UNIT OVERVIEW

Energy is everywhere. Every action and movement requires energy. Without energy, we could not see or hear anything. Energy provides us with food, warmth, transportation, and entertainment. If it weren't for energy, we would not grow and could not survive. The Energy unit helps students understand what energy is. Unit materials focus primarily on five important types of energy—light, sound, motion, heat, and electrical. Each energy type is defined and supported with everyday examples.

Certain reading resources are provided at three reading levels within the unit to support differentiated instruction. Other resources are provided as a set, with different titles offered at each reading level. Dots on student resources indicate the reading level as follows:

- low reading level
- middle reading level
- high reading level

THE BIG IDEA

Since energy is crucial to almost everything we do and everything we experience, it is important to understand where energy comes from, how it behaves, and why it is valuable to us. By becoming familiar with different types of energy, we can better appreciate having the energy sources we rely upon in our daily lives. We can then take steps to ensure that we continue to get the energy we need and use it in responsible ways.

Other topics

This unit also addresses topics such as: energy from food, how flashlights work, light energy, playground energy, static electricity, and how energy is used in cooking.

SPARK

The spark is designed to get students thinking about the unit's topics and to generate curiosity and discussion.

Materials

- scrap paper

Activity

Invite several volunteers to help demonstrate energy. Crumple a few pieces of paper and have each student hold one in his or her hand. Ask students to face a wall from at least 3 meters (10 feet) away, and extend their arm, holding the paper as far forward as they can. When you direct them to, have them toss the papers toward the wall using only their hands and wrists.

Ask the volunteers to retrieve their paper and try the toss again, but this time use a full throwing motion, including reaching back and following through. The papers should fly much farther this time.

Try it one more time, but tell the class that you will throw the paper this time in a secret direction. Ask students to close their eyes, hold their ears, and try to figure out where the paper goes when you throw it.

Below are questions to spark discussion.

Which method made the paper go farther when the volunteers threw it? Why do you think this was so?

Can you think of any sports in which people throw a ball? How do they move to make sure the ball goes far or fast?

Which paper toss took more energy? How can you tell?

Could you tell where the paper went with your eyes and ears shut? Why or why not?

Use this activity to begin an introductory discussion about energy. Explain that it takes energy to do almost everything. It takes energy to crumple the paper and to throw it. Energy lets students hear the paper hit the wall, and energy lets them see where it lands. Throughout the unit, students will learn more about different kinds of energy.

Many of the unit's vocabulary terms are related to the spark activity and can be introduced during the spark. For vocabulary work, see the Vocabulary section in this *Unit Guide*.

PRIOR KNOWLEDGE

Invite students to explain their understanding of what the word *energy* means and to identify any familiar kinds of energy. Then ask them to brainstorm activities that require energy.

Probing Questions to Think About

Use the following questions to have students begin thinking of what they know about energy.

- Why do people need energy?
- How do we get energy?
- When you feel low in energy, what do you do?

- What kinds of energy help you warm up on a cold day?
- What kinds of energy let you turn on a TV or a radio?
- What activities do you do that use a lot of energy?
- What activities do you do that use only a little energy?
- How would your life be different if you couldn't see or hear? What kinds of energy let you see and hear?
- Do you think you used energy to get to school today? What kinds of energy?

Tell students they will learn more about these topics soon.

UNIT MATERIALS

Each unit provides a wide variety of resources related to the unit topic. Students may read books and other passages, work in groups to complete hands-on experiments and investigations, discuss science ideas as a class, watch videos, complete writing tasks, and take assessments.

Resources are available for printing or projecting, and many student resources are also available for students to access digitally on Kids A–Z.

Selected unit resources are available in more than one language.

For a complete list of materials provided with the unit, see the Energy unit page on the Science A–Z website.

VOCABULARY

Use the terms below for vocabulary development throughout the unit. They can be found in boldface in the *Nonfiction Book*, the *Quick Reads*, and/or other unit resources. These terms and definitions are available on *Vocabulary Cards* for student practice. Additional vocabulary lists are provided in the teaching tips for *Investigation Packs* and *FOCUS Books*.

