

Wind Turbine

**Curriculum
Levels 1-2
Maths, Science**

Activity Description

Students will put together a simple 3D printed wind turbine model (see Wind Turbine Maker Steps) and use it to learn about wind energy using their own breath. They will quantify the effect of the wind energy by counting how many times it spins around and / or timing how long it takes to stop.



Teaching rationale

Students will:

- Make a simple wind turbine using the How to make a wind turbine steps and video on schoolgen.co.nz
- Investigate the effect of airspeed on a wind turbine

Note: This resource supports Level 1 – 2 Maths and Science

Curriculum Links

MATHEMATICS	Level 1-2 Achievement Objectives	Specific Learning Outcomes
Geometry & Measurement	Measurement L1- Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. L2- Create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature, and time.	<ol style="list-style-type: none"> 1. Use a model wind turbine to investigate the effect of wind speed on turbines. 2. Measure the number of turbine rotations (“spins” or “turns”) by counting in whole numbers. 3. State that distance is being measured in units of centimetres (cm). 4. Graph the number of turbine rotations from one breath vs distance from the turbine.
Statistics	Statistical investigation L1- Conduct investigations using the statistical enquiry cycle: <ul style="list-style-type: none"> • posing and answering questions • gathering, sorting and counting, and displaying category data • discussing the results. L2- communicating findings based on the data.	<ol style="list-style-type: none"> 5. Discuss their interpretation of the graph and what it shows.
Number & Algebra	Number strategies Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. Number knowledge Know the forward and backward counting sequences of whole numbers to 100.	

SCIENCE	Level 1-2 Achievement Objectives	Specific Learning Outcomes
Nature of Science	<p>Exploration, play, asking questions, and discussing simple models.</p> <p>Link science learning to their daily living</p>	<ol style="list-style-type: none"> 1. Use a model wind turbine to investigate the effect of wind speed on turbines. 2. Understand that their breath is being used to model wind and that both are just moving air. 3. Describe their breath as the
Physical World	<p>Explore everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves, and heat.</p>	<ol style="list-style-type: none"> 4. State that the energy source for their breath comes from food. 5. State that the wind is the movement of air in the atmosphere.
Planet Earth & Beyond	<p>Describe how natural features are changed and resources affected by natural events and human actions.</p> <p>Share ideas and observations about the sun and the moon and their physical effects on the heat and light available to earth.</p>	<ol style="list-style-type: none"> 6. Describe the energy source for the wind as the sun (whose light is absorbed at the earth's surface in different amounts at different places. 7. State that large wind turbines are used to generate electricity around the world.

Useful topic background

- Wind is a renewable energy source which is abundant in some areas of New Zealand (especially high exposed hills).
- Wind farms are groups of wind turbines and in New Zealand wind farms generate around 5% of our country's electricity. They are the 4th largest electricity source in New Zealand behind hydroelectricity, geothermal and gas/coal thermal.
- Find out about Genesis Energy's Hau Nui wind farm. (Hau Nui is te reo Maori for "Big Wind"):
www.genesisenergy.co.nz/hau-nui-wind-farm



Running the activity

Get together the following equipment

- Use the 'How to make a wind turbine' video and steps on schoolgen.co.nz and make one turbine for each group of three.
- Ruler or measuring tape.
- Print out the worksheet below so students can record their results and draw a bar graph of the outcome.

Outline the activity for the students

- Get the students to put a marker dot on the top outer edge of the turbine. As the wind turbine turns, the students will count how many times this dot passes by where it started from.
- Students take turns to blow (one breath allowed at a time) on the wind turbine from a series of decreasing distances starting at 100 cm down to 40 cm.
- They need to count how many times it spins around. (**Note:** - If the rotation speed is too fast to count then it could be videoed and then played back in slow motion for accurate counting.)

Pre- and post-activity discussion starters:

- Where does electricity come from?
- What would life have been like before electricity was available?
- What are some environmentally friendly ways to generate electricity?
- What are some issues with wind power?
- How does wind electricity work? (Wind starts with the sun's heat energy, wind hits the blades of the turbines, turbines turn generators to make electricity, wires carry electricity to where it is needed by people)

Extending your students

See the other School-gen maker projects on schoolgen.co.nz

Supporting resources

Check out the 'All our energy comes from the sun' Level 1-2 poster on schoolgen.co.nz



Wind Turbine - Puff Power!

In this activity, you will learn

- About wind and wind turbines
- How wind speed (faster or slower air) affects a wind turbine
- How electricity is generated from wind in New Zealand

Instructions

1. Set up your wind turbine on a table in an area without any breeze
2. Make sure it is level and can spin easily.
3. Check that there is a dot on the top edge of the wind turbine – you are going to use this to count how many times the turbine spins around.
4. Measure 100 cm from the edge of the wind turbine and have the person blowing stand there. (Their mouth must be in line with the wind turbine i.e. they must blow directly at the blades and not from below or above.)
5. Without moving closer, the person needs to blow on the turbine.
6. Now count the number of times it spins from start to stop.
7. Record the number of spins and the distance in the results table below.
8. Repeat this for distances of 90 cm, 80 cm, 70 cm, 60 cm, 50 cm, 40 cm.

