavour. (A cutaway diagram has part of the ship cut away to reveal what's inside, like looking at a doll's house with one wall missing). Use what you learned from the table to label the parts on the diagram. Match the number on the diagram to the name of the ship's structure.

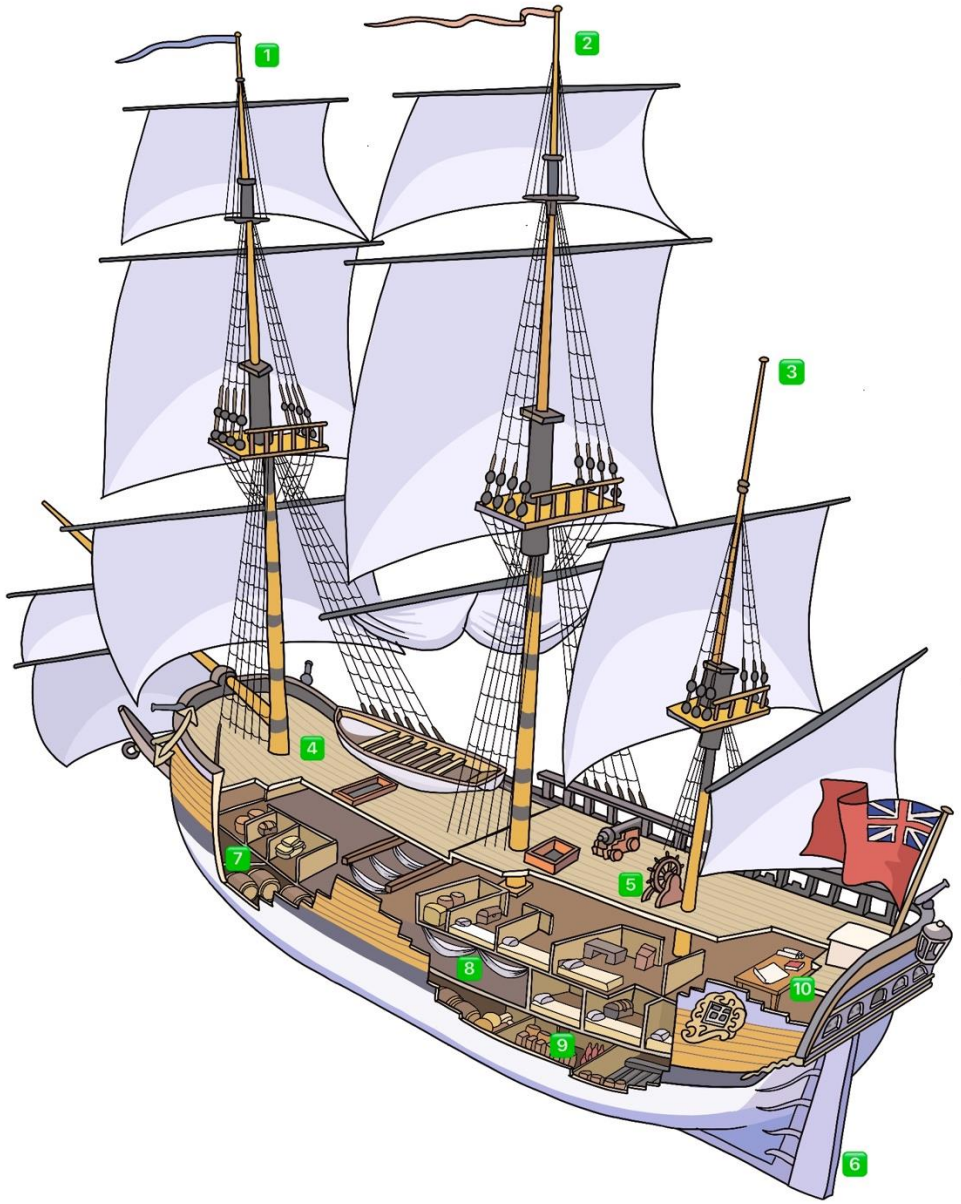
- ☐ Captain Cook's Cabin (the biggest and best space on the ship)
- ☐ Main Deck (where most daily work and activities happened)
- ☐ Lower Deck (where the sailors slept in hammocks)
- ☐ Food Storage Area (where food barrels were kept)
- ☐ Hold (the very bottom of the ship)
- ☐ Foremast (the front mast)
- ☐ Mainmast (the tallest mast)
- ☐ Mizzenmast (the small mast at the back)
- ☐ Wheel (used to change the direction of the rudder)
- ☐ Rudder (for steering - by changing the direction of the water flowing past)

Thinking Questions

- Which part of the ship do you think was the most important for survival?
- If you had to sleep somewhere on the ship, where would you pick and why?

Label The Endeavour Worksheet

Name: …… Date: …….



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Match the number on the diagram to the name of the ship's structure.

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Thinking Questions

- Which part of the ship do you think was the most important for survival?

……

- If you had to sleep somewhere on the ship, where would you pick and why?

……

……

Activity 2: Pack Your Pantry

What Was Stored Below Decks on the Endeavour?
"Imagine you are about to set sail across the vast Pacific Ocean. No turning back. No shops. No fresh deliveries. Everything you need to survive - food, water, supplies - has to fit inside your ship before you leave. That's exactly what Captain Cook and his sailors had to do on the Endeavour. They filled the ship's hull with barrels and sacks, packed tight like a giant floating pantry."

Food	Amount (approximate)	How It Was Stored
Hard biscuits (hardtack)	9,000 kg	In big sacks
Salted beef and pork	5,000 kg	In barrels of salt
Dried peas	3,000 kg	In barrels
Oatmeal	5,000 kg	In sacks
Cheese (hard types)	1,000 kg	Wrapped and stacked
Sauerkraut (pickled cabbage)	3,000 kg	In barrels
Raisins and dried fruit	1,000 kg	In crates
Beer	About 250 barrels	Stored in wooden casks
Water	Stored in wooden barrels (often went bad!)	
Brandy and Rum	Stored in barrels (for officers mostly)	

Welcome to the Endeavour Café

(No swapping, no refunds, and no fresh fruit!)

Captain's Breakfast Combo

Crunchy Sea Biscuit
(Our famous hard-as-a-rock biscuit - smash it before you snack it!)

Warm Sea Brew
(Fresh from the barrel - choose from sour beer or warm water!)

Sailor's Midday Feast

Salt Slam Special
(A juicy piece of salted beef or pork - so salty you'll want a second drink! And watch out for maggots!)

Popcorn Peas
(Boiled dried peas - crunchy or mushy, mind your teeth!)

Second Helping of Crunchy Sea Biscuit
(Because you can never have too much biscuit... or can you?)

Sunset Snack

Mouldy Marvel Cheese Slice
(If you're lucky, it's still yellow!)

One last swig of Sea Brew
(Hope the rats haven't had a sip first!)

Captain Cook's Special Treats

Pickled Cabbage Poppers
(Tangy, crunchy, and keeps your teeth in your mouth!)

Magic Lime Juice Shot
(One gulp = one less chance of scurvy!)

Bon appétit, sailors!

Student Quick Response:

- How would you feel eating this every day for months?
- Which food would you miss the most from your normal lunch?
- Why do you think keeping sailors healthy was so hard?

Design Your Own Pantry

You are packing food for a voyage across the ocean. Your food must last months without a fridge, survive storms, heat, and rats! Here are the rules:

- No fresh fruit or sandwiches.
- Only pick foods that won't rot quickly.
- Think like a smart sailor!

Good Choices	Why?
Dried fruit (raisins, apricots)	Long-lasting sweet treat
Hard biscuits or crackers	Stay dry and last months
Nuts and seeds	High energy and durable
Pickled foods (like gherkins)	Don't need chilling
Salted meat or fish	Safe if kept dry and salty
Hard cheese (parmesan style)	Stores well without a fridge
Oats (porridge)	Easy to cook and filling

Pack Your Pantry Worksheet

Name: …… Date: ……

Your Mission:

You are sailing across the great Pacific Ocean. There are no supermarkets, no fresh deliveries, and no fridges! You must pack your ship's pantry carefully.

Choose six foods that will survive for months without rotting. Your is goal is to keep your crew alive, strong, and healthy!

Rules for Packing:

- No fresh fruit that goes soft and mouldy.
- No fresh dairy like milk or yoghurt that needs to stay cold.
- Only foods that stay safe and good for a long time.

Guide to possible food choices

Food	Why It's Good
Dried fruit (raisins, apricots)	Sweet and lasts a long time
Hard biscuits or crackers	Dry and tough enough for months
Nuts and seeds	High energy and don't spoil easily
Pickled foods (like gherkins)	Stay safe for months in jars
Salted meat or fish	Salt keeps it from going bad
Hard cheese (like parmesan)	Lasts without a fridge
Oats (for porridge)	Dry and filling

NAME OF FOOD	REASON FOR PACKING
1.	
2.	
3.	
4.	
5.	
6.	

Which food would you miss the most if you were sailing for months?

……

How would you protect your food from rats and salt water?

……

What tricks could you use to not get bored of eating the same things every day?

……

Activity 3: George Gray the Ship's Boy

Introduction
The youngest person aboard the Endeavour was around 11 years old and his name was George Gray. He was the lowest-ranked on board, and did general jobs: scrubbing the deck, fetching water, helping with ropes and sails, carrying messages. He slept in the lower decks with the rest of the crew, and learned basic seamanship by doing tough, hands-on tasks.

George worked long hours doing tough jobs. He probably couldn't write a real letter — but if he could, what would he have said? We've made up a letter, based on real evidence of what life was like aboard the Endeavour. It's a way to help us imagine: what young sailors felt, what the ship looked and smelled like, what food they ate, and the dangers they faced

Reminder: This letter is pretend. The feelings and details are based on history, but the words were written by us.

Student Activity: Think and Reflect

- What was George's job on the Endeavour?
- What were the hardest parts of life at sea for him?
- What surprised or amazed George during the voyage?
- Do you think George trusted Tupaia more than the captain?
- What part of George's letter made you feel something? Why?

A Letter from George Gray:
A Work of Historical Imagination

Dear Mother,

I hope this letter finds you, though I don't know who will carry it. I met a boy from another ship in Tahiti. He says he's sailing back to England and promised to find someone to take it to you. So I'll write in hope, not knowing if it will ever reach your hands.

My ship is called the Endeavour. It's big, not just in size, but in people. There are nearly 100 of us, all squashed in like herrings in a barrel. There's always shouting, stamping boots, and ropes creaking in the wind. The sea never stops moving, and neither do we.

My job is hard. I scrub the decks before the sun comes up. I carry water. I serve officers their tea. I climb the rigging with bare feet, even when it's wet and cold. I've learned to swing in a hammock without falling out, though sometimes the rats climb in first.

The food isn't what we had at home. Mostly hard biscuits made of flour and water and salt. They are so tough you have to smash them before you can chew. We eat salted meat and peas, and pick around the maggots. The water is warm and the beer that tastes like wet bread. One poor boy cried for two days before he got used to the smell below decks.

But we've seen things I never imagined. Bright blue fish that fly. Mountains that rise straight out of the sea. We stopped in a place called Tahiti a man called Tupaia joined our ship. He speaks our language and theirs. The men say he'll get us to a land they call New Zealand. I hope he knows the way. The sea is very big down here.

I miss your bread. I miss dry clothes. I miss quiet. But I wouldn't trade this journey for all the biscuits in London. I'm seeing the world, Mum. I wish you could see it too.

Your loving son,
George

Introduction

George Gray really sailed on the Endeavour. He was about 11 years old, and he worked as a ship's boy. In those days, we can assume that George couldn't read or write, but today we are going to imagine what he might have said if he had sent a letter home. It's a way to help us step into George's shoes and feel what it might have been like on a big voyage into the unknown.

Fun Challenge:
Would you survive life as a ship's boy? Circle 👍 or 👎

👍 👎 Could you climb a wet rope in a storm?
👍 👎 Could you smash a biscuit to eat it?
👍 👎 Could you sleep while in a hammock with rats?
👍 👎 Could you spend months without a bath?

Optional Extension Exercise:
Imagine if George had stayed at home instead of sailing! Life for poor boys in England could be even harder:

- **Chimney Sweep:** Climbing up inside narrow chimneys to scrape away soot. Dangerous, dirty, and very easy to get stuck or injured.
- **Coal Mine Hurrier:** Dragging heavy carts of coal through tiny, dark tunnels underground. Hard, hot, and very dangerous.
- **Sewer Scavenger (Tosher):** Wading through filthy sewers to find coins, metal, or anything worth selling. Smelly and full of disease.

Research or imagine what a day in George's life might have been like if he never sailed on the Endeavour. Draw a picture or write a short paragraph about it!

Activity 4: Tupaia's First Night

Teacher Introduction:

"You've explored the structure of the Endeavour. You've packed its pantry and thought about survival at sea. You've seen what life was like for a young ship's boy like George Gray. Now, imagine stepping onto the Endeavour from a completely different world. Not from England - but from Tahiti. Tupaia was a high priest, a master navigator, and a respected leader from Tahiti. He joined the Endeavour to help guide the ship across the Pacific and to build bridges between peoples. Tupaia lived with the officers, not crammed down below with the common sailors. But even the officers' world was strange to him - the smells, the food, the noise, and the dark narrow spaces. Tupaia did not keep a diary, and we don't know exactly what he thought. But today, you will imagine his first night aboard the Endeavour, using everything you have learned about the ship, the food, and the life at sea."

Writing Challenge:

Write a diary entry as if you are Tupaia, describing your first night on the Endeavour as it leaves Tahiti to sail to New Zealand.

Things to Think About:

- What strange foods does he see (or taste)? (hardtack, salted meat, pickles)
- How does the ship feel compared to a waka hourua? (dark, crowded, heavy)
- How do the common sailors live, compared to the officers?
- What smells fill the ship? (tar, smoke, stale food, unwashed clothes)
- How does he feel about trusting these foreign sailors to cross the great ocean?

Helpful Sentence Starters:

- "Tonight, I sleep inside a wooden island, far from the open stars..."
- "The air smells of salt, sweat, and strange cooking..."
- "Their food is heavy and sour, not like the gifts of the sea I know..."
- "Below me, the men sing, shout, and cough in the darkness..."

Tupaia's Diary Worksheet

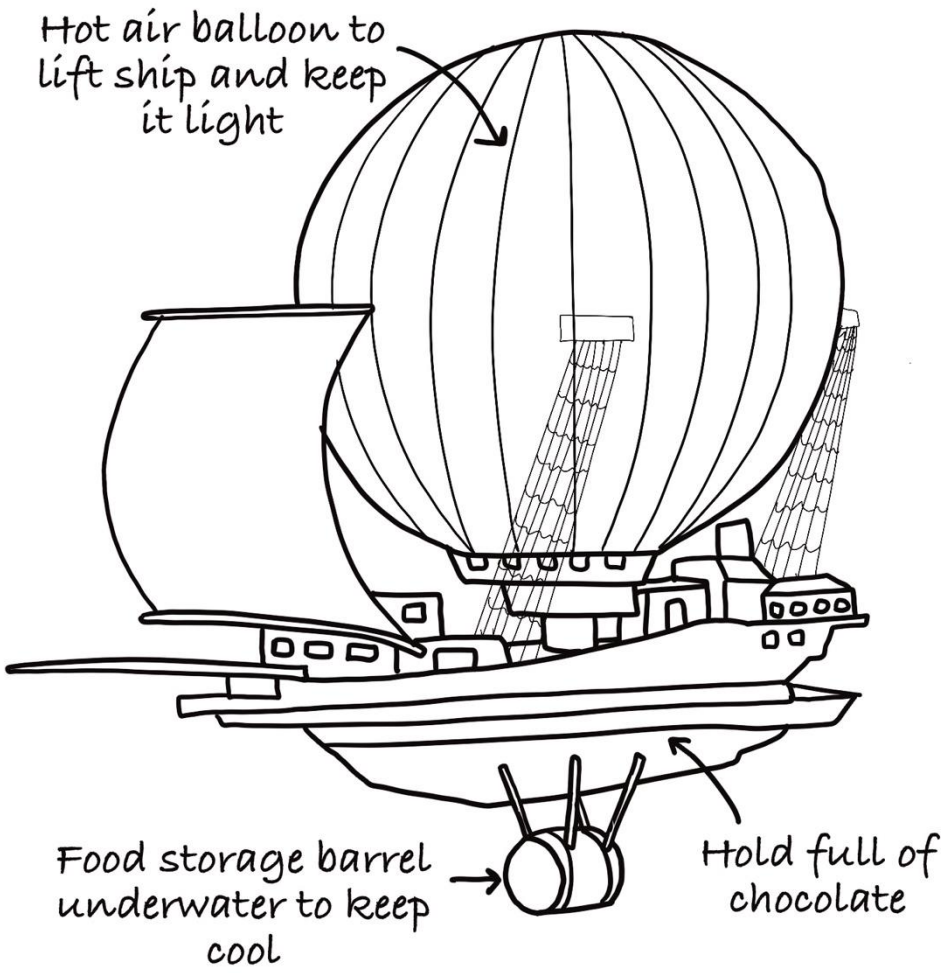
Name: ……. Date: ……

Your Mission:
Imagine you are Tupaia, a Prince and Priest from Tahiti. You have just joined Captain Cook's ship, the Endeavour. Everything around you is new - the ship, the food, the people, the smells. Tupaia didn't keep a real diary - so today, you will create an imaginary diary entry for his very first night aboard.

