



Wind Energy

Harness the power of the wind! Learn how to generate renewable energy by creating your own wind turbine prototype.

TEKS:

SCI 6.7 A: The student is expected to research and discuss the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.

SCI 8.10 A: The student is expected to recognize that the Sun provides the energy that drives convection within the atmosphere and oceans, producing winds.

Materials:

- 4 craft sticks
- Drill, ice pick, or awl
- Fan, hairdryer, or a windy day
- Hot glue gun or glue dots
- 5mm LED (red)
- Large paper cup (9-16 oz)
- Small hobby motor (6-12 volts)
- Small paper cup (3-5 oz)
- Tape

How To:

1. Use a drill, ice pick, or awl to poke a hole in the center of two craft sticks. **Safety: an adult should assist when using a drill, ice pick, or awl.**
2. Glue these two craft sticks together into the shape of an "X." It's okay if the craft sticks split a bit. Make sure that the holes line up and that glue is not blocking the holes. This is the wind turbine's blade frame. **Safety: an adult should assist when using hot glue.**

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3. Cut the bottom off of the small paper cup. Then, cut the cup into four equal parts. These four pieces are the blades of the wind turbine.



4. Glue a cup piece blade to each end of the craft stick "X," all facing up (you should be able to see the inside of the cup.) **Safety: an adult should assist when using hot glue.**



5. Take out the small hobby motor. Notice that it has two metal tabs.
6. Take out the LED. Notice that it has two metal wires (these are called pins or legs).
7. Twist one of the LED pins around one of the metal tabs on the hobby motor and the other LED pin around the opposite tab. Secure with tape, if needed.



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8. Stick the motor through the hole in the middle of the turbine's blade frame.



9. Place the large paper cup face down.
10. Glue the ends of the remaining two craft sticks to opposite sides of the large paper cup. Glue the other ends of both craft sticks on opposite sides of the motor. This creates a frame to hold the motor in place. **Safety: an adult should assist when using hot glue.**



11. The blades of the wind turbine should now be able to spin freely.
12. Place the turbine in a windy location or aim a fan or hairdryer at the blades. Does the LED light up? If not, try spinning the turbine's blades in the opposite direction. The wind turbine will need to spin very fast to illuminate the LED!
13. Modify the wind turbine design to make it work even better. Can you add weight to the base to make it sturdier? How about changing the size or material of the cup blades?

STEM Explanation:

Wind is air in motion! Warm air is less dense than cold air so it rises. When warm air rises, cool air moves in and replaces the warm air. This movement of air is what causes the wind to blow, and this wind can be collected to create energy. Wind power is pretty incredible! It is a renewable resource, available everywhere, clean, and produces zero greenhouse gases. Wind power also uses very little land. It is collected in wind farms, which are large groups of wind turbines in the same area that are used to collect wind power and transform it into electricity.

Today you created a wind turbine. A wind turbine is a generator that converts mechanical energy into electrical energy. The wind turbine prototype that you created is only inches in size, but turbines can be over 400 feet tall in real life! These massive turbines use the wind's energy to move the blades of the turbine. When the blades spin, the generator inside also rotates. This creates an electrical current. The more wind, the faster the blades turn, and the more electrical energy will be created from this turbine! Did you know that the

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state of Texas produces more wind power than any state in the United States? In 2020, over a quarter of all the United States wind-powered electricity came from Texas!

Career Connection:

Wind energy engineers design and analyze operations of wind farms. They create models to determine the layout of wind farm roads, structures, and equipment. Wind energy engineers ensure that wind farms are constructed properly and have little impact on the environment.

Resources:

<https://www.exploratorium.edu/snacks/light-wind>

https://en.wikipedia.org/wiki/Alta_Wind_Energy_Center

<https://www.eia.gov/state/?sid=TX>

https://www.bls.gov/green/wind_energy/

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