

A photograph of three wind turbines in a field under a cloudy sky. The turbines are dark green and stand on a grassy hill. The sky is filled with soft, white and grey clouds, suggesting a bright but slightly overcast day. The overall tone is calm and natural.

6TH GRADE
STEM & ART 1 LESSON



THE ANSWER IS BLOWING IN THE WIND

Driving Question:

What designs or modifications can help reduce the amount of energy a building uses to increase its sustainability?

Materials Needed:

All materials, both optional and required, are listed.
 Notebook to record observations, writing utensil, recycled materials to build and test prototypes, sketch book, materials to create a 2D or 3D wind turbine design (will depend on chosen medium)

In this lesson, students will:

- distinguish the difference between energy sources that are renewable and nonrenewable;
- understand the pros and cons of nonrenewable energy sources such as coal and oil versus green energy such as wind and solar;
- describe ways to reduce energy consumption in a sustainable way; and
- create a design for a wind turbine.

National Learning Standards:

Science: MS-PS3-3; MS-ESS3-3;
 MS-ETS1-1; MS-ETS1-2
 Art: Cr2.1.6a; Cr2.3.6a



SPINNING THE COCOON

Before beginning this lesson, ask students to interview their parent or guardian to find out the source of energy used within their home. Depending on the location of your district, many students will probably have municipal energy.

During the next class period, show the website for one of the energy providers in your area and have students identify what method is used to produce their energy. Ask students to tell you what types of energy they've heard of before and write the list on the board. Some student responses might include solar, oil (petroleum) or wind. Define renewable and nonrenewable, and ask students to sort the energy list into those two categories. Complete the list by filling out any energy sources they haven't come up with yet. Energy sources listed should include coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal and solar.

Break the students into pairs or small groups and assign each student group one energy source. Students will do quick research to find one pro and one con of their assigned energy source and present them to the class. Explain that, while some energy sources may be cleaner than others, all energy resources require some sort of energy to install the infrastructure required to run and maintain them. This infrastructure can be cost prohibitive when it comes to installing green energy. Sometimes reducing the amount of energy someone uses can be more cost effective AND nearly as green as using sustainable energy.

For this reason, it is important to also learn how to conserve energy. Many old buildings are not energy efficient, but can be with some slight modifications.

As a class, investigate the classroom and the school to examine where energy waste may be present. Look for worn-out caulk and seals on windows or bathroom lights that are constantly left on. Touch walls or windows to check for transfer of heat or cold from the weather outside. Ask students to brainstorm ideas to help the school eliminate this energy waste and convert the building to conserve more energy.

KERNEL OF KNOWLEDGE

Texas produces the most wind energy in all of the United States with over 20,000 megawatts (MW) per year. The next closest state is Iowa with almost 7,000 MW per year.



METAMORPHOSIS

Students will brainstorm or research methods of energy conservation such as glass technology, insulation or subterranean building. Students will use their new knowledge, and review the methods of energy conservation discussed in class, to choose a room or building they are familiar with to convert with energy efficient upgrades. Students will create a scale model of the room or building and retrofit the space with recycled materials such as old clothes or milk cartons to reflect how they will update the energy efficiency of that area. While water conservation is also important, the focus should remain on energy unless water is being used to help maintain the space's temperature.

THROUGH THE LENS



Divide students into pairs or small groups, and have them take a trip around the inside and outside of the school. They should stop at each location where they see an example of energy waste. Using a smartphone or other recording device, have students take turns filming each other describing the evidence that indicates energy is being wasted. Make sure they also include suggestions for how to fix the issue and eliminate the energy waste. Once each group has finished, use an app such as Flipgrid to combine the clips and have the students present their video to the principal.

UPCYCLE

Conserving energy is great, but what about completely changing the energy source you use to a cleaner, more sustainable version? The renewable energy field is constantly growing to enable more people to do this. Choose your favorite renewable energy source and use your knowledge, as well as design software, to create a renewable energy prototype such as a new style of turbine or a new way to harness energy or water.



eARTh

Wind turbines convert kinetic wind energy into mechanical power. Wind energy is an amazing source of energy for many reasons: it's low cost, renewable, has enormous power and causes no pollution. In fact, one of the only complaints that people have regarding wind energy is the way that the turbines look!

Because this is a real issue for some people, artists and designers have begun creating more aesthetically pleasing wind turbines. They are beautifully designed pieces of art, and they not only help save the environment, but they add an aesthetic element to the space that they inhabit.

With your class, take a look at this [article](#) and discuss some of the different examples of artfully designed wind turbines. What do they have in common? How are they different? Encourage students to use proper vocabulary regarding the principles of design and elements of art when they discuss the examples.

Now, have students design their own wind turbine. They also need to think about the type of space that it would inhabit, such as an open field or somewhere more populated like atop a downtown office building. Be sure they brainstorm and create preliminary sketches before deciding on a final design. As they create their designs, remind them to keep these things in mind:

- What kind of space will it be placed in?
- How will it affect the space that it is in?
- What color(s) will it be?
- What shapes will it include?
- Will it create sound?

Encourage students to push their creativity. The final project can either be a detailed drawing of their turbine, or they can build an actual 3D model of their design. When they have finished, the students should present their ideas to the class.

Community Garden

- Many resources for your community's homeless population use volunteer labor to meet the needs of the individuals they serve. Many people are able to donate time but not necessarily money. Buildings such as food pantries and shelters, however, have operating expenses such as utilities that keep the building at a comfortable temperature.
- Visit your community's homeless resource buildings and use your knowledge of energy conservation methods and renewable energy sources to formulate a plan to reduce their operating expenses. Even a small reduction in energy costs can help them serve more people!



CAREER CONNECTION

Wind Turbine Technician - Wind turbine technicians specialize in the installation, maintenance and repair of wind turbines. This is a great career if you love heights! This career requires a high school diploma and technical school. Most of the time, technicians also complete an internship.

Community Market Coordinator - Community market coordinators set up the market, recruit vendors and help manage booths. They also help market patrons find the goods they are looking for. This career requires a high school diploma, plus experience in customer service and managing people comes in handy.

Civil Engineer - Civil engineers are responsible for almost all aspects of designing, building and maintaining a city. They work on infrastructure, including roads, bridges, buildings, sewer and water systems. Anything you see in your city is probably the result of the work of a civil engineer. This career requires a bachelor's degree, although more advancement opportunities are available with a master's degree.

Architect - Architects plan and design buildings. They may create something as small as a tiny house for the homeless to something as large as a stadium. This career requires a bachelor's degree.

Drafter - Drafters use designs from engineers and architects to create technical drawings using design software. This career requires an associate's degree.



CAREER HIGHLIGHT

Dan Corson incorporated solar power and art when he created his famous “Sonic Bloom” lighted sculptures outside of the Pacific Science Center in Seattle, WA. Not only do the giant flowers produce light at night, but they also demonstrate that even rainy environs such as Seattle can access solar energy.