Remember:
Tupaia lived with the officers, not with the common sailors like George Gray. But he could still see and hear what life was like for everyone else on the ship. Even the officers' food, smells, and customs would seem strange to him.

Think About:
- What might Tupaia see?
- What might he smell?
- What might he hear?
- What might he feel or think?

14 July 1769. Day One at sea from Tahiti



Activity 5: Design Your Ultimate Ocean Explorer Phase Two

Teacher Narration:

"At the start of our unit, you began designing your ultimate ocean explorer vessel. Now you have learned so much more:

- How real ships like the Endeavour were built to survive the ocean
- How important it is to plan food and supplies carefully
- How cramped and challenging life could be at sea

Now it's time to return to your design. You are the shipwrights, the captains, the explorers!
Your task is to improve your vessel using all the new knowledge you have gathered. Your new design must be ready to survive the ocean for many months, not just a short trip

- Will you need more storage?
- A better way to catch fresh water?
- Smarter places for people to sleep, cook, or stay dry?"

Teacher Notes:

Students apply learning from waka hourua, Endeavour, and life at sea to modify and improve their original explorer vessel designs. Designs must show understanding of survival needs (food, water, shelter, safety). Encourage creative solutions: they can invent clever storage, or floating gardens!

Instructions

1. **Revisit Your First Boat Design:**
   Look at the explorer boat you designed during Lesson One. Now ask yourself — is it good enough to survive a real voyage across the ocean?
2. **Think About What You Learned:**
   Would your boat have enough food and clean water? Where would people sleep when storms hit? How will you store supplies so they stay dry and safe from rats?
3. **Redesign or Improve Your Boat:**
   Add better food storage spaces. Plan water storage or a rain catcher. Make safer spaces for your crew to live. Use clever ideas — maybe sails that also collect rainwater, or decks that open and close!
4. **Draw and Label Your New Design:**
   Draw your improved explorer vessel. Label the important parts. Explain the new features and why you added them.

Design Your Ultimate Ocean Explorer Worksheet Phase Two

Name: ……. Date: …….

Your Mission:
You have already created your first design for the ultimate ocean explorer. Now, after learning about the Endeavour and life at sea, it's time to improve your ship!

Use everything you know about:

- Storage: Where will you keep food and fresh water?
- Shelter: Where will people sleep to stay dry and warm?
- Strength: How will your boat survive big storms and huge waves?
- Fresh Air and Light: How will you stop your ship from getting too dark, stuffy, or smelly?
- Movement: How will your boat sail or move safely across the ocean?

2. Redraw Your Design

- Add new ideas.
- Label important features.
- Show storage spaces, living areas, sails, and anything clever you invented!

What is one big improvement you made to your first design?

……

……

How will your new design help your crew survive a long journey?

……

……

What idea inspired you from the Endeavour?

……

……

Endeavour in 3D

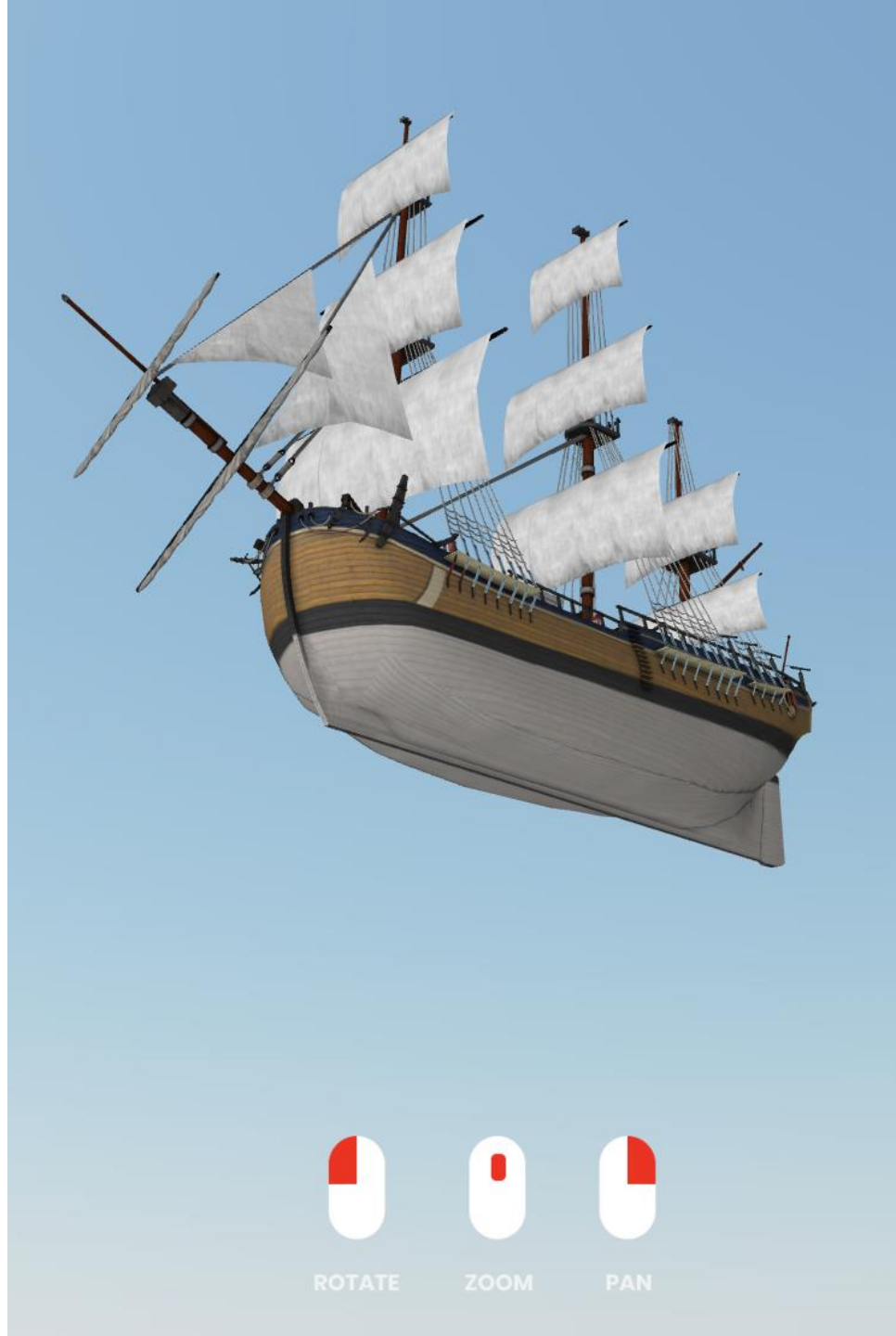
For a 360 degree view of the Endeavour, visit the Land of Voyagers website and take a look at a 3D model of the Endeavour replica that sailed to New Zealand as part of the Tuia 250 commemorations.

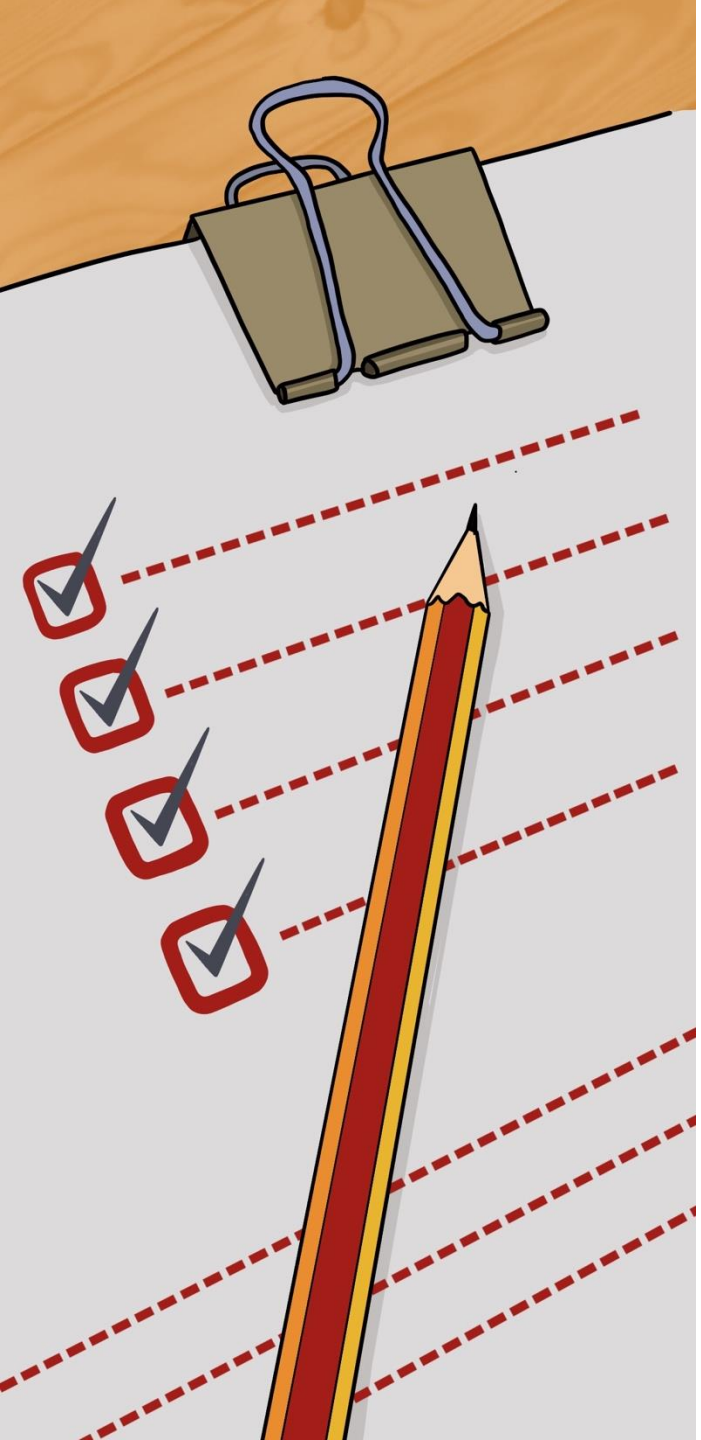
Click here

Tricky Words

Here is a glossary of tricky words found in the Endeavour lesson plan.

Word	Meaning
Endeavour	The name of Captain Cook's ship. It means "to try hard."
Hardtack	Very hard, dry biscuit that sailors ate. It lasted a long time.
Salted meat	Meat kept in lots of salt so it wouldn't go bad.
Porridge	Warm, thick food made by cooking oats with water.
Dried peas	Hard peas that sailors soaked in water before eating.
Ballast	Heavy weights (like metal) in the bottom of the ship to keep it steady.
Pig iron	Big rough chunks of heavy metal used as ballast.
Hull	The main body of a ship — the big part that floats.
Deck	The flat surface you walk on — like a floor on a ship.
Mast	A tall pole that holds up the sails.
Rigging	All the ropes and chains that control the sails and masts.
Hammock	A hanging bed made from cloth, swinging between two points.
Pantry	A place where food is stored. On ships, food was packed into barrels and sacks.
Pickled	Food that is soaked in vinegar or salty water to keep it from rotting.
Scurvy	A disease sailors got from not eating enough fresh fruit or vegetables. It made their gums bleed and teeth fall out.
Navigator	A person who finds the way across the sea by using stars, maps, and the sun.
Transit of Venus	A special event when the planet Venus moves across the Sun. Cook went to the Pacific to watch this.

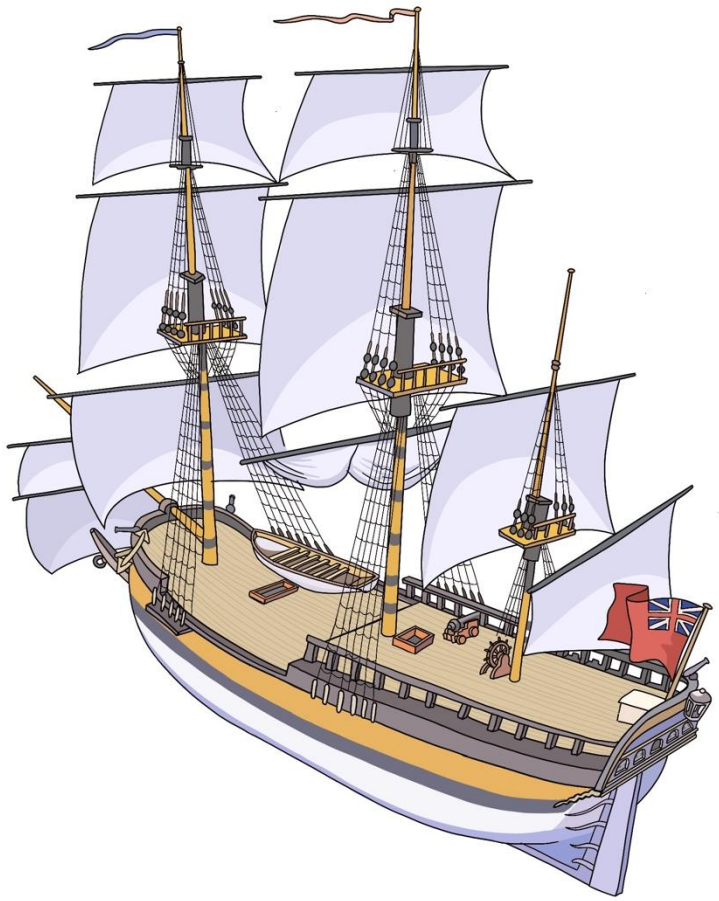




Assessment: Tupaia’s First Night

- Use this rubric to assess students' ability to combine imagination with historical knowledge.
- Encourage students to check their writing against these goals before handing it in.
- Praise effort, creativity, and thoughtful connections to the life aboard the Endeavour.

Criteria	Excellent	Good	Needs More Work
Historical Understanding	Diary shows deep understanding of life aboard the Endeavour. Includes specific details (food, smells, sounds, living spaces).	Diary shows some understanding of life aboard the Endeavour. Some details included.	Diary shows little understanding. Few or no details from what we learned.
Point of View	Strong voice of Tupaia. Feelings and thoughts clearly imagined from his perspective.	Mostly in Tupaia's voice. Some feelings or thoughts shown.	Hard to tell it's Tupaia speaking. Very little feeling or imagination.
Creativity and Imagination	Writing paints a vivid picture. Uses powerful describing words and sensory language (smell, sound, sight, touch).	Writing uses some describing words. A few senses mentioned.	Writing is plain. Few describing words or sensory details.
Structure and Effort	Clear diary format. Full sentences. Careful effort shown.	Mostly diary format. Some mistakes, but clear overall.	Hard to follow. Not organised like a diary. Very rushed or incomplete.
Links to Lesson Learning	Reflects ideas from packing the ship, food challenges, and life on board.	Reflects some ideas from earlier lessons.	Little or no link to previous learning.