Core Science Terms

These terms are crucial to understanding the unit.

change	to make something different or to become different
electrical energy	energy that gives power to things that run on electricity
energy	the ability to do work or make a change
heat	energy that brings warmth you can feel
light	energy that lets you see
motion	energy that moves something from one place to another
sound	energy that lets you hear
work	an activity that makes something happen

Other Key Science Terms

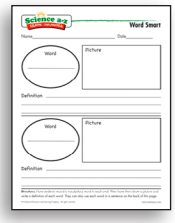
The following vocabulary is not essential for comprehending the unit but may enrich students' vocabulary.

batteries	objects that turn chemical energy into electrical energy
carbohydrate	a nutrient in food that can give you energy
chemical energy	energy made by combining natural substances
fat	a nutrient in food that your body stores up to give you energy when you need it
flashlight	an electric light that runs on batteries and is easy to carry
nutrients	substances in food that living things need to stay healthy and grow
power	energy that can be used to do work
protein	a nutrient in food that can give you energy, and helps you grow and stay healthy
ramp	a sloped path things can roll on to move between a higher level and a lower level
reflect	to throw light, sound, or heat back toward where it came from
stored energy	energy that is kept or collected to be used later
vibrate	to move back and forth very quickly

Vocabulary Activities

You may choose to introduce all the terms that will be encountered in the unit before assigning any of the reading components. *Vocabulary Cards* with the key science terms and definitions are provided. Dots on the cards indicate the reading levels of the *Nonfiction Book* or the *Quick Reads* in which each term can be found. If all level dots appear, the term may come from another resource in the unit. Students can use these cards to review and practice the terms in small groups or pairs. The cards can also be used for center activity games such as Concentration.

The *Word Work* activity sheets offer fun puzzles and practice with key vocabulary terms from the unit. For further vocabulary practice and reinforcement, you can choose from the vocabulary *Graphic Organizers*. To build customized vocabulary lessons with terms related to the topic, see Vocabulary A-Z.



Students can use the *Word Smart* vocabulary *Graphic Organizer* to organize information on the science terms. You may want to assign each student one to three words to share his or her *Word Smart* knowledge with classmates. Students who have the same word should first compare their *Word Smart* sheets with each other and then report to the larger group.

The science terms can be used in oral practice. Have students use each term in a spoken sentence.

As students read, encourage them to create a science dictionary by recording new vocabulary terms and definitions in their *SAZ Journal*.

BACKGROUND AND MISCONCEPTIONS

Use this section as a resource for more background knowledge on unit content and to clarify the content for students if misconceptions arise. Refer to Using the Internet below for more ways to extend the learning.

Q: *Does the book* Energy Is Everywhere *address all types of energy?*

A: No, far from it! The five common energy types in the book—light, sound, motion (kinetic), heat, and electrical—are only a few of many types of energy. Others include stored (potential) energy, food energy/chemical energy, radiant energy (which includes light), mechanical energy, and nuclear energy.

Q: *Is visible light the only type of light?*

A: No. In fact, visible light is a type of radiant energy that makes up just a tiny slice of the electromagnetic spectrum. (See the grades 5–6 Light unit for more on light and the electromagnetic spectrum.) In order from lowest energy (longest wavelength/lowest frequency) to highest energy (shortest wavelength/highest frequency), common radiation types are: radio, microwave, infrared, visible light, ultraviolet, X-rays, and gamma rays.

Q: *Does light bounce off a mirror as a ball bounces off the ground?*

A: A better term to describe light's movement when it reaches a mirror is *reflect.* Light reflects off surfaces in the opposite angle from where the light arrived at the mirror. In that sense, light and a ball behave in similar ways. But light moves in a straight line, whereas a bouncing ball's path may curve due to gravity. Also, a bounce consists of compressing a flexible object, storing up potential energy, and then releasing it. This does not happen when light hits a mirror; the light is simply redirected.

