

Time Frame:		Standards:	
45 minutes to complete standard turbine Additional time for extension to lesson		Idaho Standards 1.6.1 , 1.2.1 , 5.3.1	
Objectives:			
<ol style="list-style-type: none"> 1. Students will collaboratively use the scientific method to determine optimal blade designs for small scale wind turbines. 2. Students will design and build electrical generation wind turbines 			
Background Information:			
See the website http://www.eia.doe.gov/kids/energyfacts/sources/renewable/wind.html for a good background on wind energy.			
Materials:			
<ol style="list-style-type: none"> 1. The number of students per group is contingent upon the design parameters that the teacher requires. 2. A “standard” wind turbine will require the following. More challenging turbines will require more and different material. <ol style="list-style-type: none"> a. (2)- ½ x 3 7/8”, (4) - ½ x 4 1/2”, (2) - ½ x 9”, PVC pipe, schedule 40. This can be found at most home improvement centers. b. (1)- ½ x 14” PVC pipe, schedule 40. This is the “post”. c. (4)- ½ inch PVC pipe elbow joints, schedule 40. d. (4)- ½ inch PVC pipe “T” joints, schedule 40. e. (1)- Electric motor. A RadioShack Micro Gear #273-258 was used, but other motors are acceptable. This motor has a voltage range of 1.5 to 3 volts, 0.18 to 0.25 Amps. f. A red insulated wire, light gauge, with insulation. g. A black insulated wire, light gauge, with insulation h. Test tube stoppers with a single hole in center. This fits on the end of the motor and the blade is glued to it. i. A voltmeter. j. Various materials for making blades for the wind turbine. <ol style="list-style-type: none"> i. Paper plates ii. Plastic iii. Balsa Wood iv. Craft Sticks v. Pie Pan vi. Glue Gun and Glue Sticks vii. Anything your imagination can come up with 			

Procedure:

If it is possible, show the class a short presentation on how wind power works, using a web site similar to this one by British Petroleum.

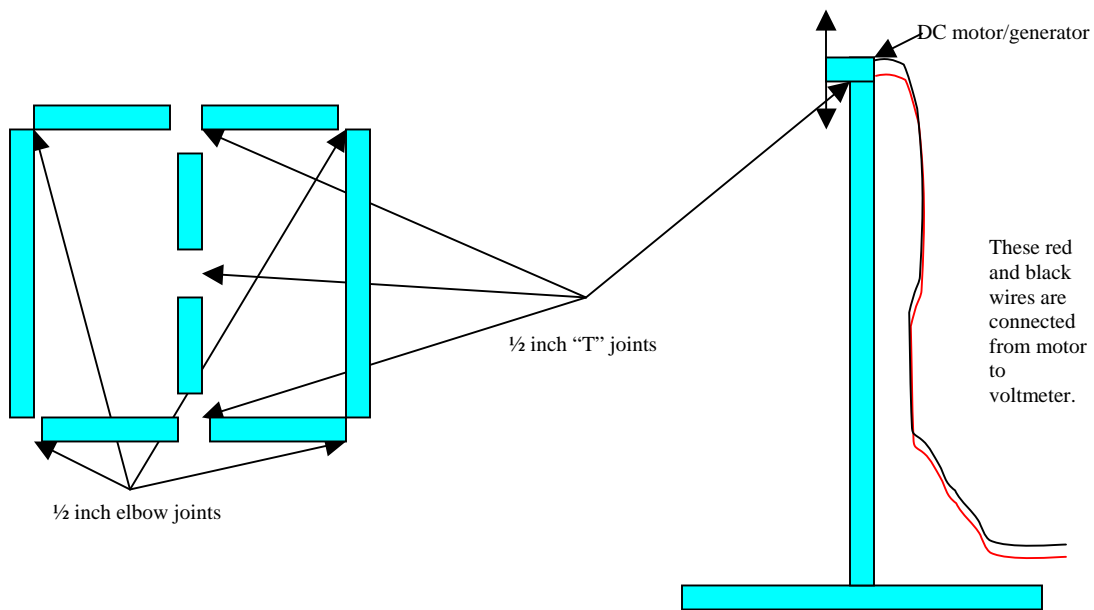
<http://www.bp.com/iframe.do?categoryId=9025015&contentId=7047453>

The students should realize that they are building a scale model of an actual wind turbine, as seen in the video.