Learning Intentions and Key Competency Overview

This overview outlines the learning intentions, success criteria, and key competencies for the lessons in *The Great Boat Build* Unit. Use it as a planning and reflection tool.

Lesson Two: The Endeavour - Sailing into the Unknown

Learning Intentions

- Compare waka hourua and the Endeavour by structure, purpose, and experience.
- Understand daily life aboard 18th-century ships through empathy and imagination.
- Strengthen explorer vessel designs based on survival needs.

Success Criteria

- I can label the main parts of the Endeavour and explain their function.
- I can describe what sailors ate and how they stored food.
- I can imagine and write from the perspective of someone on board.

Key Competency Integration

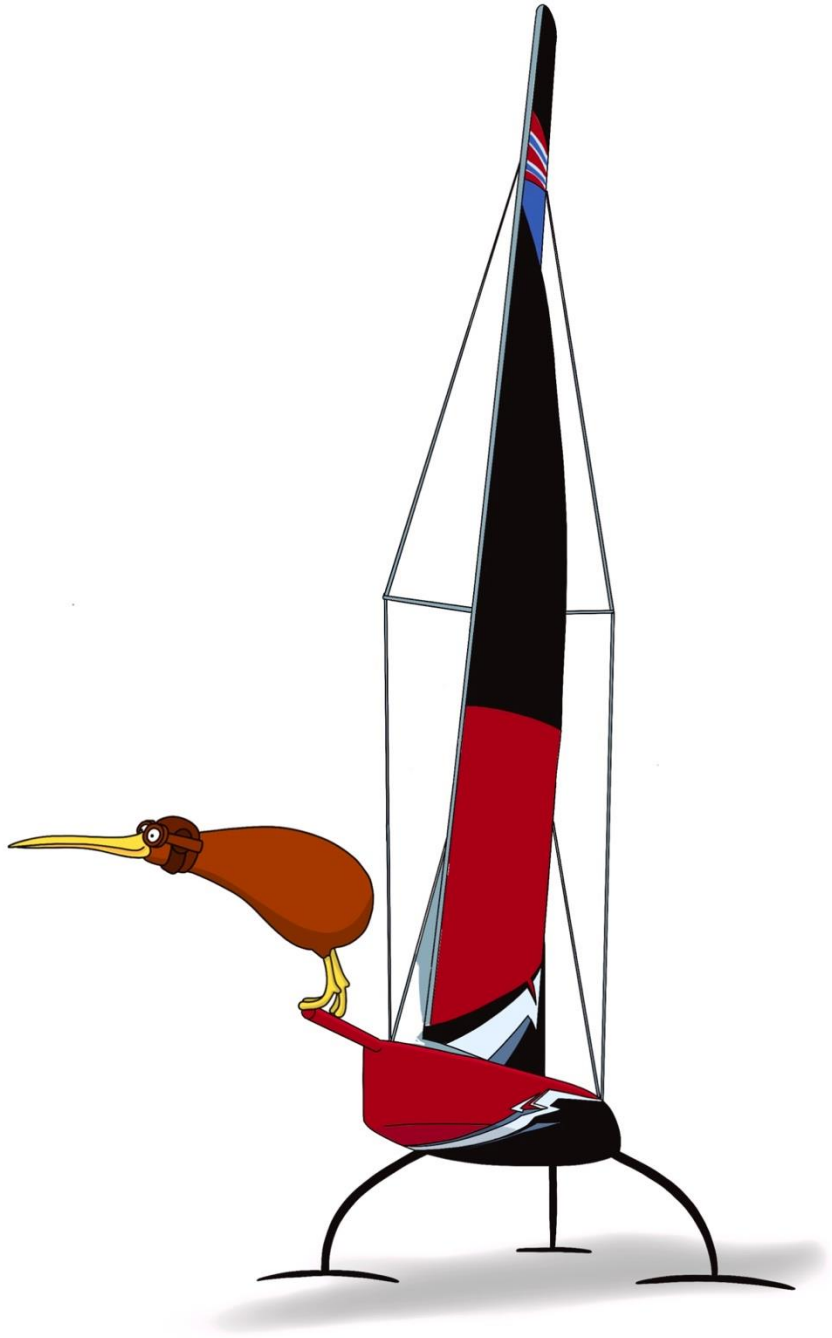
- *Thinking:* Comparing historical technologies and making improvements.
- *Relating to Others:* Exploring different worldviews (e.g. George Gray vs. Tupaia).
- *Managing Self:* Reflecting on feedback and refining ideas.
- *Using Language, Symbols, and Texts:* Writing creatively, reading maps and diagrams, summarising findings.

Lesson Three: Team New Zealand: Making Boats Fly

In this lesson, students explore how New Zealand sailors used innovation and clever thinking to revolutionise sailing - lifting boats out of the water to fly across the sea. Students will connect the concept of foiling boats to hands-on engineering by building their own land yachts. They will also explore resilience and creativity through the story of Glen Ashby and how he adapted to new challenges. Finally, students will apply their new knowledge to redesign and improve their ultimate ocean explorer vessel, using ideas from the world of hydrofoils, wing sails, and speed innovation.

Learning Objectives:

- Understand how foils and wing sails help boats travel faster by reducing drag.
- Recognise the role of New Zealand innovation in world sailing achievements.
- Experiment with basic principles of wind power, speed, and vehicle design.
- Build and test a simple land yacht and reflect on design improvements.
- Analyse and discuss Glen Ashby's story of resilience, problem-solving, and success.
- Apply creative thinking to redesign their explorer vessel, using new knowledge about speed, efficiency, and survival at sea.



Materials Needed

Worksheets
for recording results

Pencils and erasers

Scissors

Stopwatches
or phones for timing

Hairdryer
or fan

Adhesives
Sticky tape, glue, Blu tack

Rulers
For measuring

Materials from home
Plastic bottles, boxes, wheels, LEGO, straws, skewers

Prize Certificates
Fastest, Best design, best teamwork etc.

Calculators
Optional

Reading
Printed copies of *"The Boy Who Sailed on Land"*

Digital Resource 1
Video

"How to Sail Horonuku".

Click here

Digital Resource 2
Video:

"World Land Speed Record Broken"

Click here

Chalk or tape
To mark racecourse on floor

Graph Templates

Introduction

Teacher Narration

"New Zealand is a nation born of sailors. Long before planes flew in the sky or cars raced on roads, the first people who reached Aotearoa crossed the biggest ocean on Earth - guided only by the stars, the sun, the wind, and their own courage. From the earliest waka hourua to the great sailing ships of explorers like Captain Cook, our history has always been tied to the sea. That spirit never left us. It became part of who we are.

Today, we say: innovation is in our DNA. That means New Zealanders are famous around the world for inventing clever ways to sail faster, smarter, and braver than anyone else. And no one shows that better than Team New Zealand. They didn't just build better boats. They built boats that fly. Boats that lift up out of the sea on tiny underwater wings called foils, soaring across the waves at incredible speeds. Today, you'll see how they did it.

Click here

Click on the link for an introduction to the incredible innovation of the designers at Team New Zealand:

Teacher Background

Key Concepts

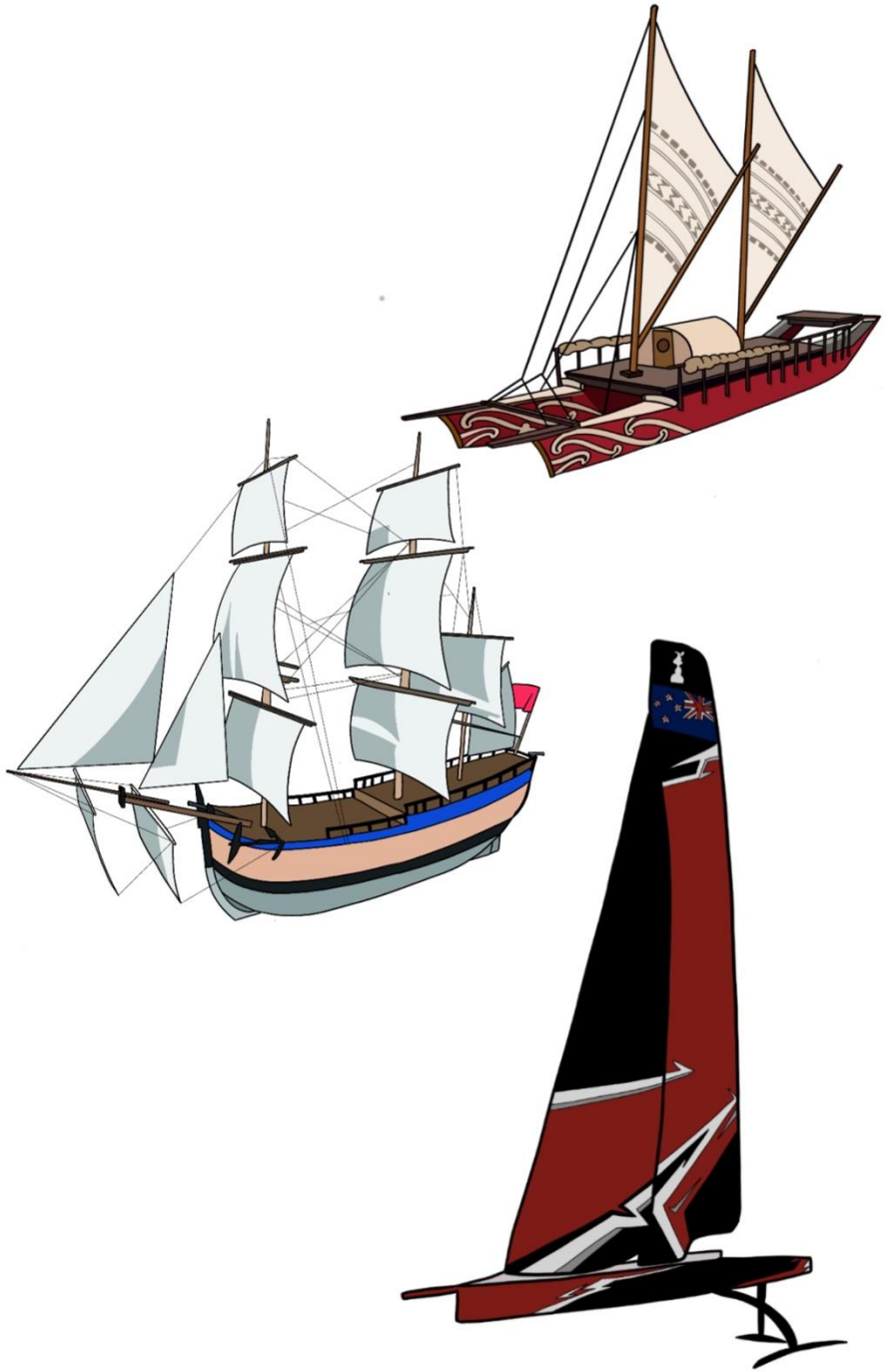
- **Tradition and Innovation:** New Zealand honours the past — but we don't get stuck there.
- **Clever Thinking Beats Big Money:** Team NZ proved that smart design and teamwork could beat much bigger, richer teams.
- **Foiling Changed Everything:** Lifting out of the water cut drag, boosted speed, and redefined sailing forever.
- **Young People Drive the Future:** Eloise Beavis's story shows that youth energy, skills, and imagination can change the world.

A Nation of Sailors and Inventors

New Zealanders have always been ocean people. From the first great waka hourua that crossed Te Moana-nui-a-Kiwa (the Pacific Ocean), to the modern-day explorers racing across oceans at breakneck speed, innovation has always been in our DNA. Sailing is not just a sport here — it's part of our story. And every generation has pushed the boundaries just a little further.

From Heavy Hulls to Flying Boats

For more than 150 years, the world's fastest racing yachts were traditional monohulls held steady by deep keels full of heavy ballast, battling resistance every wave of the way. Then came a daring idea: What if we could lift the boat out of the water altogether? Instead of dragging through the sea, what if a boat could fly above it? This was the birth of foiling boats - using clever underwater wings (foils) to lift a whole boat into the air. Suddenly, the water's drag was gone. And the speeds? They doubled.



Team New Zealand: Leading the Revolution

When the world thought foiling was crazy, Team New Zealand made it happen. They didn't just build faster boats - they redesigned sailing.

In the America's Cup, Team NZ launched boats that could fly - lifting clear of the waves, skimming on thin hydrofoils, using soft twin-skin wings instead of flapping cloth sails. These new boats were not slow and steady - they were fast, daring, and radically different.

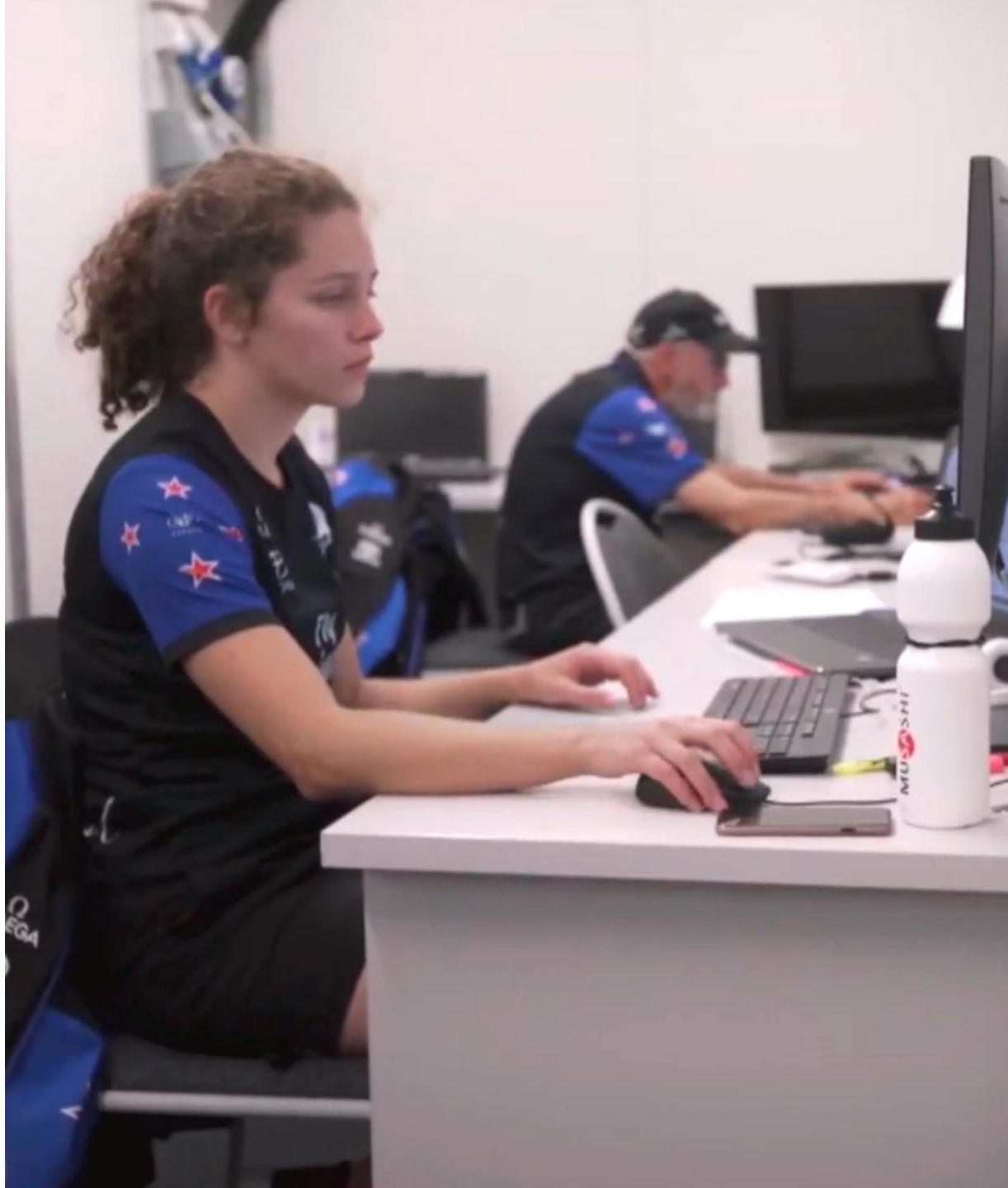
And they weren't built by grey-haired veterans either. Young Kiwis were at the heart of the innovation. One of the brightest stars was Eloise Beavis.
In her early twenties, she was already working on the design and build of the world's most advanced foiling yachts. She used her skills in engineering and science to rethink how boats balance, move, and stay fast. Her work helped Team New Zealand win the America's Cup and inspired a whole generation to think bigger.