Q: *When does light change direction?*

A: Anytime light travels through a substance, even air, it changes direction. It may be a large change of direction (through lenses or water), or it may be a small change of direction (through flat glass).

Q: *Does light only reflect off shiny surfaces?*

A: Reflections may be more noticeable on shiny surfaces like mirrors, but light is reflected from many surfaces, shiny and not.

Q: *Isn't air nothingness? How does air allow sound to travel?*

A: No, air is much more than nothingness. The small molecules/particles that make up air are largely invisible because they are so small. Sound energy exists when these air particles vibrate. Students may think that because they can't see air, nothing is there. Remind students that they can feel moving air as wind and can see air keeping a ball or balloon inflated.

Q: *I can't see this musical instrument vibrating. How does it make a sound?*

A: In many musical instruments, the air inside a chamber vibrates, not the instrument itself. Also, some modern instruments create sounds electronically. We only hear them once a speaker transforms electrical pulses into sound waves.

Q: *Is heat a substance?*

A: Students may believe that since they can feel heat and can feel a soccer ball, both are tangible objects. However, heat is a form of energy, not a physical substance. Heat affects substances but is not made of matter.

Q: *Does the heat of the Sun make things hot on Earth?*

A: No, not directly. The heat energy that the Sun puts out does not generally reach Earth. But the Sun's light does reach the Earth. When the land, water, and air absorb that light, it gets released as heat. Much of that heat is trapped within our atmosphere, which makes this planet inhabitable.

Q: *I don't feel a shock when I hold a battery. Does this mean it's safe to reach into an electrical socket?*

A: No! As a rule of thumb, it's safest for kids to never play with electricity in any form. When you hold both ends of a battery, a small amount of voltage is actually discharged and does flow through your fingers, but it is usually weak enough to be unnoticeable. A household electrical socket has much more electric current flowing through it and can cause severe injury or death if you stick something into it that conducts electricity.

EXTENSION ACTIVITIES

Using the Internet

Most search engines will yield many results when the term *energy* is entered. You can search for more on a specific form of energy, such as heat energy. Also, your local utility companies' websites may offer pertinent information for your area. Many energy-related sites focus on energy conservation. Be aware that some sites may not be educational or intended for the elementary classroom. More specific inquiries are recommended, such as:

- energy sources
- energy from food
- conserving energy
- kids and energy
- energy games

Projects and Activities

- **Project:** Challenge students to work in groups to design a machine that uses all five types of energy described in the nonfiction book *Energy Is Everywhere.* They might draw it on a poster or build a 3-D model.
- **Game:** On a playground or in a gym, invite students to take turns showing a unique way to move from one point to another. All students must observe the examples used by their peers and come up with their own version of motion energy when it is their turn.
- **Arts:** Many sounds create certain moods and evoke images in our minds. Provide art materials and have students draw or paint what they imagine as they listen to songs from different genres. Have them write the song titles on the pictures and display them publicly. Compare the representation of energy in the artwork. (Looking at works of art has inspired many pieces of music, including Mussorgsky's *Pictures at an Exhibition*.)
- **Guest:** Local utility companies often have educational outreach programs. Invite a representative to conduct a presentation on energy, which may include conservation and safety tips.
- **Project/Home Connection:** After using the *Energy from Food Quick Reads* with students, have students examine the nutrition labels on several foods and compare the carbohydrate, protein, and fat levels. They may create charts, tables, or graphs.
- **Community Service:** Provide students with opportunities to take part in an effort to conserve energy, either at school or at home.

- **Research:** Help students conduct research to learn more about types of energy besides those emphasized in this unit. Each student or student group can report to the class on what they have learned with an oral presentation and an art project.
- **Research/Home Connection:** Students can conduct research as a family/home project or in the library/media center to extend the learning about a topic in one of the *Quick Reads* or other unit resources.