genesis school-gen

EMPOWERING KIWI KIDS

YEARS 5-8

Harnessing the Power of the Wind

Hei whakaratatia te hiko a Tāwhirimātea

A joint Genesis and Emirates Team New Zealand education resource.

OVERVIEW

Genesis and Emirates Team New Zealand worked together in partnership to create STEM resources for schools based around the 36th America's Cup held in Aotearoa, New Zealand. Both organisations are known for their creative innovation and design solutions. This activity aims to inspire a new generation of scientists, sailors, innovators and engineers.

Investigate how we can harness the power of the wind.
Design a sailboat model that can use wind power to move.

NZ CURRICULUM LINKS

LEARNING AREAS:	ACHIEVEMENT OBJECTIVES:	LEVELS:	YEARS:
Science: Physical World: Physical inquiry and physics concepts	Explore, describe, and represent patterns trends for everyday examples of physical phenomena, such as movement, forces, etc.	3-4	5-8
Technology: Technological practice Planning for practice	Understand how society and environments impact on and are influenced by technology in historical and contemporary contexts and that technological knowledge is validated by successful function.	3-4	5-8

EMIRATES TEAM NEW ZEALAND AND GENESIS STAFF PROFILES

Both Genesis and ETNZ are proud to have people passionate about STEM working with us, to make the most of the wind in a range of different ways! Here's just two examples.

Craig Brown

Genesis Site Manager for the Tongariro Power Scheme and the Hau Nui wind farm

What does your role involve?

My role on the wind farm involves making sure that the wind farm keeps working and makes the most of the potential energy that the wind provides. The most important part of my job is helping to create a safe environment for the Wind Technicians who work on the turbines.

What's your background in STEM?

My background is in environmental management and I have an Environmental Planning degree. I've been lucky enough with Genesis to work in a number of different roles and have broadened my skills into a range of areas.

Should kiwi kids get into STEM?

Absolutely! You will gain skills that will enable you to go anywhere and do virtually anything! Genesis has a high number of staff who studied STEM – based subjects and have gone on to work in a range of different careers. STEM subjects give you an important base in design, analytics, written and oral communication and an gives you a glimpse into a wide-range of industries.

Elise Beavis

Performance Engineer, Emirates Team New Zealand

What does your role involve?

I am focused on working with various technologies to help the boat go faster. In the last America's Cup, one of my big challenges was working out how to fit the boat, and all of our equipment, into the airplane to travel to Bermuda – far from an easy feat!

What's your background in STEM?

I did a Bachelor of Engineering at Auckland University. This included a focus on Computational Fluid Dynamics, which has become one of my main jobs at Emirates Team New Zealand. I was really fortunate to be able to do some of the practical work hours required by my degree with Emirates Team New Zealand, which led to me becoming a permanent part of the team.

Should kiwi kids get into STEM?

For sure. As an avid sailor and someone passionate about physics and maths, I have managed to combine both my passions to create a career in my dream industry. I have an open and curious mind and always want to understand how the world works. If this sounds like you, then STEM subjects are the way to go.

TEACHER INFORMATION:

Learning sequence

INTRODUCING KNOWLEDGE

EXPLORE AND INVESTIGATE

CREATE AND SHARE

REFLECT AND EXTEND

MAKE A DIFFERENCE

Learning intentions

Students are learning to:

- explore the kinetic energy of wind which can be harnessed by sails and machinery to provide power
- use experimentation and testing to revise their own wind powered sail boat designs
- explain how the energy of the wind can be harnessed to power the Emirates Team New Zealand boats.

Success criteria

Students can:

- design a small scale wind powered sailboat
- explain that energy is transferred from the wind to the sailboat
- explain that the energy in the wind and the energy in the movement of the boat are forms of kinetic energy.

Resources needed

Materials to design and make a wind powered sailboat; for example: paper, masking tape, straws, fabric, craft sticks/skewers, pool noodles, craft foam, paper towels, toothpicks, pipe cleaners, paper clips, plastic bottles, fan.

