Cross-Curricular Activities Connected to Physical Science, Grade 4

The following activities from ***Energy Works,*** integrate math, social studies, English Language Arts (ELA), art, and more into physical science topics. These cross-curricular connections help students see how science is related to their lives, and the world they live in. These activities reinforce and extend ideas about how the Sun is Earth's ultimate source of energy and are perfect for learning-from-home lesson plans. Permission is granted to incorporate these activities into teacher and parent lesson plans.

Energy Tally (Science and Math)

Have students look around their homes to identify types of energy that is used. Have them create a chart titled: What Are Some Types of Energy We Use? to record and graph their data. Ask students questions about the data they collected. They should be able to use the tally and the graph to determine the answers.

Energy Use in Our Community (Social Studies)

Have students research which types of buildings in a community use the most energy. They will probably be surprised to learn that schools account for about 13 percent of energy use in most communities, ranking third in energy use.

Energy in Our Food (Nutrition / Health and Science)

Lead a class discussion about the types of food that students prefer to eat. You may choose to use the menu from the school cafeteria. Ask students if they notice a change in their energy depending on what foods they eat. Relate food energy to photosynthesis and the Sun.

Popcorn Energy (Science)

Make a batch of popcorn and have students describe popcorn and other types of food in terms of stored and motion energy. Beginning with the energy from the Sun, review the energy transfers and conversions that occur to make popcorn (light, heat, sound). Then ask students how the popcorn provides their bodies with energy.

Division Story Problem (Math)

Have students work in pairs to solve the following word problem:

The fourth-grade class at Shadow Brook School was working on a science unit on energy. Their teacher, Ms. Burling, took the class to the gym to discover the stored and motion energy of a table tennis game. That day, there were 20 students in class. The gym had 6 tables and a box of 15 balls. How many tables did the class need to use if there were 4 students (2 teams of 2 students) at each table? (20 ÷ 4 = 5 tables) How many balls could be given to each table? (15 ÷ 5 = 3 balls for each table)

An Australian Inventor (ELA and Social Studies)

Have students research Alfred Traeger, who invented a pedal-operated radio in the 1920s. Ask students to describe what he did and how the pedal-operated radio used energy transfers and transformations to work. You may choose to provide an article or encourage students to find their own.

Pedal Power (Science)

Ask students to find out about how they might use the pedal power of a bicycle to generate enough electricity to illuminate a small headlight and taillight on the bike.

Energy Math—Joules and Multiples of Ten (Math and Science)

Copy the list below (but not the powers of 10) onto the board. Have students work in groups to develop a three-column table for the information about units of measure for the energy of work. The first column will have the name and symbol, the second column will have the number that each unit needs to equal a joule, and the third column should have the symbol of each number to the tenth power.

joule symbol: J = 1

decajoule symbol: daJ = 10 J (101)

hectojoule symbol: hJ = 100 J (102)

kilojoule symbol: kJ = 1,000 J (103)

megajoule symbol: MJ = 1,000,000 J (106)

gigajoule symbol: GJ = 1,000,000,000 J (109)

Make Waves in a Bottle (Engineering)

1. Fill a clear, 16-oz bottle two-thirds full of water. Add a few drops of food coloring to the water, secure the cap, and shake to mix.

2. Remove the cap and fill the bottle the rest of the way with mineral oil or vegetable oil. Fill it up to the top so there is no room for air. Secure the cap.

3. Lay the bottle on its side. The oil will float to the top.

4. Roll the bottle back and forth. Observe that the waves move up and down as energy moves through the water.

Earthquakes Make Waves (ELA and Science)

Earthquakes are catastrophic events that make waves on Earth's surface. The United States Geological Survey website offers several resources students can explore to learn about the science of earthquakes. Find an article for students to read or a video to show to the class.

How Fast Is a Tsunami Wave? (Math)

An undersea earthquake unleashes a tremendous amount of energy and powerful waves. Tsunami waves move at speeds of up to 800 kilometers per hour, or as fast as a jet plane. If there are 1.5 kilometers in 1 mile, how many miles can a tsunami wave travel per hour? (500 miles)

Concrete Poems (ELA)

A concrete poem is written in a special shape related to the theme of the poem. Invite students to write and share a concrete poem about waves.

Making Sound Waves (Music and Science)

1. Students can make drums using jars, balloons, and rubber bands. They can observe vibrations using grains of rice. Provide these materials to individuals, small groups, or the whole class, and follow these steps to lead students through assembling and using a drum.

    a. Cut a balloon vertically through the middle.

    b. Stretch one-half of the cut balloon over the mouth of the jar.

    c. Place the rubber band around the mouth of the jar to secure the balloon skin.

    d. Place a few grains of rice on the skin so that when the drum is tapped (i.e., a force is applied) to produce sound, students can observe the effects of the vibration.

2. After everyone has had a chance to experience the model and create sounds, discuss the following questions:

- Is your drum different from other students' drums?
- What do you think would happen if you filled the jar with something? Would the sound it produces be the same?

Powered by Wind and Water (Social Studies)

Have students research real-life uses of wind and water energy. Students might be interested in learning about windmills in Holland and how they are used. If students are curious about hydroelectric power, encourage them to look into the hydroelectric power plant at Niagara Falls, which has a long and fascinating history.

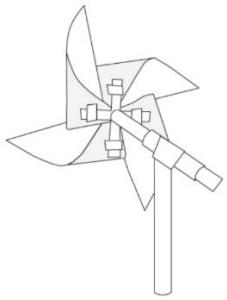
Geothermal Energy in Iceland (Geography and Science)

Have students research the use of geothermal energy in Iceland, where 70 percent of the energy comes from geothermal sources. You might offer one or both of the following questions to guide student research.

- Why is Iceland in a good location to make use of geothermal energy?
- How is geothermal energy used in Iceland?

Making a Rotor—What's the Angle? (Math)

During or after Lesson 5, Investigation B: Making a Wind Turbine, provide students with a protractor. As they follow the directions to build the rotor on Student Investigation Sheet 5B.1, have students measure the angle of the paper square in Part B, Step 1, in degrees from the top left corner. In Step 2, have students measure the leftmost corner after the paper square is folded diagonally into a triangle. List each angle of the rotor on the board. Are they the same?



For Further Research (Science and Careers)

Suggest to students that there are many topics related to energy that were not explored in this unit. Have interested students select and research a topic related to energy and present their findings to the class. Ideas include:

- Careers in energy
- Energy conservation
- Types of renewable energy