YEARS 2-4

Hydro Turbine

Hiko ā Wai

OVERVIEW

Students will make and play with a water turbine (option to use a 3D printer) and explore a range of concepts such as force, motion, renewable energy, electricity.

NZ CURRICULUM LINKS

LEARNING AREAS:	ACHIEVEMENT OBJECTIVES:	LEVELS:	YEARS:
Science: Physical World: Physical inquiry Physics concepts	Explore everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves, and heat.	1-2	1-4
Technology: Technological modelling	Understand that functional models are used to represent reality and test design concepts and that prototypes are used to test technological outcomes.	1-2	1-4
English: Speaking, writing and presenting	Acquire and begin to use sources of information, processes and strategies to identify, form and express ideas.	1-2	1-4

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 and experience how energy is carried by moving water and can move objects.
- Understand how a water wheel which uses the energy of water to move.

Success criteria

Students can:

- Describe the energy of moving water and discuss how it can move objects.
- Design a water wheel that uses the energy of water to move and reflect on the success of their design.

Resources needed

Exploring Energy and Electricity slideshow Introducing hydro power slideshow

Water Power article by Sandra Carrod. School Journal: Part 2 No 4 2005, Ministry of Education.

Power article by Alex Taylor: School Journal, Level 2 August 2011

Additional Support

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

Google Slideshow: Hydroelectricity and turbines

Vocabulary

Water, hydro, turbine, axis, blades, shaft, buckets, reservoir, penstock, powerhouse.

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

Introduce the concept of hydro power or sourcing energy from water.

- Read 'Water Power' by Sandra Carrod (see Resources needed, page 2) or a suitable alternative. Students can share their prior knowledge about hydro power with a partner.
- View the Google Slides presentation: Introducing hydro power slideshow
  This slideshow introduces vocabulary and basic concepts about how water moves, the water cycle, hydrolectric dams and turbines.

Visit the websites below for more information:

- Te Ara - hydroelectricity
- Science Learn – Hydro-power
- Hydropower 101 video by Student Energy – Video

EXPLORE AND INVESTIGATE

Timing will vary

Discuss where water comes from. Explain that water is always moving, and when it moves, it carries energy.

Make a continuous flow of water, for example a watercourse made by running tap water along a channel. You could also use a water slide or water fountain.

Students can discuss and record their experiences when placing a hand or an object in the continuous flow of water.

- What happens to your hand or the object?
- Can you stop the objects from being moved by the water?
- What can you say about the force of the water?
- Which objects were moved by the water and which were not? What did these objects have in common?
- Create some water poetry. What does water taste like?... feel like?...look like?...sound like?...

THINKING LIKE A SCIENTIST:
Ask questions: Where does water come from? What does water feel like? How can water move objects?

CREATE AND SHARE

Timing will vary

Design and make a simple water wheel

Using recycled objects such as wooden chopsticks or skewers, pieces of plastic, ice-cream containers or laundry powder scoops, make a water wheel.

- View several examples of how to make a water wheel with your students. There are many YouTube sites that will show you how to make one.
  Kid Science – Build a Water Wheel
  Nanogirl Lab - Make your own Water Wheel!
- Your water wheel will need to spin from a centre point (axle) and have blades that will catch the water.
- Then students can design and build their own water wheels or turbines, using the ideas from their viewing. They can work in groups, pairs or individually. The worksheet below may help with their design and evaluation of their prototype.

Our water wheel – Design, testing and reflection	
Our water wheel plan	
What happened to our water wheel in water?	Other observations
What went well and why?	What could be improved? How could we change our plan?

Link to Google Docs version

So you can better observe the speed of the blade turning, make one blade a different colour or mark one blade with a large dot. When you have made your turbine hold it by the axle (the rod that goes right through the very centre of the wheel to help it move) and place it in the path of flowing water.

Try out your water wheel prototypes. Observe what is happening as they spin in water.
Discuss with students:

- What is the water pushing on?
- What does the push of the water do to the waterwheel?
- If you change the speed of the water how does this affect the waterwheel?
- Reflect on the different water wheel designs.
- How can students make their water wheel go faster?

Complete the student activity sheet on page 4.

- Can they get their water wheel to lift an object?

Look at and discuss a picture of a hydro turbine and its parts.

- What new vocabulary can you learn about? (water flow, blades, wicket gate, rotor, shaft).

REFLECT AND EXTEND

Allow approximately 15 minutes

Reflecting on learning

- What did you learn about the energy of water from this activity?
- How can people harness the energy of water and what can this energy be used for?
- Which water wheel was the most successful? Why is this?

Extending learning

- Find out about how a water wheel might be similar to a hydro turbine used in a hydroelectric power station. See Google slideshow: Hydroelectricity and Turbines
- Research on the internet how a hydroelectric power station makes electricity.
- If you have one, you can use a 3D printer to make a hydro turbine using the step by step guide on our website, see also the Year 5-8 Hydro turbine challenge activity.
- Mark on a map of New Zealand where the major hydroelectric dams are located. Are they in a specific area? What do you need to have a successful hydroelectric dam?

MAKE A DIFFERENCE

Allow approximately 5 - 10 minutes

- It takes a lot of energy, money and effort to get electricity to our homes. Genesis Energy provides many New Zealanders with electricity using real-life hydro turbines.
- These are bigger and a different structure to the models described, however they do follow the same principles. How can you use less electricity in your classroom or home?
- Some of our large New Zealand rivers provide us with drinking water and electricity.
- How can you look after the precious water resources in your neighbourhood? List ways you can conserve water.

We hope you have enjoyed this educational STEM resource.
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