



KŌKŌKAHA

POWERED BY WIND



Kia ora

Welcome to Kōkōkaha - powered by wind.

Kōkōkaha is an integrated unit of work that focuses on the science, technology, engineering and maths (STEM) associated with harnessing the wind.

Kōkōkaha's learning experiences are designed for ākonga in years 5 through to 10 and are intended to provide them with the skills and knowledge to design their own technologies to harness the power of the wind.

Kōkōkaha learning experiences can easily be adapted for older or younger ākonga and are available to schools and kura throughout New Zealand through the website:

www.runa-yachtingnz.org.nz

During Kōkōkaha ākonga are challenged to design a technology to harness the power of the wind.

Before launching into their designs ākonga participate in a range of hands on **learning experiences** to build their knowledge about wind.

They can also feel the power of the wind by participating in a **sailing experience** at sailing clubs or providers around Aotearoa New Zealand.

Then when they are ready ākonga design a technology to harness the power of the wind and upload their ideas to the **Kōkōkaha Ideas Gallery**.

This teacher's guide gives you all the information you need to get underway with Kōkōkaha in your classroom.

We hope you enjoy Kōkōkaha and look forward to seeing your designs.

Ngā mihi
The RŪNĀ team



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1. TE WERO



Kōkōkaha challenges ākonga to take action in their local community to help solve a problem that faces us all - climate change. In introducing Kōkōkaha teachers should present ākonga with the following challenge and mission.

The world is continuing to increase its use of energy. Much of this energy is from non renewable sources. This is having an impact on our climate as more and more carbon dioxide is released into the atmosphere.

In New Zealand more than 80% of energy is generated from renewable sources, with wind being one of those sources. We need to find ways to harness even more power from the wind.

Your mission is to design a technology to harness the power of the wind.

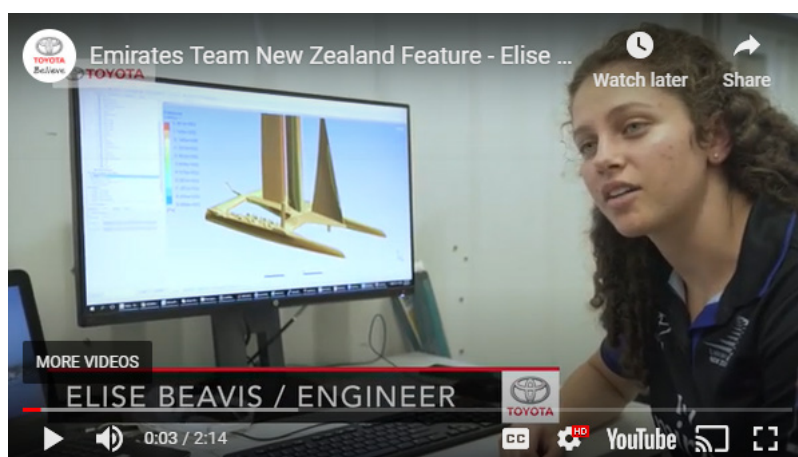
2. SETTING THE SCENE

A key outcome of Kōkōkaha is for ākonga to get the opportunity to develop their capability to use the technology development process.

Emirates Team New Zealand are world leaders at developing technological solutions to harness the power of the wind.

Elise Beavis is a member of the design team and spends her working days using the technological problem solving process to find ways to make the racing boats sail faster.

Kōkōkaha links to a video where Elise explains how the team designs, tests and refines new ideas. There are clues in her video that your ākonga will be able to use to help them with their design ideas.



3. CLASSROOM LEARNING EXPERIENCES

Kōkōkaha has 12 learning experiences which teachers can pick and choose from to help ākonga develop the skills and knowledge needed to design their own technology idea. The learning experiences are organised into three sets of four experiences.

SET ONE WHEN THE WIND BLOWS

Discovering wind

How can you see it? How do you know it is there? How is it recorded? What are tell-tale signs of the wind?

Which way wind

How do you know where the wind is coming from? Ākonga design and build a wind vane.

The need for speed

How do you measure the wind? Ākonga design and build an anemometer.

Wind and waves

Where do waves come from? What makes the water move? How do you measure waves?