Why This Matters for Your Students:

Sailing history connects us to science, technology, and courage. Foiling boats show design thinking at its best — bold ideas, tested, tweaked, and flown. New Zealand's story proves that small countries and young minds can lead the world with big ideas.

Takeaway Message:

Innovation in New Zealand is not just for the old and wise.
It belongs to every kid with a clever idea and the courage to try it.



How to sail Horonuku

Click here

New Wind Powered Land Speed Record

Click here

Introduction to Land Yachts

Teacher Narration

”Unfortunately, the only way we can build and test real boats inside the classroom would be fill the room with water, and then the principal would definitely yell at us. But we can build and race the next best thing: a land yacht - a wind-powered vehicle that races across the floor instead of across the sea.

Just like Team New Zealand, you’re going to use clever design, wind power, and lots of experimenting to make your machine go as fast and as far as possible. So your mission is to build a land yacht that moves using only the power of the wind. Then we test it. Improve it. And then you race it against others!"

What is a Land Yacht?

A land yacht is like a sailboat — but instead of floating on water, it rolls across the land on wheels! It uses a sail to catch the wind, just like a boat does. The wind pushes against the sail, and instead of sliding through water, the land yacht rolls forward on its wheels. And land yachts can travel very very fast!

Glen Ashby And Horonuku

Today we’re going to meet a boy who built a device to sail on land, who went on to break the world record for the fastest land yacht! Glen Ashby is an amazing sailor who has been part of America's Cup-winning Team New Zealand since 2013. But Glen has always loved using the power of the wind to travel fast on land, and that's why he helped use the technology behind the America's Cup boats to build a record-breaking land yacht! Here are a couple of videos to see his land yacht racing on a dry lakebed in Australia.

Activity 1: The Boy Who Sailed On Land

Step 1. Shared Reading

Read this short story aloud to the class:

The Boy Who Sailed On Land

Glen Ashby was a boy who loved to sail. He grew up near a big, beautiful lake in Australia, where the wind would fill his sails and send his boat gliding over the water. Glen spent hours practicing, learning how to catch the wind just right. But one summer, something strange happened—the lake dried up! The water was gone, leaving behind cracked mud and dust. Most kids might have put away their boats and found something else to do, but not Glen. He loved sailing too much to stop.

Instead of giving up, Glen had an idea. If he couldn't sail on water, why not sail on land? He began building land yachts—special carts with wheels and sails that could race across the dry lakebed. Using old parts and a lot of clever thinking, Glen made his first land yacht. The wind caught the sail, and off he zoomed! Glen spent hours racing his land yachts, learning how to go faster and turn quicker. He didn’t need water; all he needed was the wind and a wide-open space.

Years later, Glen’s love for sailing took him all over the world. He became a champion sailor and joined Team New Zealand, one of the most famous sailing teams in the world. The engineers at Team New Zealand were known for their revolutionary designs—boats that could lift above the water and fly on hydrofoils, using wings instead of traditional sails to catch the wind.

Glen played a big part in testing these new designs and making them even faster. His skills helped Team New Zealand win the America's Cup in 2017, defending it at home in Auckland, and again in Barcelona, using the latest wing technology that was lighter and more powerful than ever before.

But Glen never forgot his land-yachting days. With a team of experts, he built a land yacht that was faster than anything the world had ever seen. They named it Horonuku, a Māori word that means “to fly across the land” or “to move swiftly over the earth.” This name was chosen to honour the way the land yacht seemed to glide over the dry lakebed, almost like it was flying.

Using the same special wing technology that helped Team New Zealand win the America's Cup, Glen set out to break the world record. On a huge, dry salt lake, Horonuku whooshed forward, faster and faster, until it reached an incredible speed of 222 kilometres per hour! That’s about as fast as a racing car and more than three times the speed of a cheetah, the fastest animal on land. Imagine zooming down a road so quickly that even the wind struggles to keep up!

Glen's adventure shows that when you love something, there’s always a way to keep doing it, no matter what gets in your way. Whether on water or land, Glen’s sails were always full of wind and dreams. And that’s how a boy who loved sailing on a lake ended up racing across the land—and the ocean—faster than anyone else in the world!

Step 2: Understanding the Story:

Students answer these comprehension questions individually or in pairs:

- What was Glen's favourite thing to do when he was young?
  (Short answer)
- What happened to Glen's favourite place to sail?
  (Short answer)
- What did Glen do when he couldn't sail on water anymore?
  (Short answer)

Looking Deeper:

- Why do you think Glen didn't just give up when the lake dried up?
  (One or two sentences)
- What skills did Glen use when he built his first land yacht?
  (Choose two or more: imagination, teamwork, bravery, laziness, determination)

Connecting to Innovation:

- How is building a land yacht an example of "innovation"?
  (Explain in your own words)
- How did Glen's land yacht lead to something even bigger later in his life?
  (Link his early ideas to Team New Zealand and the speed record.)

Reflecting Personally:

- Have you ever had to change your plan because something didn't work?
  (Short story or drawing option.)

Step 3: The Think Like Glen Challenge

“Imagine you are teenage Glen. You love sailing, but your lake has dried up. You have a pile of old bits — wood, rope, wheels, sticks, sheets — and a big open space to race across. No engines. No magic. Just wind power, scrap materials, and your clever brain!”

Instructions:

“Get into groups of four because we are going to test your ability to think fast like Glen! You’ll get a problem card - maybe you have a broken mast, or perhaps it’s a sneaky dust storm. You will have just two minutes to think of a clever solution. Your answer must be realistic — what could Glen actually build or fix with stuff from home, the shed, or a paddock on the farm? You’ll work fast, you’ll think smart, and you’ll share one brilliant idea with the class. Ready to think like Glen? Let’s go!”

Ground Rules:

- Groups have 2 minutes to brainstorm a solution once they get their card.
- Use your imagination — but keep it realistic. (No lasers, rockets, or teleporters!)
- Solve the problem with what a teenager could find in a garage, shed, or backyard.
- Be ready to share your idea in one strong sentence after your brainstorm.

Serious and Silly Cards

Print both pages of cards for this Activity. Cut along the table grid lines around each card, then stack into "Serious" and ”Silly" piles for classroom use.

Why Serious Challenges?

- Encourage logical thinking.
- Develop real-world problem-solving skills.
- Help students understand that design problems happen all the time

Why Silly Challenges?

- Unlock creativity and imagination.
- Allow students to think outside the box while still staying grounded in realistic materials.
- Innovation often starts with a crazy idea - he trick is adapting it to work in real life.
- Keep the energy fun, playful, and high - building a positive, resilient learning culture.

No Sail!

Your sheet is ripped. What else could you use to catch the wind?

Flat Tyre!

One wheel has popped. What could you use instead?

Wind in the Wrong Direction!

The wind is blowing sideways! How could you still move forward?

Wheels Keep Falling Off!

Your wheels keep falling off. How could you fix them?

Stuck in the Dirt!

The ground is rough. How could you make your yacht roll better?

Bent Axle!

Your axle is bent and wobbly. How can you make a straighter one?

Mast Too Short!

Your mast is too short. How could you make it taller or stronger?

Heavy and Slow!

Your yacht is too heavy. How could you make it lighter?

Balance Problems!

Your yacht tips over easily. How could you fix the balance?

Sail Keeps Tearing!

Your sail rips in strong wind. How could you make it stronger?

Flies Everywhere!

Flies are buzzing around your face. How could you protect yourself?

News Crew Panic!

The TV crew is filming! How could you quickly fix your sail or wheels?

Your Friend Wants a Turn!

Someone else wants to drive your land yacht. How can you make it safer?

Dust Storm!

A dust storm blows through! How could you protect your eyes and sail?

Sail Made from Mum's Best Tablecloth!

Mum wants her fancy tablecloth back! What else could you use quickly?

Ants Attack!

Your yacht is crawling with ants! How can you clean it up quickly?

Borrowed a Shopping Trolley!

You "found" a shopping trolley. How could you turn it into a land yacht?

Borrowed Tools Vanish!

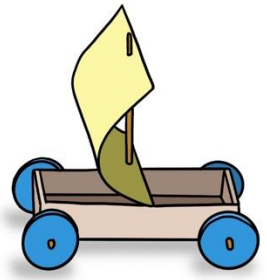
Your mate took all the good tools. What else could you use?

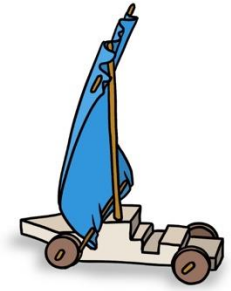
Sleeping Under the Stars!

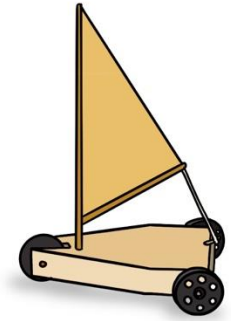
You have to camp out with your land yacht. How could you make it comfy?

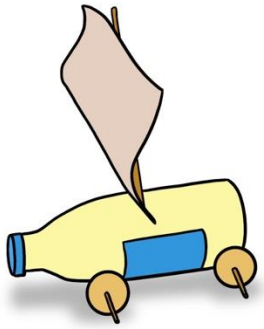
Heatwave Trouble!

Your hands keep slipping in the heat! How can you keep control?









Activity 2: Building Your Land Yacht

Part A. Planning (work in pairs)

Before you start building, you need to think like an engineer and design your land yacht carefully. Team New Zealand didn't just glue a few bits together and hope it worked. They planned, tested, improved, and succeeded. Today, you'll do the same!

Step 1: Think About the Big Questions

Before you draw anything, ask yourself:

- How big will my land yacht be? (Bigger is heavier, smaller is faster!)
- How wide should the base be? (Wide = more stable. Narrow = faster but wobblier!)
- Where will the mast go? (Centre or closer to the back?)
- What shape will my sail be? (Big rectangle? Triangle? Something wild?)
- How will I keep my wheels straight and spinning freely?

Step 2: Materials Planning

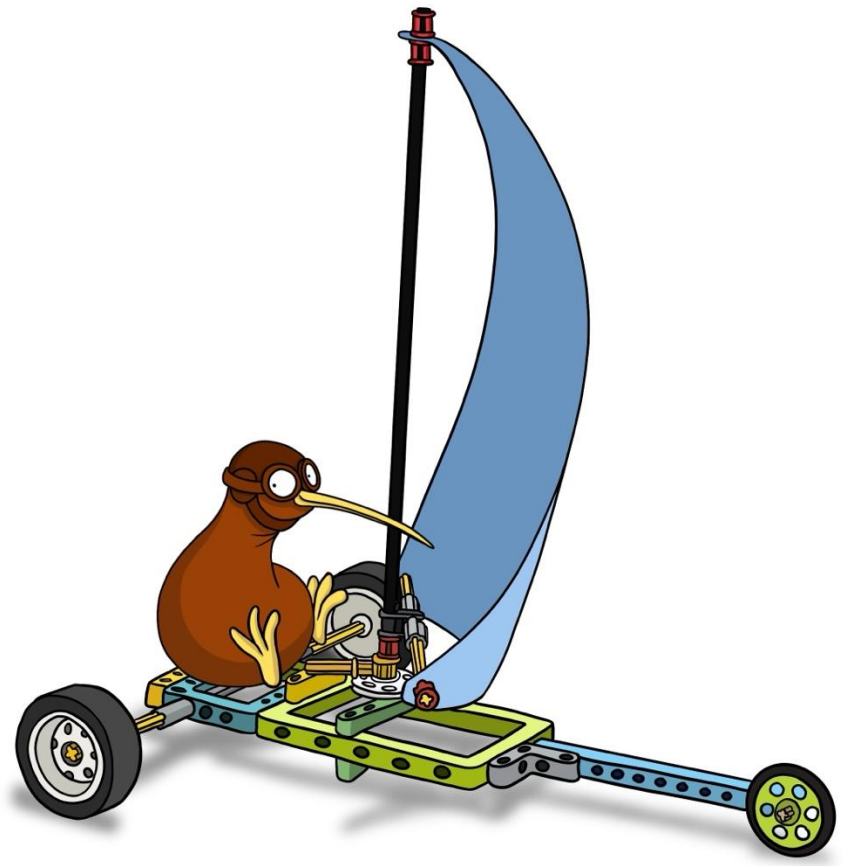
Think carefully about what you will build your land yacht from.

Part	Material Ideas
Base/body	Cardboard, plastic bottle, small box, ice cream sticks, LEGO pieces
Axles	Straws, skewers, dowels
Wheels	Bottle caps, old toy wheels, cardboard discs
Mast	Skewers, sticks, strong straw *(how is it attached?)*
Sail	Light paper, plastic, cloth

Step 3: Sketch Your Design

Draw your land yacht plan on paper. Include:

- The shape of the body
- The position of the wheels and axles
- The mast and sail location
- Any special ideas you have (like extra stabilisers or clever shapes!)



Part B. Building (work in pairs)

Now that you have planned your design, thought about your materials, and brought in extra equipment from home, it's time to build! Remember: even Team New Zealand's first ideas didn't always work — building is about testing, adjusting, and improving as you go.

Step 1: Build Your Base and Wheels

Try building the base/body first, attach your axles firmly under the body. Then attach the wheels onto the axles.

- Check: Do your wheels spin freely?
- Check: Are they straight so your land yacht can roll properly?

Step 2: Attach Your Mast

Use your chosen material (skewer, stick, straw) for the mast. Question: How is it attached to the base? Your mast must stand upright and strong enough to hold a sail.

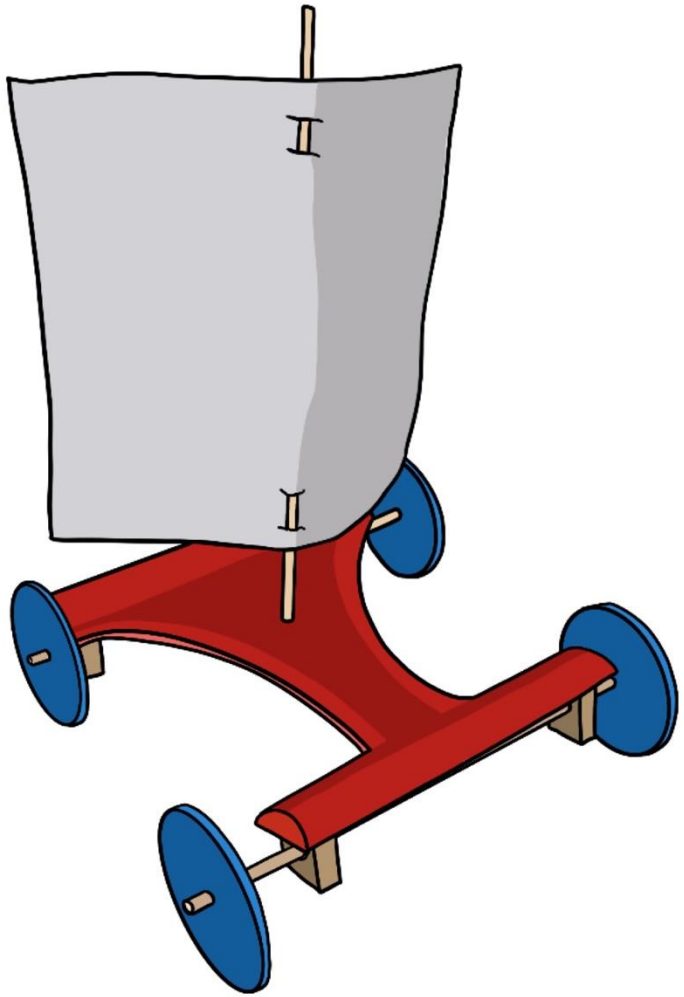
- Tape it securely?
- Punch a hole and slot it in?
- Build a stable mast base with LEGO?