Additional Support

Emirates Team New Zealand official website

2018 - Emirates Team New Zealand. The day we won back the America's Cup

Genesis: Powering Emirates Team New Zealand

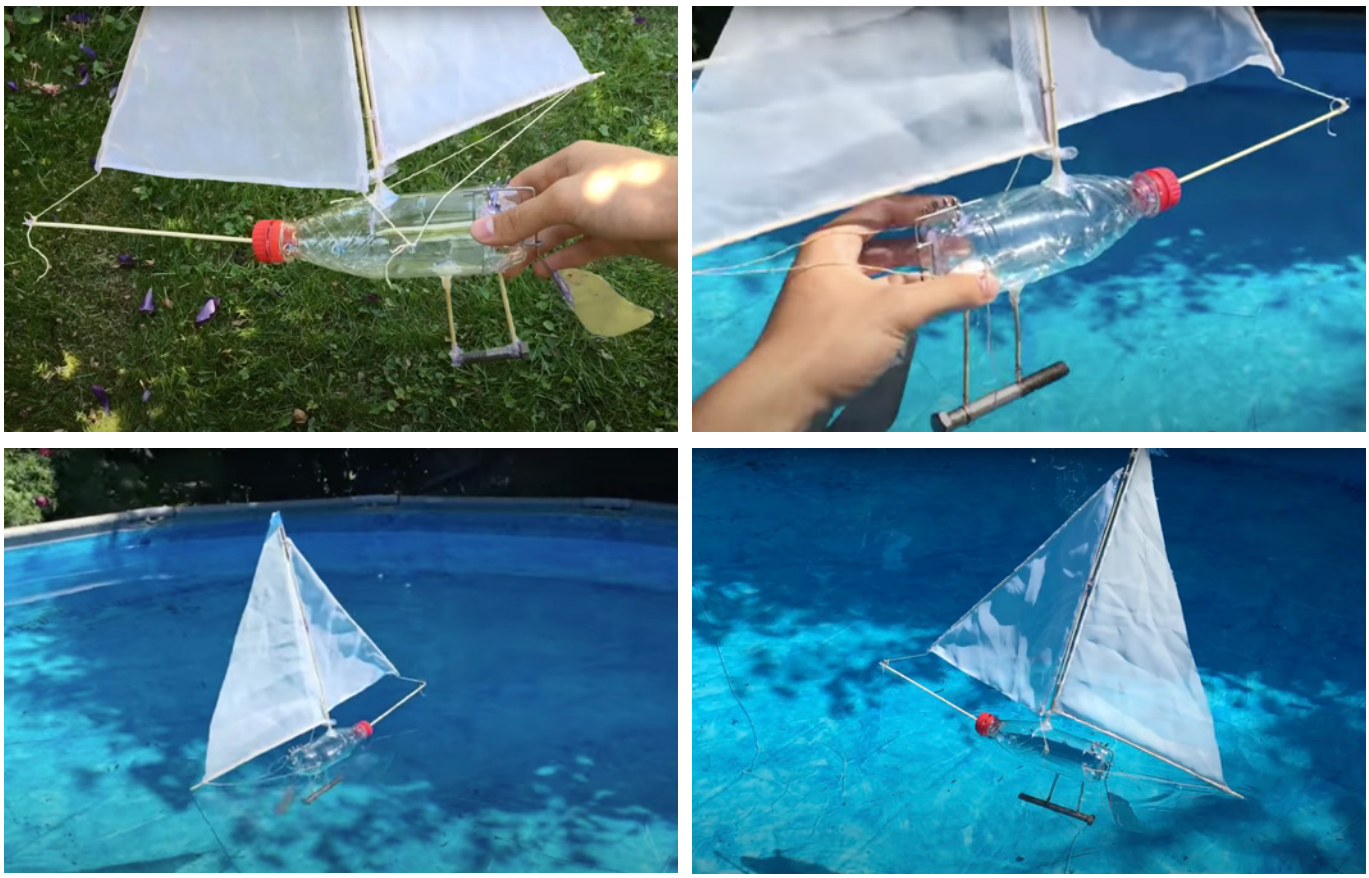
Slideshow: Introducing Wind Energy and Turbines

Ministry of Education (2004). Windmills and Waterwheels: Harnessing the Energy of Wind and Water. Building Science Concepts Book 54. Wellington: Learning Media.

Ministry of Education (2004). Floating and Sinking – How objects behave in Water, Building Science Concepts Book 37. Wellington: Learning Media.

Vocabulary

potential energy, kinetic energy, harness, force, float, sink, buoyancy, displace.



Any text highlighted in orange represents a link to further material. If you have printed this resource, please return to schoolgen.co.nz/for-teachers/resources to access the linked material.