SET TWO A FORCE TO BE RECKONED WITH

Tāwhirimātea is howling

Who is Tāwhirimātea? Where did he come from and what does he do? Ākonga create a dance to represent a type of wind.

Harvesting wind

How do wind turbines work? Where are wind farms in Aotearoa New Zealand? Ākonga design a pinwheel.

Capturing wind

Why do sailors love the wind? How do they capture it? Ākonga design a wind sock to capture the wind.

Power my car

How do blokarts use the wind? What is kinetic energy and friction? Ākonga design and test a sail car?

SET THREE HOW SAILBOATS WORK

Float your boat

What makes a boat float? Why do some boats sink? Ākonga design and make a clay boat and test its ability to float.

Sail away

What are the parts of a sail boat? How do they work? Ākonga build a model sail boat.

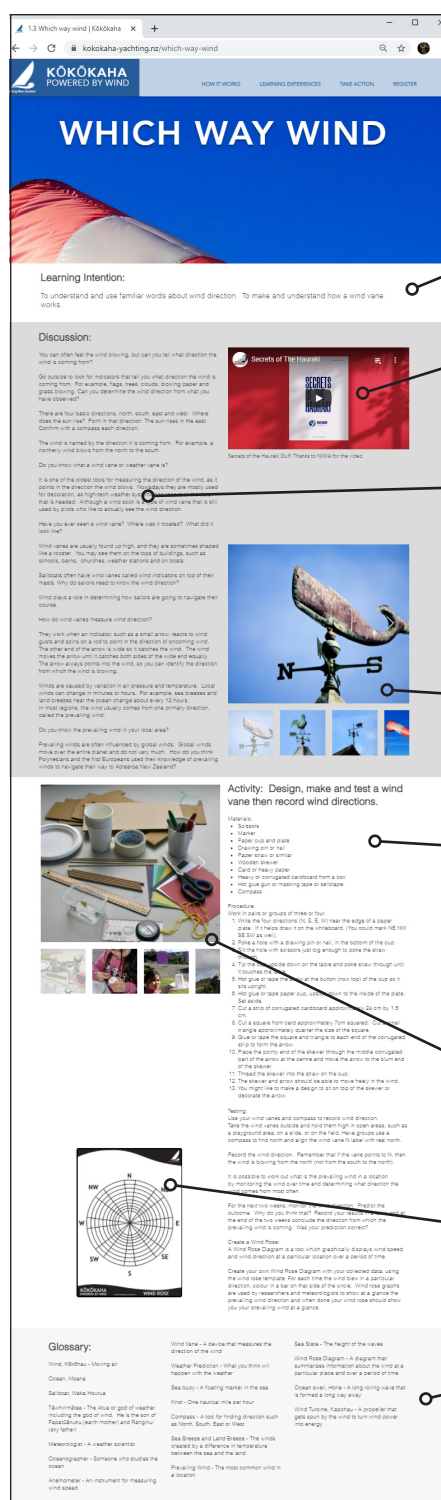
Sail power

How do sails work? Ākonga work out how to measure the perimeter and area of a sail.

Up on the foils

How have sail boats changed over the years? How have these changes led to foils on boats? Ākonga design and test a simple foil.

Each of the 12 Kōkōkaha learning experiences are presented in the same way on the website.



WHICH WAY WIND

Learning Intention:
To understand and use familiar words about wind direction. To make and understand how a wind vane works.

