TEACHING NOTES

WIND POWER

A Hands-On STEM lesson from Nanogirl's Lab

This worksheet is to help you to support your teaching on the topic of renewable energy. It contains a summary of the science knowledge, experiment instructions, topics for further inquiry, and links to the curriculum.

If you do not have access to our teacher resources, they are available at no charge - please visit nanogirlslab.com, click 'Teachers' and sign up to receive access to three hands-on STEM lessons, each with accompanying teaching notes. Our team are always happy to help, so please don't hesitate to reach out with any questions.

For this session, your class will each need:

- **Bottle cap**
- **Cardboard**
- **Pencil**
- **Ruler**
- **Scissors**
- **Blu-tack**
- **Wooden skewer or twig**
- **Filled water container**

NZ CURRICULUM STRAND: PHYSICAL WORLD

Achievement Aims	Learning Outcomes
Curriculum Strand: Physical World Physical inquiry: Explore, describe and represent patterns and trends for everyday examples of physical phenomena. Identify and describe the effect of forces on the motion of objects.	• Understand that the shape of a plane is engineered to help it sustain flight • Identify the forces of gravity, lift and drag and how each affects a plane in flight.

Renewable Energy from the Wind

Wind is moving air created by differences in temperature across the earth's surface As the sun heats up the air, it rises up. Cold air then moves in underneath to take its place. This moving air is called a convection current and along with the turning of the earth create what we know as wind. We can use this wind to generate electricity with wind turbines. The large blades of the turbines catch the wind and their turning motion is converted into electricity. As our planet will always create wind, electricity created in this way is classed as a type of renewable energy. Other types of renewable energy include solar power from the sun, geothermal energy using heat from underground and tidal energy from the power of the tides. This is different from non-renewable energy that comes from sources that will not be replenished in our lifetimes like coal, petroleum and natural gas.

As well as using it to make electricity, we can also use the power of the wind to push other things. Sailboats for example can use the power of the wind to help push them across the ocean. The sails are usually large so they can trap the force of the wind as it blows into them. This force on the surface of the sail helps to push the boat forwards. The angle of the sail relative to the wind is important, as sails can be angled to make most efficient use of the wind, and to best overcome the boats' inertia.

ACTIVITY— Sailboat

1. Place a lump of bluetack into the middle of the underside of the bottle cap to act as ballast.

2. Draw and cut out a boat shape on the card, making sure it's much bigger than the bottle cap. If you have a wax crayon use it to waterproof the card.

3. Use a small piece of blue tack to stick the boat shape to the upside-down cap

4. Measure and cut out a small rectangle of paper 5 cm wide and 8 cm long to make a sail.

5. Poke two holes into the top and bottom of the sail then thread onto the small stick, which will act as the mast.

6. Stick one end of the mast into the bluetack and trim the length if needed

7. Fill a bowl or sink with water.

8. Place the sailboat on the water, and blow gently into the sail.

EXPLORE FURTHER

(Use these prompts to start a discussion or further inquiry on the topic of Flight)

- Why don't we make airplanes circular?
- Where does the force to take off come from in airplanes and in your paper planes?
- How do birds take off without engines?
- What's the difference between flying and gliding?
- What is the largest airplane in the world?
- What other shapes might be good for planes?
- How do planes know where to go?

If you have any questions, please contact info@nanogirllabs.com or check out Nanogirl's Lab at www.nanogirlslab.com