Step 3: Make and Attach the Sail

Cut your sail out of light material (paper, light plastic, cloth). Attach the sail to the mast. Tape it? Tie it? Make sure the sail can catch the wind without bending too much!

Step 4: First Test Run!

Place your land yacht on a smooth surface. Blow into the sail, or use a fan or hairdryer to create wind. Watch how it moves!



Step 5: Improve Your Design

Real engineers always test, tweak, and test again! After the first test, think:

- Is your land yacht stable?
- Does it roll straight?
- Is your sail too small, too big, or too floppy?
- Can you make it lighter, stronger, faster?

Step 6: Name Your Land Yacht

Every great sailing vessel needs a name! Choose a name that shows speed, power, or clever thinking - just like Team New Zealand's real craft, like Horonuku ("gliding swiftly across the land").

Here are some examples:

- "Wind Dancer"
- "Storm Flyer"
- "Sir Wobbles-a-Lot"
- "Captain Crash"
- "The Flying Sausage"
- "Taihoro"

Step 7: Predict Your Race Performance

Before you start racing your land yacht, look at you design carefully. Think about:

- Is it lightweight?
- Is the sail big enough?
- Are the wheels straight?

Write a short prediction:

"I think my land yacht will go _____ because _____."

Examples:

"I think my land yacht will go fast because it has a big sail and smooth wheels."

"I think my land yacht might wobble because my axles are a little loose."

Build Your Land Yacht Worksheet

Name: …….. Date: …….

Materials Planning:

Remember you can bring materials from home if needed.

Part	Material We Will Use
Body	
Wheels	
Axles	
Mast	
Sails	
Ropes/ties	

What could go wrong with your land yacht?

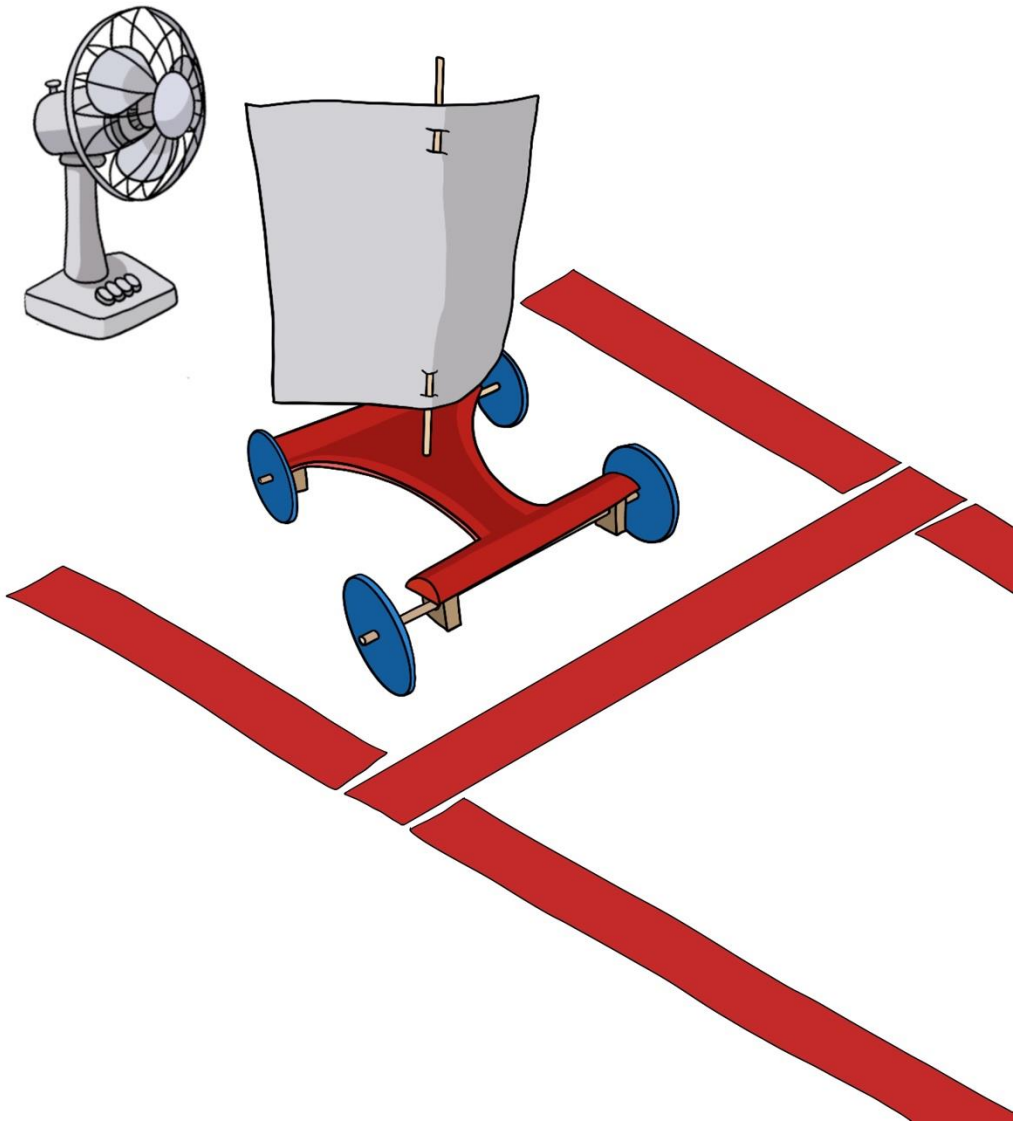
……

One way I could make my land yacht stronger or faster is:

……

Design Sketch:

Draw your land yacht here.



Activity 3: Race Your Land Yacht (working in pairs)

Teacher Narration

"Today is the big day! You have designed, built, tested, and named your land yachts - now it's time to race them! Like real engineers and racers, you're not just trying to win - you're collecting data, learning from the results, and thinking like innovators. Remember: the fastest yachts aren't always the fanciest. Clever designs, good planning, and tiny improvements can make a big difference!"

Step 1: Build Your Racetrack

- Find a long, flat surface (school hall, gym, hallway, or classroom).
- Mark a Start Line and a Finish Line using masking tape.
- Measure the distance between Start and Finish (e.g., 2 metres).
- Mark lanes if you want side-by-side races (optional).

Step 2: Set Up the Wind Source

- Set up a fan or hairdryer at the start line.
- Make sure it's on a safe setting (cool air if using hairdryers).
- Check that the wind blows steadily down the track.

Step 3: Safety Check

- No running or crowding near the fan or track.
- Stay behind the Start Line unless it's your turn.
- Gentle handling of yachts — no crashes on purpose!

Step 4: Race Time!

- Use a stopwatch to time how long it takes each yacht to reach the Finish Line.
- Record every time carefully on a class chart.
- Each yacht gets three runs to get the best average.

Step 5: Five-Minute Pit Stop

Remember real engineers and sailors tweak their designs after each test. Making improvements is part of the race! After the first round of racing is finished, racers have five minutes to:

- Repair any broken parts
- Adjust sails and wheels
- Change designs slightly for better speed or balance

Step 6: Race Time – Final Runs

After the pit stop, each yacht does two more runs. Record times carefully.

Step 7: Calculate Average Time

After racing, it's time to work out the average time for each land yacht. 'Average' means how fast your car went most of the time. Imagine your car raced down the track in times of 4,5 and 4 seconds. Use this equation to find the average:

$$\text{Average Time} = \frac{\text{Run 1} + \text{Run 2} + \text{Run 3}}{3}$$

$$\frac{4+5+4}{3} = 4.\overline{3} \text{ seconds}$$

Step 8: Calculate Average Speed

Speed is how fast something moves over a certain distance. It tells us how much ground it covers in a set time.

To calculate speed you need two things: the distance your yacht travelled (in metres) and the average time it took (in seconds). Then use the formula: speed = distance divided by time.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

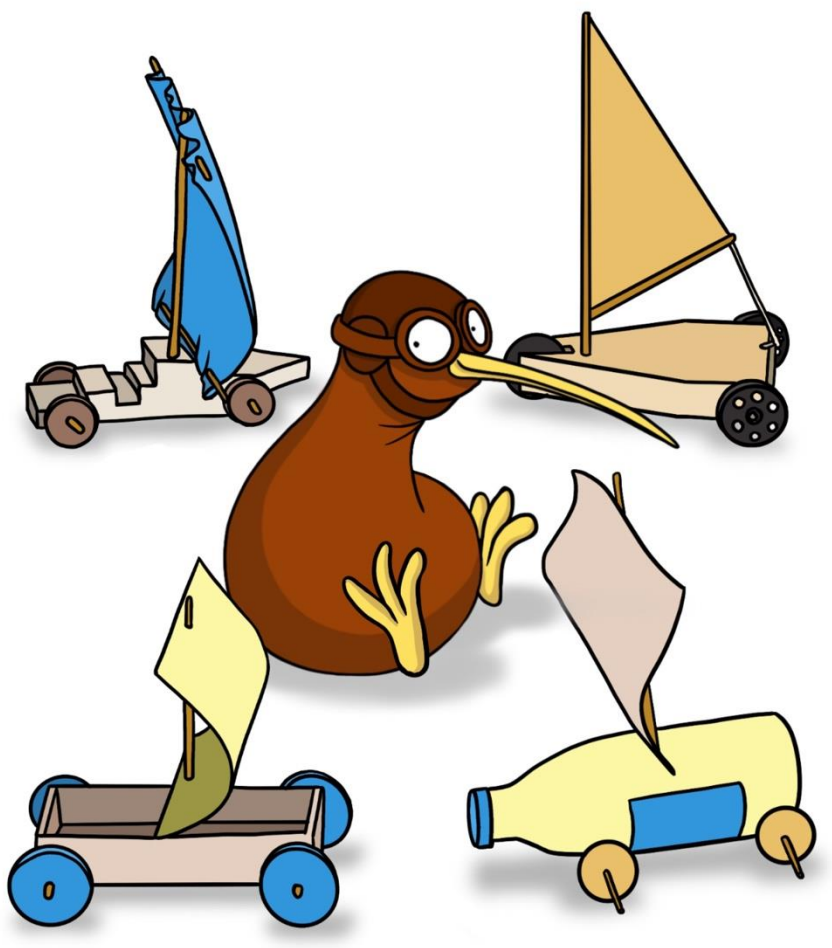
Example: If your car took 4 seconds to travel 200 centimetres:

$$\text{Speed} = \frac{200}{4} = 50 \text{ cm per second}$$

Step 9: Create a Bar Graph of the Results

A bar graph shows information clearly. Each yacht gets its own bar.
Taller bars = slower speeds. Shorter bars = faster yachts!

- Draw two big lines to make an L shape (this will be your graph's axes).
- Across the bottom (X-axis): write the names of all the yachts (one for each bar).
- Up the side (Y-axis): write the numbers for average speed.
- Choose appropriate scale based on the range of speeds measured. Each space between numbers should be the same size.
- Draw the bars by starting at the yacht's name on the bottom and draw up to the number that matches its average time or speed. Colour your bars if you like but keep them neat!



Step 10: Analysis

Analysis means looking closely at the information (your graph and results) and thinking about what it shows. Scientists, engineers, and sailors like Team New Zealand always analyse before they make improvements.

Key Thinking Questions:

Look at your Bar Graph and ask:

- Which land yacht had the shortest average time or highest speed? (This yacht raced the fastest!)
- Which land yacht had the longest average time or lowest speed? (This yacht raced the slowest!)
- Are the results what you expected from your predictions?

Design Thinking:

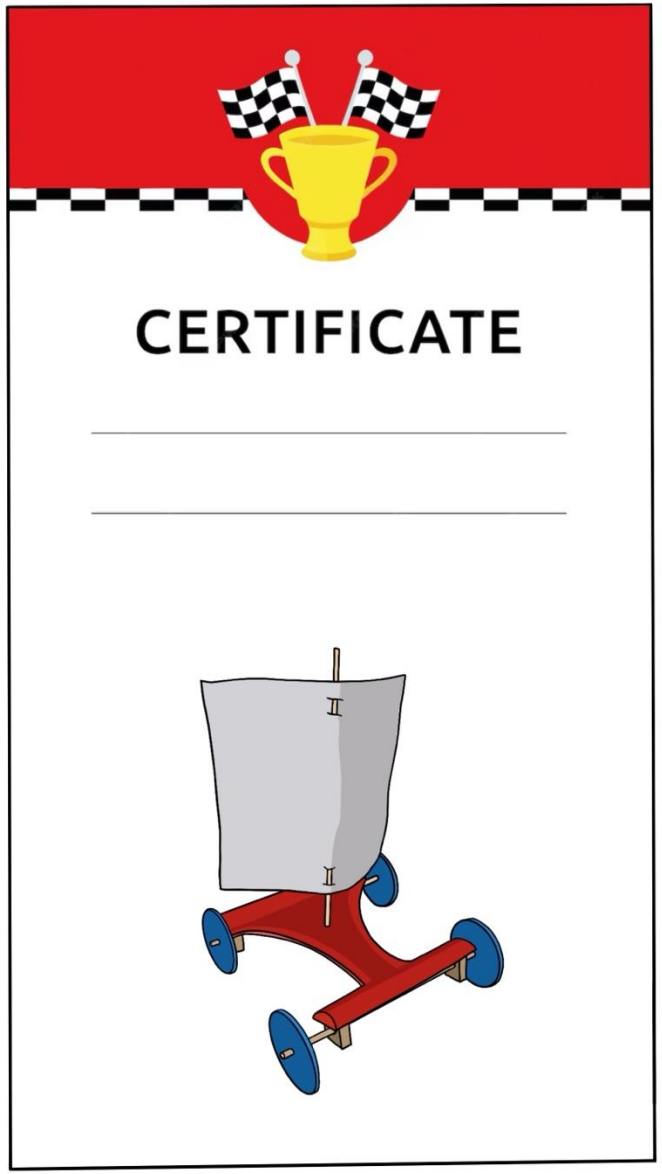
- What do the fastest yachts have in common?
- Was the sail big? Was the yacht light? Were the wheels straight?
- Did any yachts improve after the Pit Stop adjustments?

Unexpected Results:

- Was there a yacht you thought would go fast, but didn't?
- What might have caused that (wobbly wheels, floppy sail, heavy body)?

Future Planning:

- What would you do differently next time?



Step 11: Presentation Ceremony

Great inventors, engineers, and explorers don't just work hard - they also celebrate their successes (and their funny failures too!). Today, we honour everyone's courage, creativity, and cleverness in the Great Boat Build Challenge.

- Gather all students in a special place and display all land yachts proudly.
- Have the bar graphs and results visible if possible.

Suggested Award Categories:

You can give certificates or simply announce winners for:

Award	What it Recognises
Fastest Land Yacht	Best average time or speed
Best Engineered Yacht	Clever and strong construction
Most Creative Design	Wild, fun, or imaginative features
Best Pit Stop Improvement	Best fix-up during the 5-minute pit stop
Best Team Spirit	Helping others, sharing ideas, great attitude
Slow and Steady Award	(Fun award!) Yacht that made it across the finish line no matter what!

