

HARNESSING



a STEM activity
guide provided
by SDAN



TMC
to go



Electricity

Wind Power: Designing a Turbine

Activity Description: Students explore renewable energy and engineering by designing and testing their own wind turbine. Using a voltmeter, groups of students compete to design the optimal wind turbine using basic materials and a small DC motor.

Time: 60 minutes

Grade: 3 - 8

Introduction Video: [Wind Power! Designing a Wind Turbine - YouTube](#)

Lesson URL: [Wind Power - Informal Learning Activity - TeachEngineering](#)

Materials Needed:

Each group needs:

- 1 sheet of paper
- 1 writing utensil
- 1 small DC motor
- 1 rubber band
- scotch tape
- stiff ruler
- cylindrical-shaped cork, at least 2 cm or $\frac{3}{4}$ -inch in diameter
- 4 paperclips
- 4 index cards
- scissors



For the class to share:

- alligator clips
- DC voltmeter
- hair dryer or electric fan (wind source)

This activity aligns with the following South Dakota Science Standards:

4-PS3-4 Design, test, and refine a device that converts energy from one form to another.* (SEP: 6; DCI: PS3.B, PS3.D, ETS1.A ; CCC: Energy/Matter)

Extensions:

- Use this activity in conjunction with the following: [Build an Anemometer - Informal Learning Activity - TeachEngineering](#). Students can calculate the effects of wind speed on electric output.
- Have students take their projects outdoors and hypothesize whether their wind turbines will produce more or less energy using wind.
- If additional materials are available, have students design additional prototypes that include other materials that improve the overall design.
- Connect with the South Dakota Wind Energy Association to learn more about wind projects in South Dakota: [South Dakota Wind Energy Association \(sdwea.org\)](http://sdwea.org)

Creating Model Lungs: Just Breathe

Activity Description: Students learn about the structure and function of the lungs in order to create a model of the organ using basic materials. Students learn the anatomy of the lungs that corresponds to each part of the model and consider how medical researchers design medical devices to help people breathe.

Time: 45 minutes

Grade: K - 5

Introductory Video: [Creating Model Working Lungs: Just Breathe - YouTube](#)

Lesson URL: [Creating Model Lungs: Just Breathe! - Informal Learning Activity - TeachEngineering](#)

Materials Needed:

Each student needs:

- 2 small-diameter straws (such as coffee stirrers)
- 2 small (water) balloons
- Scissors
- 1 large balloon
- duct tape
- 1 ~20 oz. plastic bottle with two holes drilled in the cap and one hole punctured in the bottom 1/3 of the bottle



This activity aligns with the following South Dakota Science Standards:

1-LS1-1 Design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* (SEP: 6; DCI: LS1.A, LSI.D; CCC: Structure/Function, Technology)

MS-LS1-3 Construct an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (SEP: 7 ; DCI: LS1.A; CCC: Systems)

NGSS:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Extensions:

- Have students research a selection of respiratory conditions such as asthma and COPD. Use the model you've created to explain how the condition influences lung function.

Engineering

Build an Anemometer

Activity Description: Students explore weather and meteorology by building an anemometer, which is a device that measures wind speed. This is an important tool for predicting future weather events, ensuring safe travel for boats and planes, and exploring the best areas for wind energy. Students use their anemometers to determine the best place for a wind turbine by taking measurements in different locations.

Time: 45 minutes (more depending how many locations you use for measurements)

Grade: 3 - 8

Lesson URL: [Build an Anemometer - Informal Learning Activity - TeachEngineering](#)

Materials Needed:

- ruler
- 4 paper cups
- marker
- paper
- scissors
- pencil, with eraser end
- push pin
- stapler/staples
- miscellaneous cardboard pieces



This activity aligns with the following South Dakota Science Standards:

3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence for how a pattern can be used to predict future motion. (SEP: 3; DCI: PS2.A; CCC: Patterns)

4-PS3-4 Design, test, and refine a device that converts energy from one form to another.* (SEP: 6; DCI: PS3.B, PS3.D, ETS1.A ; CCC: Energy/Matter)

MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. (SEP: 3; DCI: ESS2.C, ESS2.D; CCC: Cause/Effect)

Extensions:

- Connect this activity to a career that uses wind speed measurements. E.G. - Meteorologist, Wind Energy Engineer, Air Traffic Control
- Follow up this lesson with a wind turbine design challenge like this: [Wind Power - Informal Learning Activity - TeachEngineering](#)
- Have students consider other materials that would be better suited than those used in this activity. Consider allowing students to redesign their anemometers using these materials