EXPLORATION:

In this activity we will build a model turbine connected to a generator to produce electricity. We will look at the speed of the wind to the amount of electricity produced and then look at blade design.

1. In your groups assemble the wind turbine using the red blades as shown in the next three pictures. (Parts in wind turbine kits may vary from those shown). First, thread the wires from the nacelle through the support post. Next, push the wires that are at the bottom of the post through the base. Finally, press the blade assembly on to the shaft extending from the nacelle.

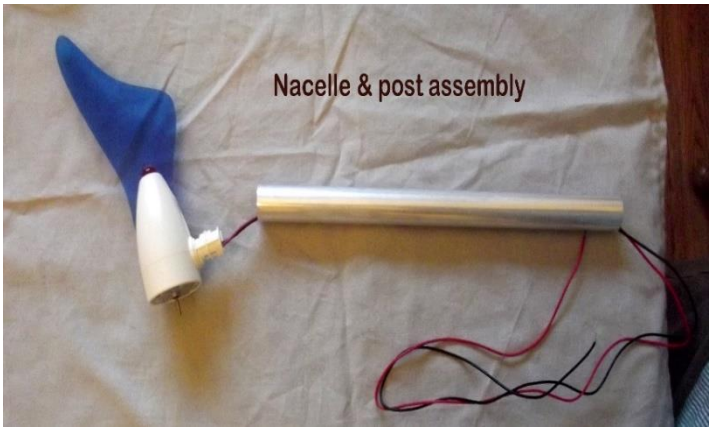

Photo by Van Barker

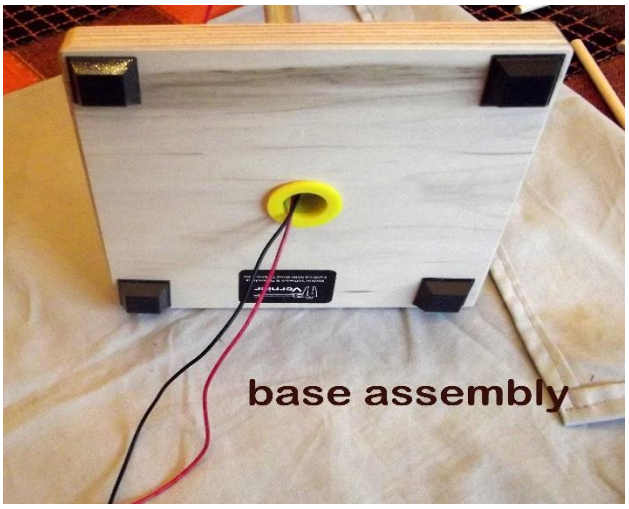

Photo by Van Barker

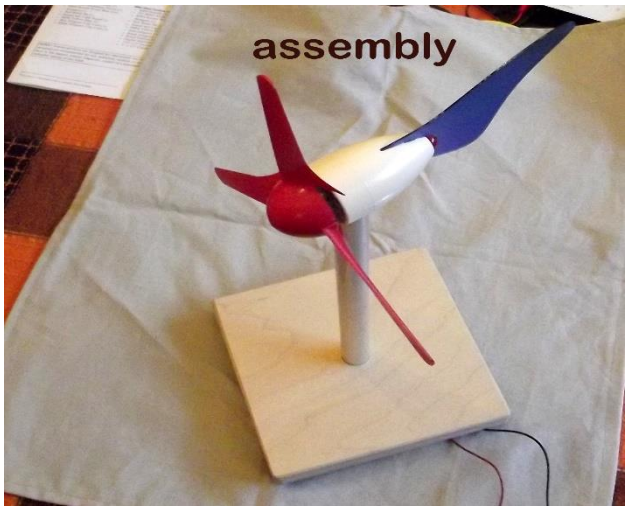

Photo by Van Barker

Connect the wires from the wind turbine to the wires from the interface board (red wire to red wire and black wire to black wire). Move the switch on the interface board to the Music setting. Turn the fan speed switch to the medium setting. See if you can get the music to play. What, if anything did you have to do?

2. Once you get the music to play then connect the multimeter up to the wind turbine (red wire to red wire and black wire to black wire). Then measure and record the voltage produced by the wind turbine. _____

3. Turn the fan speed to low and then measure and record the voltage on the multimeter. _____

4. Turn the fan speed to high and then measure and record the voltage on the multimeter. _____

5. Measure and record the distance between the front of the fan and the blades on the wind turbine. _____

6. Move the fan 3 meters farther away and then measure and record the voltage with the fan set at medium speed. _____

7.Looking at the wind turbine and the picture. When the blades move what are they turning inside the nacelle? _____

Now let's look at the blade design.

Set up the wind turbine using the hub (see picture below) and locate the fan 2 meters away from the turbine. Attach the wires from the turbine to the multimeter as described previously. This will be the testing area.

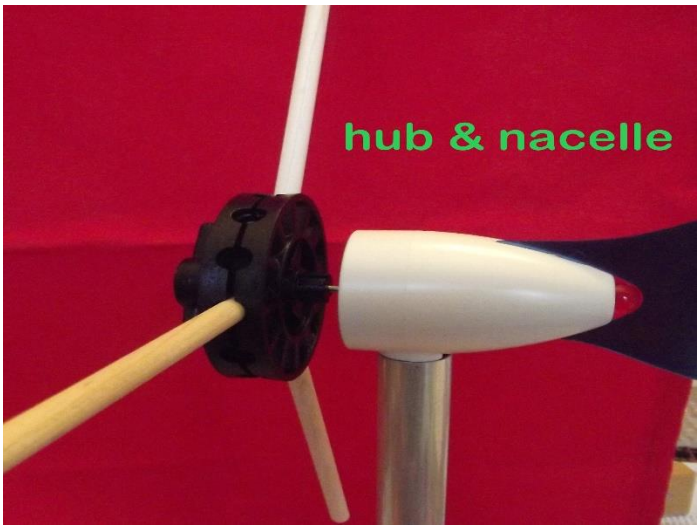

Photo by Van Barker

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Design blades for your turbine using the materials your teacher has for you.

What material did you choose? _____

1. Cut out your blades and draw them.
How many blades do you have?

2. Take your blades to the testing area and place your blades on the hub.

3. Turn the fan on low. Measure and record the pitch of the blades and then measure and record the voltage produced. _____

4. Turn the fan on high and then measure and record the voltage. _____

5. What do you think you can do to get the wind turbine to produce a higher voltage?

6. Change the pitch of the blades and record the angle. _____. Did the change in the pitch cause anything else to change? If so, what changed and how did it change?

7. Measure and record the voltage with fan on the low setting. _____ Then measure and record the voltage with the fan on the high setting. _____.

8. Change the pitch of the blades to a new angle. Record the new angle and then measure and record the voltage. _____

9. Design a new set of blades and draw them.
How many blades do you have?

10. Repeat steps 3 - 8 above using the new set of blades and record the data below.

Starting pitch of new blades _____

Low speed voltage _____ High speed voltage_____

Changed pitch of new blades _____

Low speed voltage _____ High speed voltage_____

Try several different blade pitch angles to see which causes the wind turbine to produce the highest voltage. What angle was best? _____