Final Thoughts:

"Real success isn't just winning races. It's trying new things, thinking cleverly, and learning every time you build. You are the innovators of the future - and today you raced like champions!"

Race Your Land Yacht Worksheet

Name: ……. Date: …….

My Data:

	Time in seconds
Race 1	
Race 2	
Race 3	

Calculate Average Speed:

Add your three times together, then divide by 3 to find your average.

Graph of Results:

Draw your bar graph here. Y-axis: Time in seconds. X-axis: Land yacht names

What might have helped my land yacht go faster?

…….

Land Yacht Analysis Worksheet.

Name: …… Date: ……

1. Building and Testing

What worked really well with my land yacht?
(e.g., strong wheels, big sail, lightweight body)

……

……

What didn't work so well?
(e.g., mast kept falling over, wheels wobbly)

……

……

2. Bar Chart Analysis

Which land yacht had the highest speed?

……

Are the results what you expected from your predictions?

……

What do the fastest yachts have in common?

……

Was there a yacht you thought would go fast, but didn't? What might have caused it problems? (e.g., wobbly wheels, floppy sail, heavy body)

……

3. Racing Analysis

Did your land yacht perform the way you expected? Why or why not?

……

……

If you could redesign your land yacht, what would you change to make it even faster?

……

……

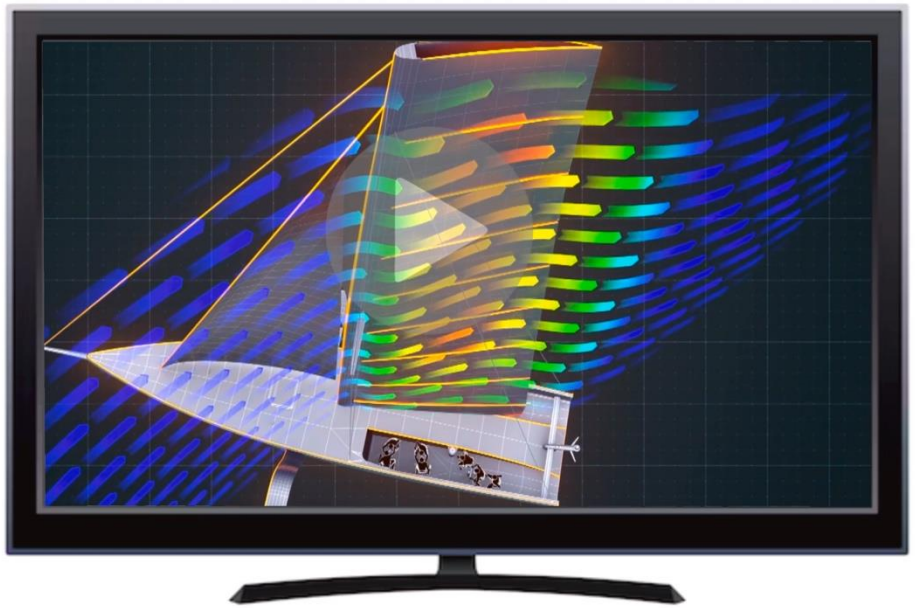
What was the most important thing you learned about building and testing a moving vehicle?

……

……

4. Self Assessment

	😃	🙂	😐	😟
I worked hard and stayed focused				
I thought carefully about my design				
I helped others and showed good teamwork				
I learned from my mistakes and kept improving				



Activity 4: Design Your Ultimate Ocean Explorer Phase Three

Teacher Narration:

“Before we design our final, ultimate ocean explorers, let's get even more inspiration! Team New Zealand used the power of the wind to do amazing things. It lifts boats out of the water, sail faster than ever before, and even create clean energy!

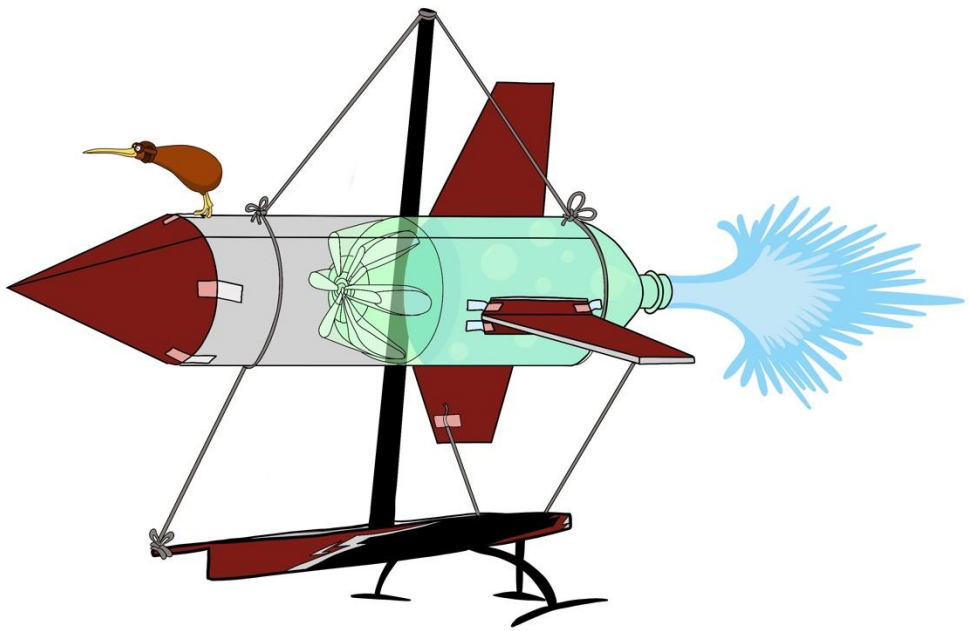
This video is called *Powered By Nature* – and as you watch, think about what you could invent that uses the wind in a new way…”

Click here

“So now we are going to have another look at your ultimate ocean explorer. Remember that you are inventing a boat no one has ever seen before - a vessel so clever that it could cross oceans faster, safer, and cooler than anything humans have ever built.

You've seen Polynesian double-hulled waka exploring vast distances. You've seen Cook’s Endeavour braving wild seas with heavy cargo. You've raced land yachts and learned how Team New Zealand made boats fly above the water on foils!

Now it’s your turn to create something new, something futuristic, something unforgettable. Your only rule: make it awesome."



Teacher Notes:

By the end of this activity, students will use cumulative knowledge from all three lessons to create a final advanced design. They will apply historical lessons and future technologies thoughtfully and reflect on how innovation transforms existing ideas into something revolutionary. They should feel proud of how far their thinking and creativity have come!

Instructions

1. **Step 1: Review Your Previous Design**

   Students look back at their Phase Two boat designs. What parts of your design work really well? What might need changing now that you know more?

2. **Think About What You Learned:**

   Could your boat lift out of the water like a hydrofoil? Could you add a wing sail instead of a cloth sail? How could you balance better at super-high speeds? Twin foils? Triple hulls? Could you use wind, solar, water currents, or something else? Could you add drone scouts, underwater vision, flying rescue pods, smart sails that move themselves?

4. **Draw and Label Your New Design:**

   Draw a full new version of their upgraded vessel. Show the key upgrades from their previous model (highlighted or annotated), and add innovative technologies inspired by Team NZ and beyond.

Design Your Ultimate Ocean Explorer Worksheet Phase Three

Name: ……. Date: …….

Your Mission:
You have already created two designs for the ultimate ocean explorer. Now, after learning about the amazing advances in modern technology, it's time to improve your ship!

Use everything you know about:

- Sails and wings: What's the most efficient way to power you ship?
- Foils: Will you lift your boat out of the water?
- Power: how will you generate power? Wind turbines, solar panels or people peddling fast on bikes?
- Materials: Is your boat made of wood? Metal? Or Carbon fibre?

2. Redraw Your Design

- Add new ideas.
- Label important features.
- Show storage spaces, living areas, sails, and anything clever you invented!

What is one big improvement you made to your previous designs?

……

……

How will your new design help your crew survive a long journey?

……

……

What idea inspired you from the Team New Zealand engineers and designers?

……

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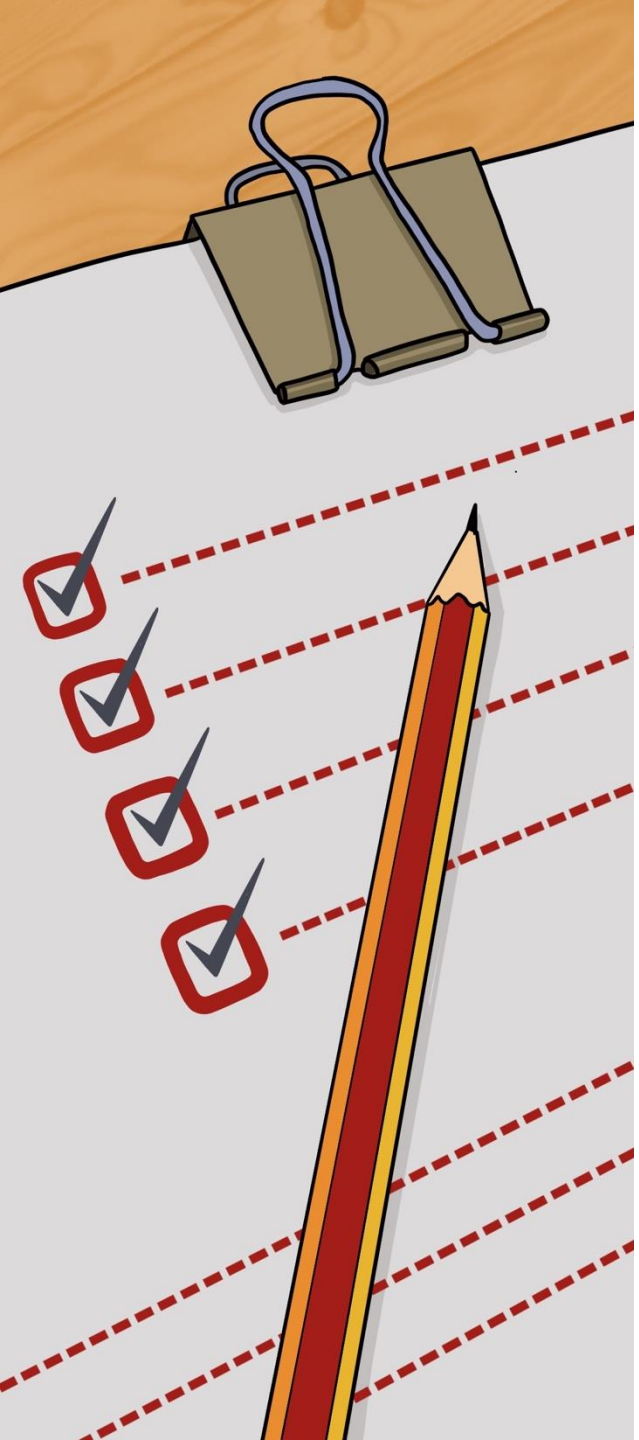
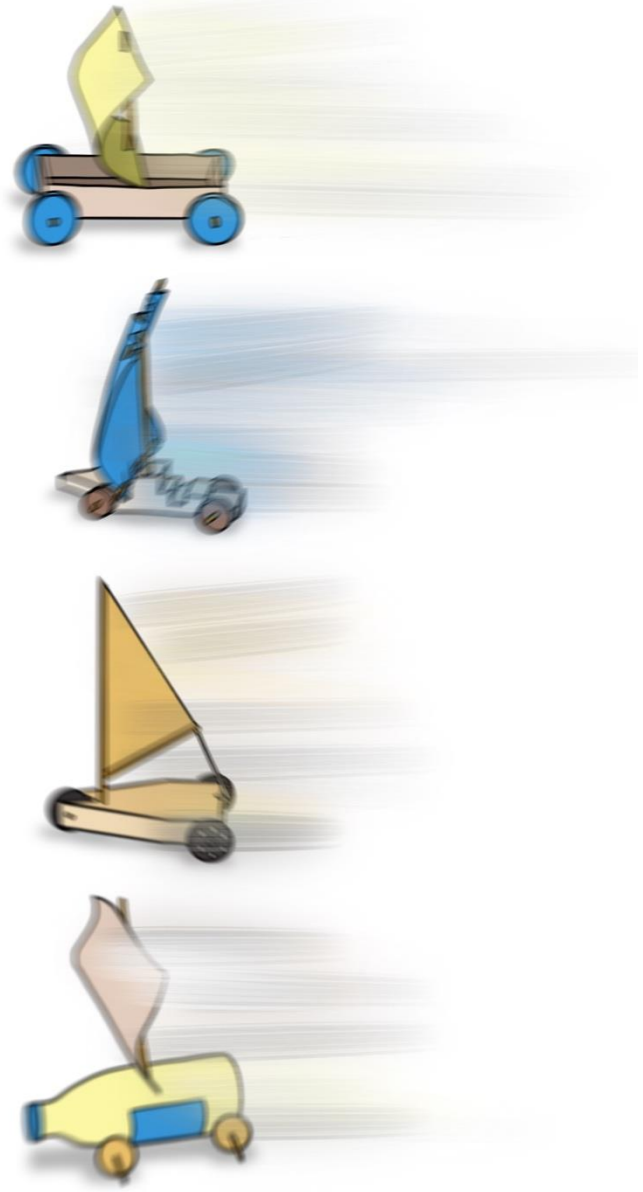


Assessment: Build and Race Your Own Land Yacht

- Celebrate effort and creativity alongside technical skills.
- Improvement through testing and pit stops is a key success indicator.
- Honest reflection is just as important as racing results.

Criteria	Excellent (4)	Good (3)	Developing (2)	Needs Support (1)
Land Yacht Construction	Well-built, stable, creative use of materials, strong sail design	Generally well-built with only minor issues (wobbles, small repairs needed)	Land yacht built but has significant stability or function issues	Land yacht incomplete or not functional without teacher help
Participation in Testing and Racing	Actively engaged, positive attitude, supported others, raced all runs	Engaged in racing, completed runs, generally positive	Some reluctance or missed races; needed reminders	Minimal participation or disruptive during testing/races
Recording Race Data	Carefully recorded all race times and pit stop notes	Recorded most data, minor gaps	Incomplete or rushed recording	Little or no useful data recorded
Calculating Averages and Graphing Results	Accurately calculated averages and created a clear, labelled bar graph	Minor errors in averages or graph, but clear effort shown	Averages or graph attempted but unclear or inaccurate	No averages calculated or graph incomplete/missing
Reflection on Performance	Deep reflection: clear understanding of what worked, what didn't, and how to improve	Good reflection with some detail about successes and challenges	Basic reflection, very general statements	Little to no useful reflection; needed a lot of prompting



Learning Intentions and Key Competency Overview

This overview outlines the learning intentions, success criteria, and key competencies for the lessons in *The Great Boat Build* Unit. Use it as a planning and reflection tool.

Lesson Three: Team New Zealand - Making Boats Fly

Learning Intentions

- Investigate how modern science and technology have changed boat design.
- Use experimentation and data to improve a floating vessel.
- Prepare for the final presentation of a redesigned explorer craft.

Success Criteria

- I can explain how foils reduce drag and help boats lift.
- I can record and reflect on performance using simple data.
- I can revise my boat design based on testing and peer feedback.