Hint! It is easier to work in a group of 3, so one person can set the distance to the wind turbine, one person can do the puff, the other person can count the spins and record your result.

Hint! If you find it hard to count all the spins, then you might try to take a video of it spinning and then replay it.

1. Results Table

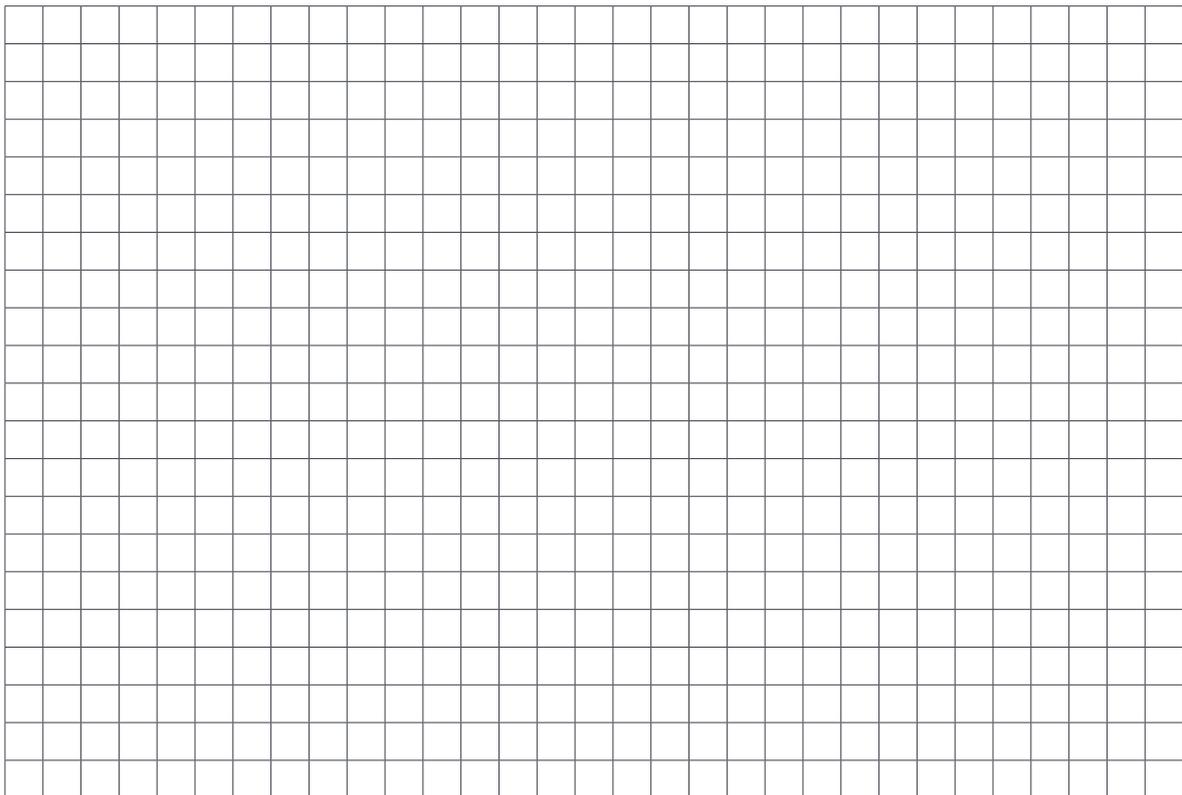
Number of turbine spins from 1 puff at different distances

There are extra columns for each person in the group to have a turn at blowing (it is not a competition though!)

Distance measured in	Number of spins Name	Number of spins Name	Number of spins Name
100 cm			
90 cm			
80 cm			
70 cm			
60 cm			
50 cm			
40 cm			

2. Draw a bar graph of your results

Use the numbers you recorded in the table and make a bar graph of how many spins.



3. Write a sentence or two to describe what you think the graph shows?

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4. Questions about wind turbines

(a) Where does the energy in the wind come from?

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(b) Where does the energy to make you breathe come from?

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(c) Complete these sentences using these words in the right order:

air, breathe, breath, faster, slower, turbine, wind

My makes the model wind spin around.

When I out the is moving

..... close to my mouth, and further away.

To the model wind turbine, my breath is like the

(d) In what way are breath and wind the same?

.....

(e) In what way(s) are they different?

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(f) What are large wind turbines used for?

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(g) Where in New Zealand might you find really big wind turbines?

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(h) Discuss with your friends if the wind will ever run out and explain your answer.

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