



VERTICAL AXIS WIND TURBINE

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WIND LESSON

Time Frame:	Standards:
3 -- 45 minutes blocks 3 rd Grade	3.S.1.2.1 Make observations, collect data and evaluate it. 3.S.1.2.2 Replicate and/or use models 3.S.1.3.1 Measure changes that occur 3.S.1.6.3 Use appropriate tools and techniques and display data. 3.S.1.6.5 Make simple predictions. 3.S.1.6.7 Communicate the results of tests to others 3.S.1.8.1 Read and give multi-step instructions
Objectives:	
SWBAT to follow multistep directions and be able to work within small group to complete construction of a vertical axis wind turbine	
Background Information:	
Context Wind turbines are classified into two main categories, depending on whether the blades rotate around a horizontal or vertical axis. A horizontal axis wind turbine (the most common type from wind farms) will usually have a tail or a motor to make it turn to face into the wind. As the wind hits the propeller blades, the air is deflected to one side, causing the propeller to move in the opposite direction, thus causing the turbine to rotate.	
Materials:	
<ul style="list-style-type: none">• a cork from a wine or champagne bottle• a drinking straw• a bike spoke or straight piece of stiff wire• an aluminium can or a plastic drink bottle (In this project, you can make your propeller blades from either the drink can or the plastic bottle. If you decide to use the can, be careful, as cutting the can will leave sharp edges and sometimes small needle-like points of metal.)• snips or scissors• a knife	

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Procedure:

What to do

To start with, you need to cut both the top and bottom off of the can and bottle. The easiest way to do this is to poke a hole through the bottle or can and then cut around so that you end up with straight-sided tubes.

Next, you will need to cut three strips from the bottle or can, each strip about two centimeters wide, and as long as possible. You can see how this is done in Figure 1.

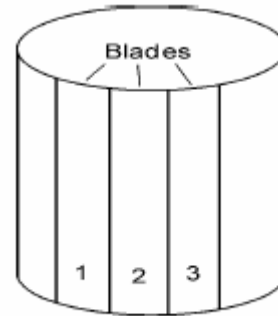


Figure 1. You cut out your blades from the can or bottle like this.

Now mark the centre of each end of the cork and push the bike spoke through the cork so that it goes straight down the center of the cork..

Using the knife (and a good deal of care so as to not cut yourself) make three evenly spaced cuts in the cork. These are where the blades will fit, so they need to be angled at about 30 degrees to the bike spoke.

Now carefully slide each blade into place in its slot, making sure that the curved side of the blade is toward the front. Place a small dab of glue on each blade where it meets the cork, so that the blades will not come out when the turbine is turning.

When the glue is dry, you just place the straw over the bike spoke and you have a finished wind turbine. You can see how to assemble the turbine by looking at figure 2.

To make the turbine rotate, you can blow on it, hold it into the wind, or even run along with it.

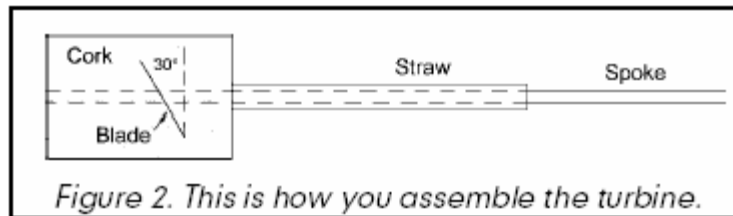


Figure 2. This is how you assemble the turbine.

Assessment:

This is an Observation Assessment. Are the students able to build turbine according to the model. Students can be creative and design different blades to see if they could build a fast model.

Additional Content:

Other things to try

If you have used metal blades on your wind turbine, you can twist them so that their angle at the end of the blades is less than the 30 degrees at the base. If you do this, the wind turbine will rotate faster for the same wind speed. Why does this happen?

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Another thing you may want to try is tying a small weight onto the bike spoke at the other end from the cork, and then dropping the turbine from a height. What do you think will happen?

References:

Wind Power is one of a series of five publications collated by the Queensland Sustainable Energy Industry Development Group, a nongovernment alliance of organizations whose aim is to enhance the sustainability of Queensland's energy supply. Each of the topics in the series contain a range of practical activity-based workshops for use in Queensland schools and aims to allow students and teachers to explore and discover the fundamental principles that underpin sustainable energy.

Other activity sets in this series include

- Global Warming and Climate Change
- Passive Solar Building Design
- Photovoltaics (Solar Electricity)
- Solar Cooking

Website is http://apps1.eere.energy.gov/education/lessonplans/pdfs/wind_power.pdf