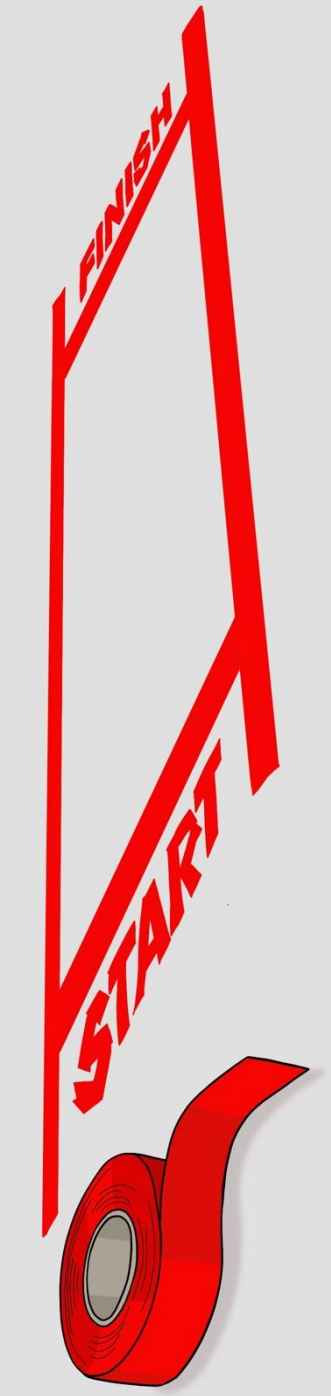
Key Competency Integration

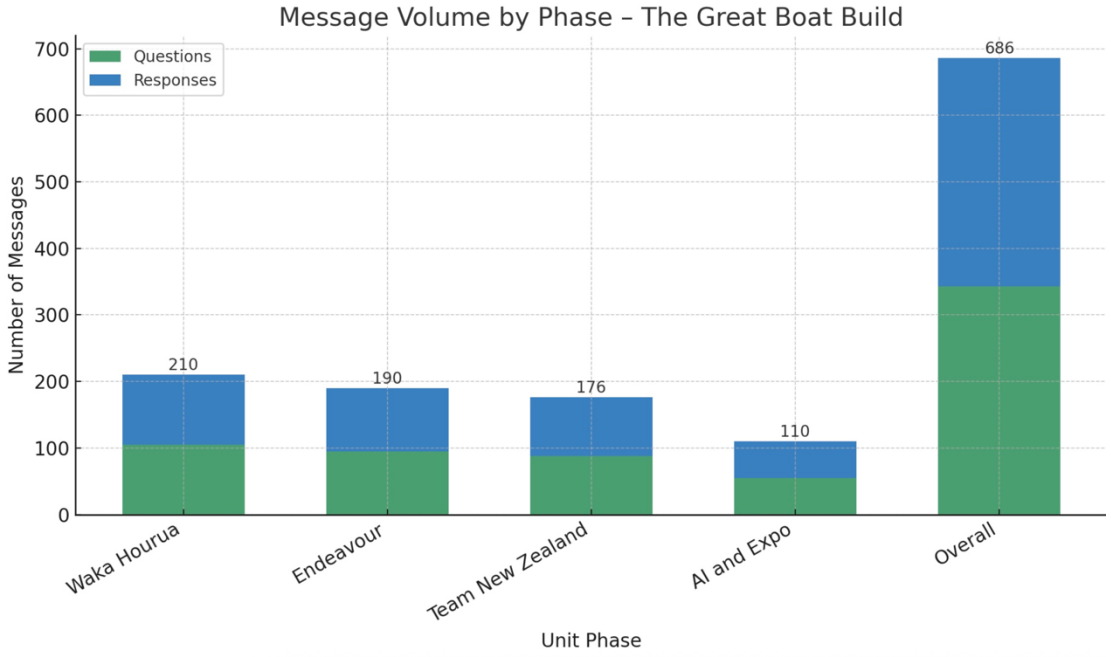
- *Thinking:* Analysing trade-offs in design and interpreting test results.
- *Managing Self:* Taking responsibility for repeated testing and revision.
- *Participating and Contributing:* Collaborating during the Great Boat Expo.
- *Using Language, Symbols, and Texts:* Graphing results, explaining changes, and presenting with clarity.

Tricky Words

Here is a glossary of tricky words found in the Team New Zealand lesson plan.

Tricky Word	Meaning
Hydrofoil	A special wing underwater that lifts a boat out of the water so it can go faster.
Foiling	When a boat rises up onto its hydrofoils and flies above the water.
Hull	The bottom part of a boat that floats on the water.
Wing Sail	A sail shaped like an airplane wing that catches the wind better than a normal sail.
Innovation	A new idea or clever way of doing something better.
Wind Turbine	A big machine that uses wind to spin blades and create electricity.
Aerodynamics	How air moves around something — good aerodynamics help boats (and planes) move faster.
Design Challenge	A problem that needs a creative solution, often by building or inventing something.
Land Yacht	A little cart with wheels and a sail that races across land using wind power.
Speed Record	The fastest time ever recorded for a race or journey.





LESSON FOUR: Designing With AI - Can you build a better boat?

Introduction:

This entire Unit, *The Great Boat Build*, was created with help from Artificial Intelligence - but not by Artificial Intelligence. A human designer worked closely with ChatGPT to develop ideas, refine activities, and build resources.

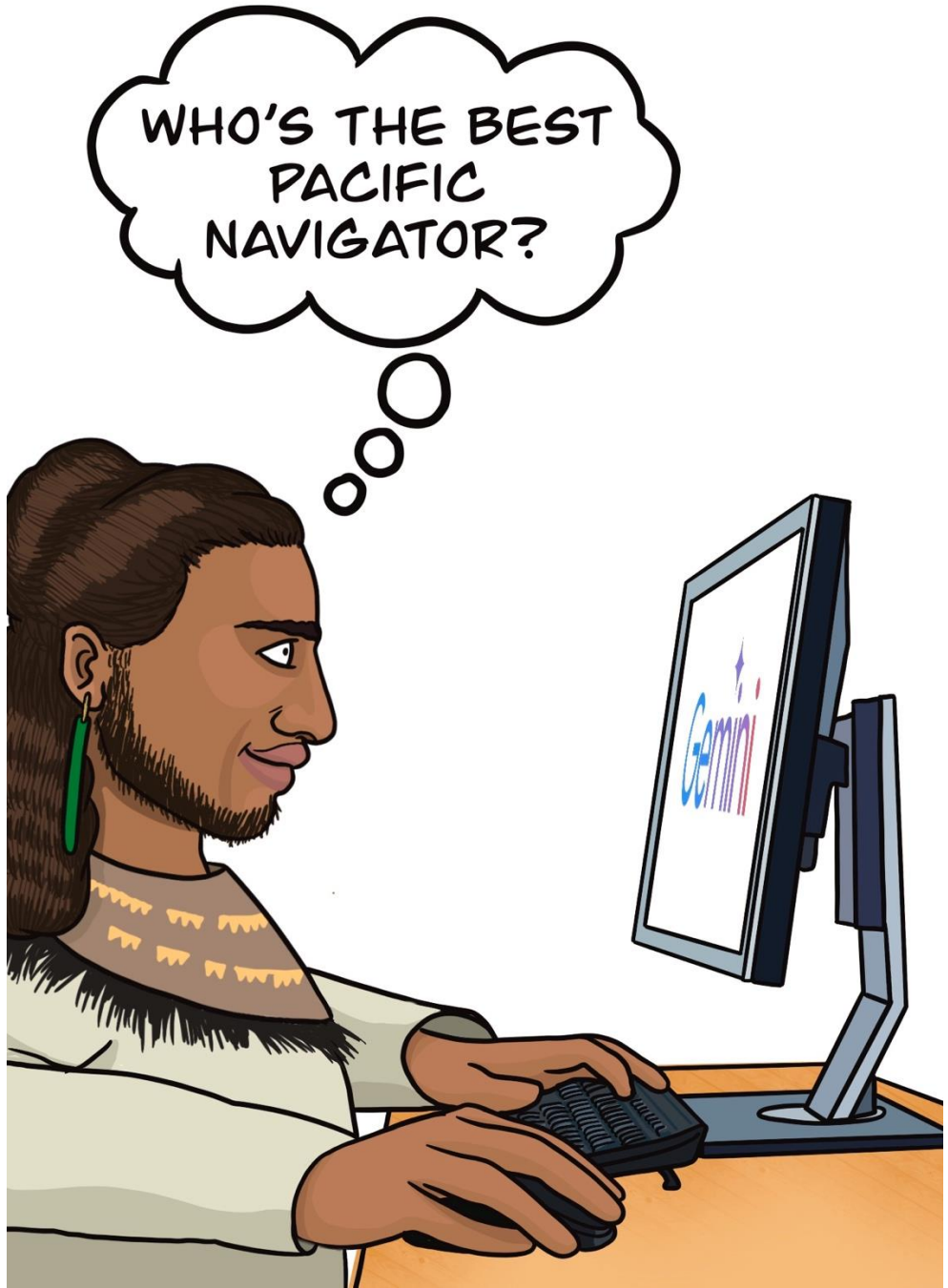
It wasn't done with just one quick question. You can't just type in "design lesson plans about building the ultimate ocean explorer" and expect ChatGPT to deliver a complete package.

It took more than seven hundred (700!) careful chats - asking specific questions, checking the answers, changing ideas, asking better questions, and always improving the work. Note that the 700 chats are just about the text. All the illustrations are done without using any AI assistance.

ChatGPT was used as a tool - like a hammer or a pencil - to help the human create something detailed, creative, and exciting for students. The human mind stayed in charge the whole time.

Important Teaching Considerations

Teacher Focus	Why It Matters	What to Do
Promote AI as a Tool, Not an Author	Students must know their ideas come first.	Emphasise that AI is like a smart helper, not the boss.
Teach Critical Thinking	Students should not automatically accept AI suggestions.	Coach students to ask: "Does this idea make my design better?"
Remind Students of Original Ownership	Their boat is still their creation.	They should change, improve, and personalise any AI suggestions.
Discuss AI Limitations	AI can make mistakes, offer silly ideas, or misunderstand.	Model how to question and refine AI outputs critically.
Respect Privacy and Access Issues	Not everyone has ChatGPT at home.	Make this exercise optional and provide manual peer-review alternatives.
Transparency	Students must say if they used AI and how they changed the suggestions.	A simple reflection box: "How did you use AI?"



Activity 1: Design Time

Teacher Narration

“Artificial Intelligence like ChatGPT or Gemini is not a magic machine that knows everything. It’s just a tool that helps you think better, ask better questions, and improve your ideas. AI can suggest ideas - but it’s your job to choose the good ones, change the weak ones, and invent something amazing!”

Step 1: Write a Paragraph

Describe your Ultimate Ocean Explorer. Remember the more detail you add in your description the better the suggestions the AI will make. Your paragraph should be clearly written in full sentences, focus on your final design for your boat, and include 3–5 features you want your AI to think about.

Example Paragraph:

"My ultimate explorer boat has two large hulls for balance. It rises out of the water on hydrofoils when it moves fast. It uses a wing sail and has solar panels on the roof for extra power. I want it to be very fast but also able to have a greenhouse onboard so I can grow fresh food to eat on my voyage around the planet."

Step 2: Copy and Paste into ChatGPT

When you are ready, highlight your paragraph. Right-click and choose Copy.

Open your AI program. Click into the chat box. Right-click and choose Paste.

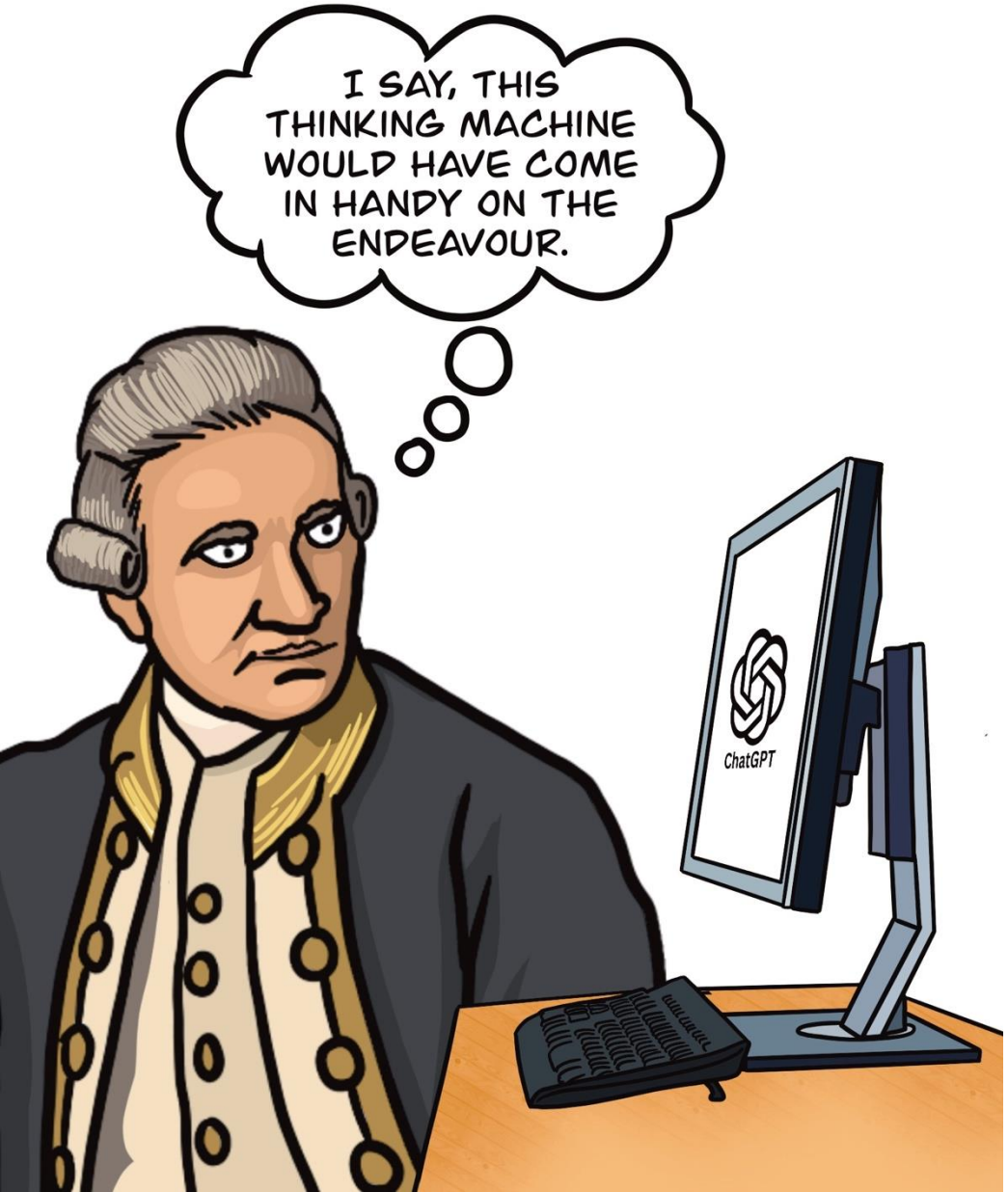
Press Enter to upload it. Then type a clear question to the AI.

Example Questions to Type After Uploading:

"Can you tell me the strengths of my boat design?"

"How could I make my boat even faster or more stable?"

"What creative ideas could make my boat even cooler?"



Step 3: Thinking About your AI's Answers

After the AI replies, read the suggestions carefully. Ask yourself:

- Do I agree with these ideas?
- Are they useful?
- Should I change anything?

You can ask more questions if you want better ideas!

- "Can you suggest more ways to make it stable in storms?"
- "How could I improve the sails even more?"

You are allowed to keep asking until you get an answer you like!

Important Warnings

If the AI suggests something too silly or that doesn't fit your design, you can ignore it. You are the boss - not the computer. Only change your boat if YOU think the idea is good.

Step 4: Improving and Reflecting

After finishing questioning your AI:

- Write down the ideas you liked.
- Update your boat design (drawing or paragraph).
- Reflect on how AI helped you - and if there were times you to think smarter than the AI!

Artificial Intelligence Worksheet.

Name: …… Date: ……

1: Record AI's Suggestions

What did the AI suggest to you?

