

Lesson 6	Wind Speed and Direction		
Level	Key Stage 2	Time required	1 hour
National Curriculum Links			
Science, Maths, English, Geography, D&T (view scheme of work for full details of links)			
Aims			
<ul style="list-style-type: none"> The students will discover how the wind speed and direction affect the wind turbine's output 			
Resources required			
Pen, record sheets (one of each per group), Wind Turbine Kit, electric fan, safety goggles			
Web search keywords			
Wind speed wind turbine, wind direction wind turbine, weather vane, direction of wind turbine, wind turbine facing wind, wind turbine tail plane			

Introduction

The students are asked to experiment with different wind (fan) speeds and see how the wind direction affects the wind turbine's voltage output.

Using all the information the students have gathered so far, ask them to set up the Wind Turbine Kit as efficiently as possible. Set up a fan (ideally 15" diameter) as described in the activity sheets.

Instructions are included with the Wind Turbine Kit. These can be downloaded in PDF format from: http://www.ecostyle.co.uk/products/wind_turbine_kit/wind_turbine_kit_activity_sheets_v2.15.pdf

Once the fan is in position, do not move it or the Wind Turbine Kit. It is important to keep this setting constant in order to achieve meaningful results.

From the students previous findings, ask them to select the most efficient number of blades and blade pitch.

Make sure the students have connected the turbine into the voltmeter. Explain that this simply tells us how much electricity is being generated by the turbine.

Ask the students to record their findings methodically. Test each fan speed at least twice to check and record.

The students will need to record the fan speed and the reading on the voltmeter.

Risk assessment

Ensure the rotor blades are pushed firmly into the rotor hub. If the rotor blade spokes become loose, squashing the spoke slightly with pliers will achieve a tighter fit. Safety goggles should be worn by students operating the equipment and by those in the surrounding area.

Task 1

This experiment requires a variable-speed fan, ideally with three speed settings: low, medium and high.

Set the fan to the lowest (slowest) setting and record the wind turbine's voltage output in the chart.

Repeat the experiment with the fan speed set to medium, then with the highest (fastest) setting.

Task 2

Set the fan to the highest (fastest) setting.

Record the voltage output in the chart.

Now gently swing the turbine head 45° by moving the tail fin (see diagram). Hold the turbine head in this position and record the voltage. Observe how the voltage changes as the turbine head is moved to the new position.

Finally swing the turbine head so it is almost 90° to the fan (see diagram). Hold the turbine head in this position and record the voltage. Again, observe how the voltage changes as the turbine head is moved to the new position.

Ask the students to record what they find and to test each direction at least twice.

The students will not be able to rotate the turbine axis with great accuracy so use the protractor to illustrate the size of angles, the students can deflect the turbine axis by approximating the angles,

Agree what you are going to name these directions. You may decide to use the cardinal points, north, south, west, east or some other definition of direction e.g. in front, behind, left, right. This may depend on the age and ability of your students. Ensure you are all naming the directions in the same way.

For your information

They should discover that the most power is produced when the wind turbine is pointing directly into the wind. Large commercial wind turbines have a weather vane and an anemometer at the top which automatically informs the computer in the nacelle which way the wind is coming from. The computer controls a motor that moves the whole top of the turbine round to point into the wind. If the wind speed is too high or too low the turbine will automatically stop. These lower and upper limits differ depending on the size and type of the turbine.

KS2 Lesson Plan

Record sheet

(Task 1)

Wind Speed	Voltmeter Reading
Low (slowest)	
Medium	
High (fastest)	

(Task 2)

Wind direction	Voltmeter Reading
0°	
30°	
60°	
90°	