Discussion:
You can often tell the wind blowing, but can you tell what direction the wind is coming from?
Go outside to look for indicators that tell you what direction the wind is coming from. For example flags, trees, clouds, blowing grass and grass blowing. Can you determine the wind direction from what you have observed?
There are four basic directions: north, south, east and west. Where does the sun rise? From in that direction. The sun rises in the east. Can you use a compass to find direction?
The wind is named by the direction it is coming from. For example, a northerly wind blows from the north to the south.
Do you know what a wind vane or weather vane is?
It is one of the oldest tools for measuring the direction of the wind, as it points in the direction the wind blows. It is a device that is usually used to determine the direction of the wind. It is a simple device that is used to determine the direction of the wind. It is a simple device that is used to determine the direction of the wind.
Have you ever seen a wind vane? Where was it located? What did it look like?
Wind vanes are usually found on high and free air sometimes placed on a rooftop. You may see them on the tops of buildings, such as schools, homes, churches, weather stations and on boats.
Sailboats often have wind vanes called wind indicators on top of their masts. Why do sailors need to know the wind direction?
Wind plays a role in determining how sailors are going to navigate their boats.
How do wind vanes measure wind direction?
They work when an indicator, such as a small arrow, reacts to wind gusts and points in the direction of prevailing wind. The arrow and the vane are attached to a central point. The wind moves the arrow and it points both sides of the vane and equally. The arrow always points into the wind, so you can identify the direction from which the wind is blowing.
Winds are caused by variation in air pressure and temperature. Local winds can change in minutes or hours. For example, sea breezes and land breezes that the coastal climate about every 24 hours.
In most regions, the wind usually comes from one primary direction, called the prevailing wind.
Do you know the prevailing wind in your local area?
Prevailing winds are often influenced by global winds. Global winds come from the north and south and blow in a steady flow. You do you know. Polynesians and the first Europeans used their knowledge of prevailing winds to navigate their way to discover New Zealand?

Activity: Design, make and test a wind vane then record wind directions.

Materials:
• Scissors
• Marker
• Paper cup and plate
• Drawing pin or nail
• Paper straw or similar
• Wooden skewer
• Card or heavy paper
• Heavy or corrugated cardboard from a box
• Hot glue gun or melting tape or sealant
• Compass

Procedure:
1. Roll a piece of paper or glue of three or four.
2. Write the four directions (N, S, E, W) near the edge of a paper plate. If you have a compass, use it to check that the directions are correct.
3. Place a hole with a drawing pin or nail in the bottom of the cup.
4. The hole with a drawing pin or nail should be in the middle of the plate.
5. To the middle of the hole on the side and glue straw through until it touches the bottom of the cup.
6. Hot glue or seal the top of the cup around the straw.
7. Hot glue or seal the top of the cup around the straw.
8. Cut a hole in the middle of the straw.
9. Cut a square from card approximately 10cm by 10cm.
10. Draw a line across the square from the middle of the square to the edge.
11. Draw a line across the square from the middle of the square to the edge.
12. Place the pointy end of the skewer through the middle of the square.
13. The arrow and the skewer should be able to move freely in the wind.
14. The arrow and the skewer should be able to move freely in the wind.
15. You might like to make a design to go on top of the skewer or decorate the arrow.

Testing:
Use your wind vane and compass to record wind direction.
Take the wind vane outside and hold it high in open areas, such as a playground, park, or a field, or on the roof. Then groups use a compass to find north and sign the wind vane with the letters N, S, E, W.
Record the wind direction. Remember that the vane points to the direction the wind is blowing from (not from the south to the north).
It is possible to look out what is the prevailing wind in a location by monitoring the wind over time and determining what direction the wind blows from most often.
For the next two weeks, monitor the prevailing wind. Record the direction the wind blows from most often. Record the direction the wind blows from most often.
Create a Wind Rose
A Wind Rose Diagram is a tool which graphically displays wind speed and wind direction at a particular location over a period of time.
Create your own Wind Rose Diagram with your collected data, using the wind rose template. The arrow on the wind rose is a particular direction, color in a bar on that side of the circle. Wind rose graphs are used by weather and meteorologists to show the average wind direction and speed over a period of time. Wind rose graphs show you the prevailing wind at a glance.

Glossary:
Wind indicator - A device that measures the direction of the wind.
Weather Prediction - What you think will happen in the weather.
Sea Breeze - A rising mass of air.
Tsunami - A sea of water moving the part of wind. He is the son of Poseidon, god of the sea and earthquakes (his father).
Meteorologist - A weather scientist.
Oceanographer - Someone who studies the ocean.
Anemometer - an instrument for measuring wind speed.
Sea Level - The height of the waves.
Wind Rose Diagram - A diagram that summarizes information about the wind at a particular place and over a period of time.
Ocean swell - A long rolling wave that is formed by wind and waves.
Wind turbine - A generator that gets spun by the wind to turn wind power into energy.

Each experience has a set of learning intentions.

Most of the experiences have a video that helps unpack the topic.