1.
……

……

2.
……

……

3.
……

……

4.
……

……

5.
……

……

2: My decisions

Ideas I will keep or change

1.
……

……

2.
……

……

Ideas I will not use

1.
……

……

2.
……

……

3. Did using A.I. help make me a better designer?

……

Activity 2: The Great Boat Build Expo

Teacher Narration

“Explorers, innovators, designers - today your mission changes! Until now, you’ve been working hard designing, testing, racing, improving. Now, it’s time to turn your incredible work into something the world can see and celebrate. Just like museums around the world show off amazing inventions, voyages, and creations, we are going to build our very own Museum right here in our classroom.

Your final challenge is to create a display that shows off your Ultimate Ocean Explorer to the world.

- You can build a small model.
- You can design a poster.
- You can write a booklet.
- You can even build it in Minecraft or Tinkercad

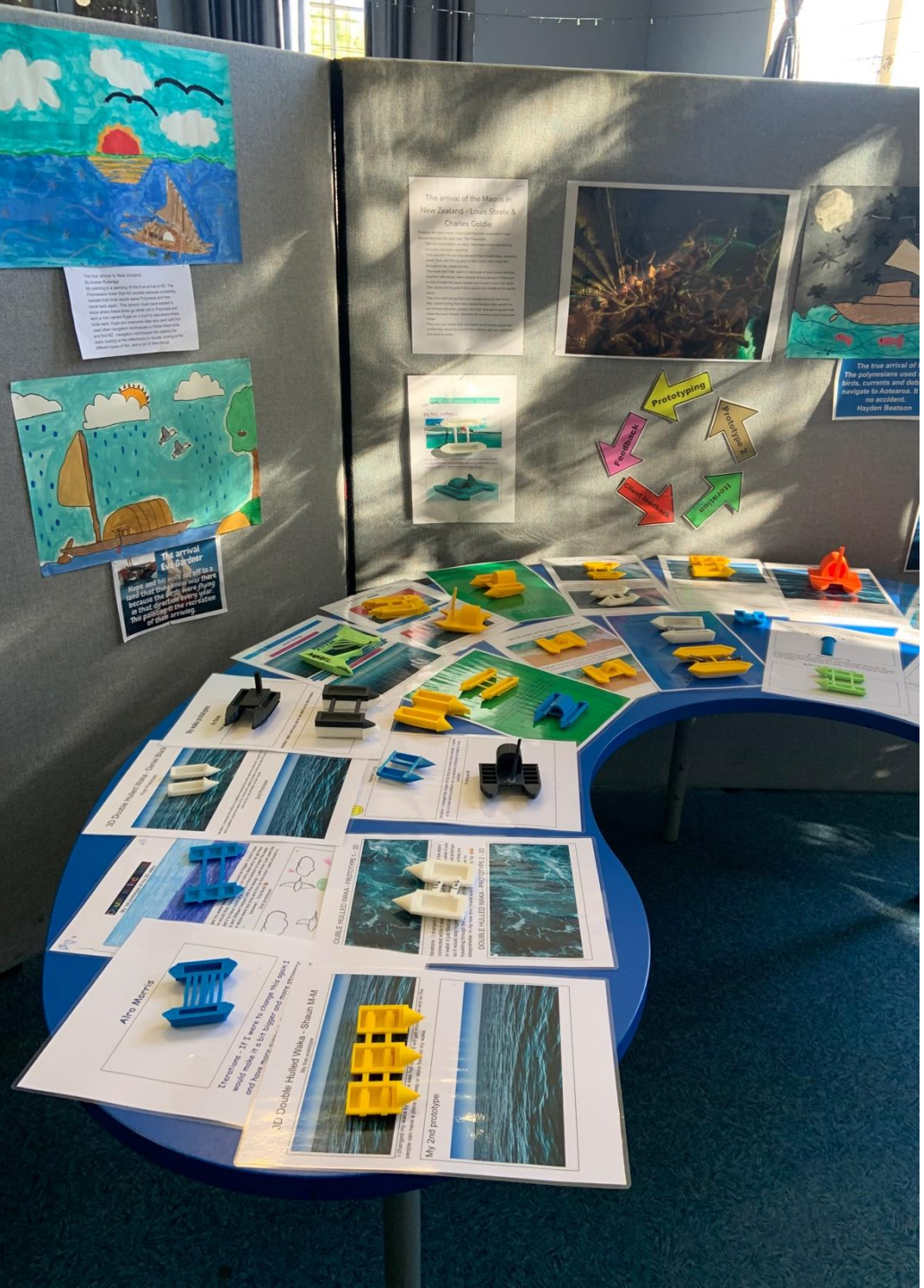
Whatever you decide to make, your exhibit will tell the story of your boat; how you used clever ideas from history, and how you used new technology and your imagination to create something truly special. And you'll be explaining your ideas to visitors who come to our Great Boat Build Expo!”

Teacher Tips for Managing Different Exhibit Types

- Have students choose their option early so you can plan for setup needs (power cords, headphones, quiet corners, etc.).
- Emphasise quality over complexity. A simple, well-done model or clear poster is better than an unfinished huge project.
- Encourage students to think about "visitor friendliness": "Will people be able to quickly see how clever your idea is?"

Options for Student Exhibits in the Great Boat Build Expo

Option	What You Need to Do
Model	Build a small 3D model of your boat using cardboard, clay, LEGO, or recycled materials.
Poster	Draw a colourful large poster of your boat. Label important parts like sails, foils, turbines. Add a title!
Booklet	Make a mini-book telling the story of how your boat was designed and improved. Include drawings and writing.
Minecraft or Tinkercad Design	Build your boat digitally and print screenshots to display, or show it on a tablet.
Shoebox Diorama	Create a 3D ocean scene inside a shoebox, showing your boat in action. Add waves, reefs, or storms!
Video Tour	Record yourself giving a short talk about your boat design. Show your model, drawing, or diagram in the video.
Infographic Poster	Make a cool poster using pictures, arrows, and small bits of text to show how your boat works.
Storybook Version	Write and illustrate a short story about an adventure your boat goes on. Turn it into a small book.
Poem or Song	Write a fun poem, chant, or short song about your boat and how it explores the oceans. Perform or display the lyrics!
Digital Animation	Create a simple computer animation showing your boat moving across the ocean, lifting on foils, or powering through storms. (Use Scratch, Canva, or another simple tool.)



Step 1: Create Your Exhibit
Each exhibit should have:

- The name of the boat
- A picture or model of the boat
- Labels showing key features (like wings, foils, sails, turbines)
- A short description of how it works

Step 2: Prepare a Short Talk (Expo Mini-Tour)
Students prepare a short 1-minute explanation:

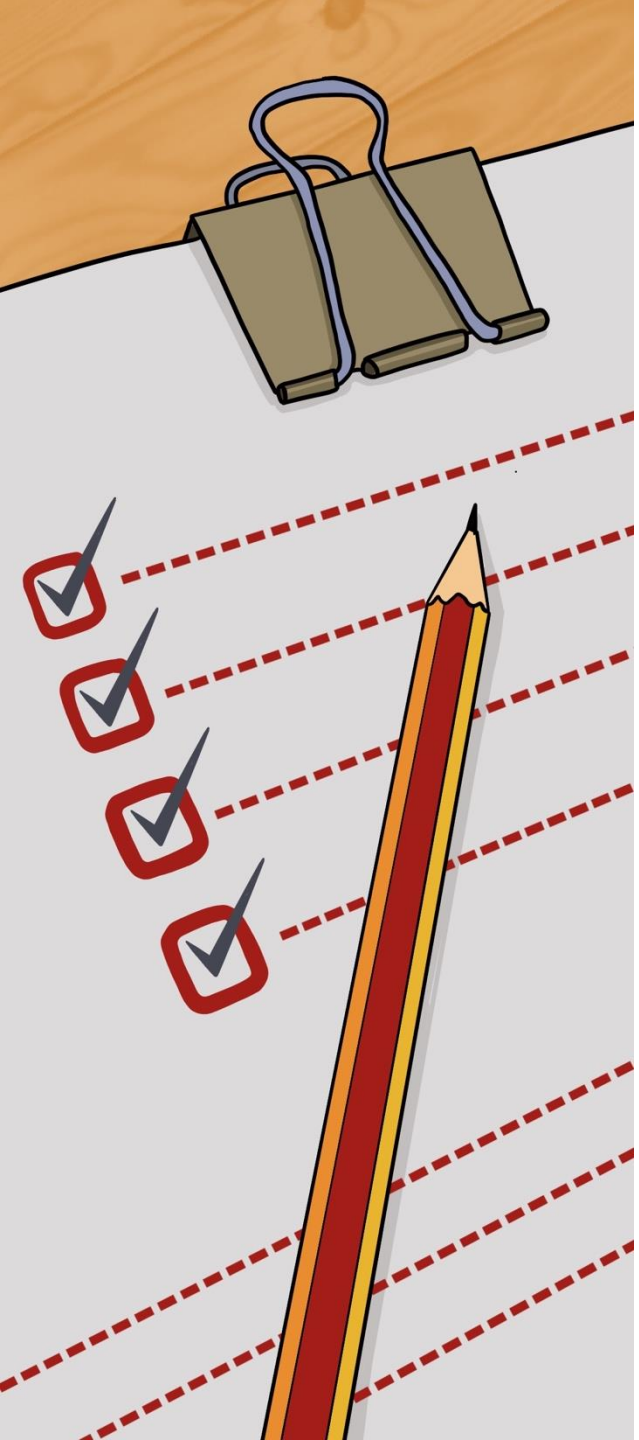
- What is your boat's name?
- What makes your boat special?
- How did you use clever ideas to solve problems?
- How did your boat change from your first design?

Step 3: Set Up the Expo
Arrange tables or desks in a big loop or clusters around the room. Students place their posters/models/booklets/screenshots neatly on the desks. Put up a "The Great Boat Build Expo" sign if you can! Leave pathways for visitors to move easily around the exhibits.

Step 4: Expo Walk and Share
Visitors (classmates, teachers, families) walk through the Expo. Students stand by their exhibits and proudly share their mini-talks.

Step 5: The Expo Awards
At the end of the Expo, you could give awards for outstanding achievement:

Category	Example Award
Most Innovative Boat	Best use of new ideas
Best Use of Wind Power	Clever sails or turbines
Best Presentation	Clear, confident talk
Visitor Favourite	Voted by the visitors!



Assessment: The Great Boat Build Expo

- Focus on effort, innovation, and growth, not just technical perfection.
- Celebrate brave thinking and problem-solving, even with simple exhibits.
- Every student should feel proud of their learning journey!

Criteria	Excellent (4)	Good (3)	Developing (2)	Needs Support (1)
Exhibit Presentation	Highly creative and clearly shows the boat's features and innovations. Easy to understand and very engaging.	Clearly shows most important features. Some creative elements.	Shows basic design ideas, but missing details or explanations.	Difficult to understand. Missing major features or poorly presented.
Effort and Care	Exhibit is very neat, detailed, and obviously made with pride.	Exhibit is tidy and complete.	Exhibit is rushed or missing important parts.	Exhibit is messy or very incomplete.
Explaining the Design	Student explains their boat clearly, confidently, and links it to design thinking and innovation.	Student explains their boat with some confidence. Some connection to design ideas.	Student explains only the basics, with little connection to innovation.	Student struggles to explain their design. Needs a lot of help.
Use of Innovation	Design shows outstanding original thinking and clever new ideas. Links to inspiration from waka, Endeavour, or Team NZ clearly.	Design shows good creativity and some new ideas. Some link to past learnings.	Design shows little innovation. Few links to learning.	Design shows no real innovation or connection to previous lessons.
Reflection on Learning Journey	Student explains how their ideas changed and improved during the unit. Deep reflection shown.	Student can describe some improvements and learning.	Student mentions a few changes but no deep thinking shown.	Student struggles to reflect or describe improvements.

Learning Intentions and Key Competency Overview

This overview outlines the learning intentions, success criteria, and key competencies for the lessons in *The Great Boat Build* Unit. Use it as a planning and reflection tool.

Lesson Four: Can We Build A Better Boat

Learning Intentions

- Use feedback from AI tools like ChatGPT to evaluate and improve boat designs.
- Reflect on design thinking by revising based on testing, feedback, and imagination.
- Design and present a museum-style exhibition space to showcase final boat creations.

Success Criteria

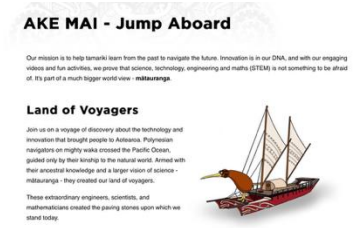
- I can describe how I used AI or feedback to improve my boat.
- I can explain at least one change I made and why I made it.
- I can design a museum display space that communicates my ideas clearly.
- I can speak or write about what I learned from my design journey.

Key Competency Integration

- *Thinking:* Analysing suggestions, comparing options, making improvements.
- *Managing Self:* Taking responsibility for revision and preparing for presentation.
- *Using Language, Symbols, and Texts:* Using diagrams, labels, and written reflections to communicate.
- *Participating and Contributing:* Presenting work to peers or whānau during the Boat Expo and contributing to a shared learning space.
- *Relating to Others:* Listening to feedback, asking questions, and working respectfully in a shared design space or gallery.

Useful Resources

Click on the picture to access the links



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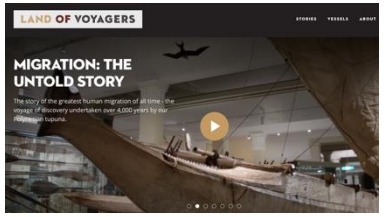
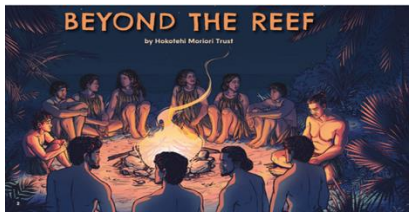
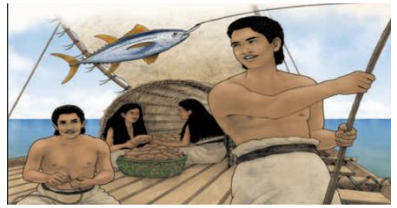


Land of Voyagers

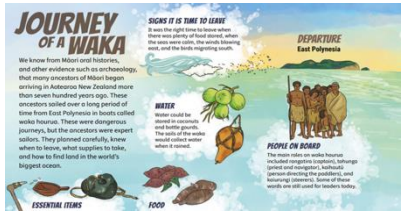


Beyond the Reef

Beyond the Reef TSM



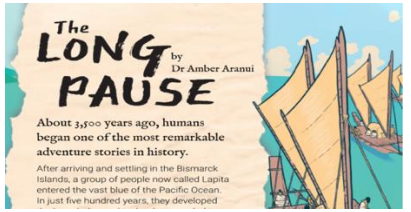
Explorers of the Sunrise



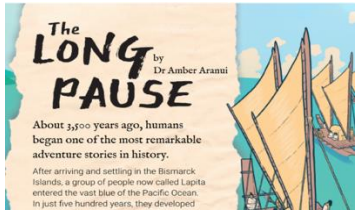
Journey of a Waka

Hui Te Rangiora – the Navigator

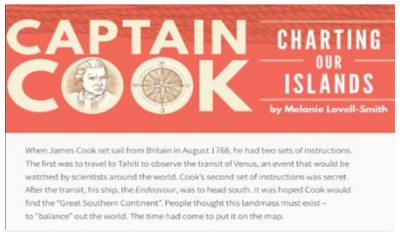
Star-Gazing



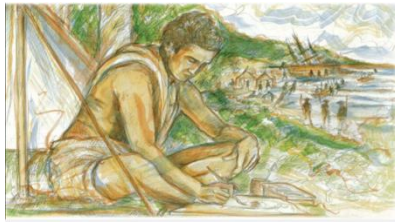
The Long Pause



The Long Pause TSM



Captain Cook
Charting our Islands



Tupaia Master Navigator

Kupe and the
Giant Wheke

Tuia Mātauranga

Connections Across
the Pacific