LEARNING EXPERIENCE

Note: These are suggestions only and teachers are encouraged to adjust the activity to suit the needs and interests of their students.

INTRODUCING KNOWLEDGE

Allow approximately 15 minutes

- Discuss the concepts of floating and sinking. Choose a variety of items to submerge in water for example: paper, wood, plastic, metal, and fruit. Students can observe and report which objects float and sink. Why do some objects float and others sink?
- Encourage (through observation) an understanding of basic concepts about floating and sinking. For example: usually, an object with air trapped inside it will float, an object that is light for its size compared with water will float in water.
- View the wind energy slideshow to revise learning about potential energy, kinetic energy and harnessing the wind using sails and turbines.

EXPLORE AND INVESTIGATE

Allow approximately 20 minutes

THINKING LIKE A SCIENTIST:
How can the wind help us? Wind helps us to generate electricity and transport ourselves (on boats, planes)

Discuss: What exactly is wind? How does it move?
Have you ever been outside when it is really windy?
What happens to objects around you on a windy day?

- Research on the internet and investigate previous America's Cup races.
- Watch YouTube videos of America's Cup races and look at the AC75 Boat concept. For example: Observe how the boat uses wind energy.

Discuss: Why sails are needed and what they do? What shape the sails are and why they are that shape? How the position of the sails on the boat affect speed? How the boat travels along the water?

CREATE AND SHARE

Allow approximately 45 minutes

Design a boat that will float and travel by wind power (individual or group).

Create/make a wind powered sailboat.

A toy sailboat can harness wind, and use the power of the wind to move forward in the water. Your design will be more simple than the new and complex designs of competitive yachting, but it will use wind in a similar way to the America's Cup boats.

YouTube has a variety of ideas to inspire you.

1. Design your sailboat

- View examples of sailboats and decide with your group what features your sailboat will have
- Decide which materials and resources you will need
- **Plan, draw and label a sailboat design, showing what the boat will look like and what it will be made from**
- Possible materials: paper, masking tape, straws, fabric, craft sticks/ skewers, pool noodles, craft foam, paper towels, tooth picks, pipe cleaners, paper clips, plastic bottles, fan.

2. Make your sailboat

- Create your sailboat using your design and plans
- Use your plan to make your model sailboat.

3. Test your sailboat

- Test your boat on water. Does it float? Does it stay upright in the wind?
- Do you need to make adjustments to your design or sailboat to make it float or move better? Discuss and return to plan and materials to make adjustments where needed
- **Race or time your sailboat:** use a pool or large trough to race or time the sailboat
- Record how your boat sailed during the race.

4. Reflection and improvement

- Was your boat successful? Why/Why not?
- Think about how you could solve any problems that you had
- Describe how your boat was able to harness wind's kinetic energy
- Go back to your design and adjust your plan
- Change your prototype and re-test.

REFLECT AND EXTEND

Allow approximately 10-20 minutes

Exploring measurement with model sailboats.

Develop mathematical challenges around the making and testing of the model sailboats and around America's Cup yacht races.

- Work out the distance your sailboat travelled.
- Calculate the length, width and height of your boat.
- Time how long it took your boat to go from point A to B.
- Use a graph to show the distances the boats travelled in your class.
- Try the extension level 4-5 activity: Measuring wind power and explore how wind energy affects real America's Cup boats.

Reflect

- Use a rubric to reflect on the success of your boat design and how you went. Allow students to think about their work and how they went. Students can self-assess their performance using a scale: 1=unsatisfactory, 2=needs improvements, 3=good effort, 4=outstanding effort. Use this google sheet to reflect on your experience and document your reflections.

Example comments or rubric statements:

- I sketched my design and used notes and labels to show what shapes and materials I used.
- I made a sailboat using my plan and materials.
- I made improvements on my sailboat after testing.
- My sailboat was able to float and was powered by the force of a wind on the water.

MAKE A DIFFERENCE

Allow approximately 15 minutes

- List the different materials that were used to make the model sailboats. Which items were bought? Which items were recycled or came from nature? Why is it beneficial to use recycled objects to make things? Which choices were the most sustainable?
- List ways that we can keep our waterways clean.

We hope you have enjoyed this educational STEM resource.
School-gen is a Genesis community initiative to get kaiako, tamariki and whānau enthused about STEM.
For more free resources please visit our Genesis School-gen website and
follow us on Facebook and Instagram @schoolgennz