Each experience has a discussion section to help engage learners with the topic. The discussion section includes questions that teachers might like to ask learners to get them thinking about the topic. Brief answers to the questions are provided as well to help teachers who might not have the prior knowledge of the topic.

Many of the experiences have a gallery of images that help illustrate the topic under discussion.

Each experience has an activity section which in most cases involves learners in making and testing something. The activity section includes a list of the materials that are needed. The activities have been designed to use materials that are already in most schools and kura or are easy to source. The activity descriptions also give step by step instructions for learners to complete the task.

A gallery of photos to help illustrate the activity is included with most experiences.

In some experiences there are downloadable templates provided to help learners record and analyse data.

Each experience has a glossary of terms that relate to the topic.

4. SAILING EXPERIENCE

In addition to the classroom learning experiences, ākonga can feel the power of the wind during a sailing experience.

We have set up Kōkōkaha providers around Aotearoa New Zealand to deliver a day long Kōkōkaha sailing experience to classes of up to 30 ākonga. The Kōkōkaha website provides registration and contact details for the sailing experience.

The sailing experience day typically has two parts. Generally each group of up to 30 ākonga is split into two groups.

In the morning the first group goes sailing to experience the power of the wind. Meanwhile the second group undertake a set of hands-on challenges to introduce them to some of the technologies used in sailing. After lunch the groups swap.

The hands-on challenges are lead by the teachers from the participating school, while the sailing experience is facilitated by Kōkōkaha kaiako. You will be provided with guidance into how to lead the hand-ons challenges.

Part one: Feel the power of the wind

Ākonga are introduced to safer boating skills as they get out on the water and go for a sail. All the equipment including boats and life jackets are provided. The focus is on ākonga feeling the power of the wind.



Part two: Hands-on technology challenges

There are four challenges to introduce ākonga to technologies involved in sailing.

Pulley Power: How can pulleys be used to reduce the amount of effort required to lift a weight?

Knot Know How. What are some of the common knots used in sailing?

Sink & Float. What makes a boat float and what makes it sink?

Hull & Sail Materials. How have the materials used to build hulls and sails changed over the years?



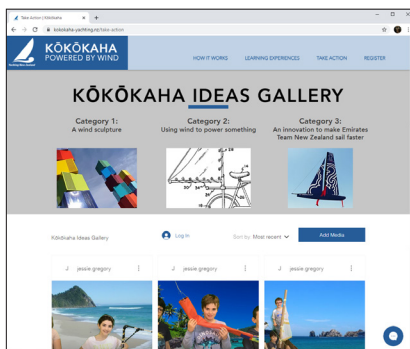
5. TAKE ACTION

Once ākonga have learned all they need to know about wind their mission is to design a technology to harness the power of the wind. Designs can be presented as either an image or as a video. If a video, they need to be less than one minute in length. There are three categories of design to choose from.

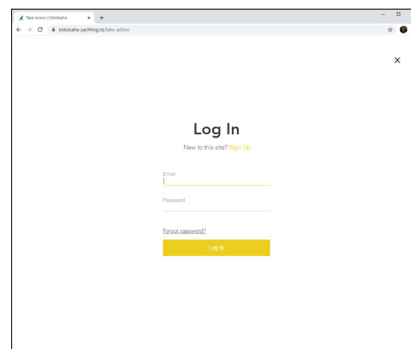
1. A wind sculpture
2. Using wind to power something
3. An innovation to make a yacht sail faster

Teachers are responsible for loading the designs into the Kōkōkaha ideas gallery.

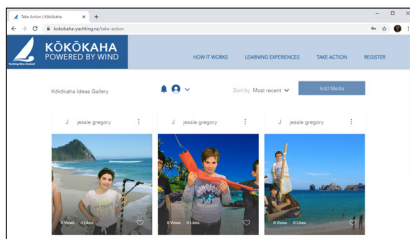
1. Click the login icon on the ideas gallery.



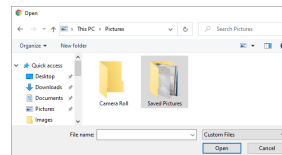
2. Enter your user name and password. If you have not got one already the gallery will prompt you to set one up.



3. Click the add media button.



4. Choose the file you want to upload to the gallery from your computer.



For help and assistance please don't hesitate to contact Yachting New Zealand.

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