Advanced classes may choose to connect their scale model wind turbines into a small grid to provide power to another small toy or electronic device.

Tower and Foundation Assembly:

A picture is worth a thousand words. Examine this picture carefully.





MODEL WIND TURBINE

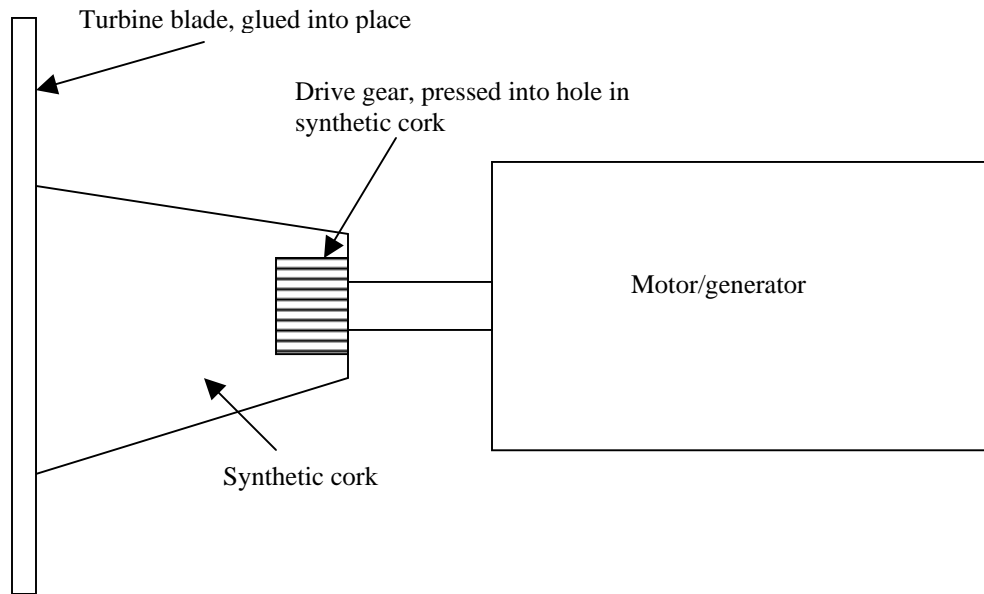
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Nacelle Construction:

Energy for Educators

Bringing Energy into the Classroom

Assemble the wind tower and frame, as shown above.



Assemble the generator and blades, something like what you might see above. Because different materials will be used, assembly will be altered.

Assessment:



MODEL WIND TURBINE

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Depending upon the instructor, assessments may take different forms. These are just some suggestions.

Rubric

Design	Cooperation	Quality/Care	Focus
Went above and beyond minimum standards, creative <u>3 points</u>	Showed much cooperation with team members. <u>3 points</u>	Showed much care when building project. <u>3 points</u>	Remained very engaged in project. <u>3 points</u>
Met minimum design standards, little additional creativity 2 points	Showed some cooperation with team members. <u>2 points</u>	Showed some care when building project. <u>2 points</u>	Remained somewhat engaged in project. 2 points
Design did not meet minimum standards, no creativity shown. <u>1 point</u>	Showed little cooperation with team members. <u>1 point</u>	Showed little care when building project. <u>1 point</u>	Was not engaged in project. <u>1 point</u>
_____	_____	_____	_____

			Total = pts.

Write a one to two page essay on the construction of this wind turbine model, and how it compares to large wind turbine projects.

Use what you have learned and what you have gotten from others and increase the wind turbine's energy output by at least 33%, without changing the amount or speed of the wind.