

LESSON 1: Sources of Energy

LESSON'S CONCEPTS

- Energy is the ability or capacity for doing work by a body or system, and energy is required for any change to take place. The word *energy* can also describe resources used for producing power; e.g., solar energy, fossil fuel energy.
- Various sources of energy are used to make a variety of objects and to provide power to operate certain objects.

PURPOSE

Students will be introduced to the ways people use sources of energy. They will also be taught how to identify the connections among a purchased object, the use of energy sources to make and possibly use this object, and the waste of energy sources when the object is placed in a landfill.

Note: It is not the intent of this lesson to teach students about units of energy, forms of energy, or transformation of energy. For those topics, science textbooks should be consulted.

OVERVIEW

In this lesson students will:

- Define the word energy.
- Identify the sources of energy people use to make and operate various objects and determine which of these are considered renewable or nonrenewable.
- Determine what things they enjoy doing that requires using objects and identify the energy sources and other natural resources used to make or to use these objects.
- Develop a game to teach others about energy sources and other natural resources and the importance of conserving them.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students identify the sources of energy people use to make and operate various objects and determine which of these are renewable and nonrenewable.

- "Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation." (*Science Content Standards, Grades K–12; Grade 6; Resources, Standard 6*)
- "... students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and classify them as renewable or nonrenewable." (*Science Content Standards, Grades K–12; Grade 6; Resources, Standard 6b*)
- "... students know the natural origin of the materials used to make common objects." (*Science Content Standards, Grades K–12; Grade 6; Resources, Standard 6c*)
- Students write directions to the games they invent about energy sources and other natural resources.
 - Students "use traditional structures for conveying information (e.g., chronological order, cause and effect, similarity and difference, and posing and answering a question)." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 23*)
 - Students "choose the form of writing (e.g., personal letter, letter to the editor, review, poem, report, narrative) that best suits the intended purpose." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 37*)

SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, classifying, applying

TIME

30 minutes to prepare for the lesson; approximately 90–120 minutes to complete the

lesson (Additional time might be required for students to complete the games they are designing.)

VOCABULARY

energy, energy sources

PREPARATION

- Read the “Background Information for the Teacher” at the end of this lesson.

MATERIALS

- Several dictionaries
- Piece of butcher paper on which to record students’ answers
- Materials for students to create games, such as playing cards and reused items from which to make board games

PRE-ACTIVITY QUESTIONS

- Ask students what is *energy*? They can look up the word in a dictionary. As a class (or in small groups) have students develop a definition. *Energy is the ability or capacity for doing work by a body or system. Energy is required for any change to take place. It takes energy to make things. The word energy can also describe resources used for producing power; e.g., energy sources, solar energy, fossil fuel energy.*
- Discuss with students what sources of energy are found on Earth. *Fossil fuels (petroleum, coal, natural gas); sun (solar energy); wind power; hydropower; geothermal energy; and tidal energy.* (Students might not know all of these at this time.) Write students’ answers on a piece of butcher paper and keep the list to use at the end of the lesson.
- Ask students what things they enjoy in life that require energy to make or to use (e.g., computer or television set needs electricity; energy was needed to manufacture the different parts). Develop a list of these things with the class and display the list during this lesson.

PROCEDURE

- Ask students:
 - How else are energy sources used by people, other than for making things? *For*

transporting things, heating, and generating electricity.

- Think of all the things we use electricity for. Where does the energy for generating electricity come from? *From energy sources, such as fossil fuels, hydropower, wind and solar energy.* (Students might not know this as this time.)
- Explain to students that just as plants are considered to be renewable, natural resources and most minerals are nonrenewable natural resources (studied in the 4–6 Module, Unit 1, Lesson 4); there are renewable energy sources and nonrenewable energy sources. Write the following words on the chalkboard: solar, wind, oil, coal, natural gas. Ask students which of these do they think are renewable energy sources (solar, wind) and which are nonrenewable (oil, coal, natural gas) and to explain why.
 - Ask students to select something they really like to do that requires the use of some type of object or objects. They can get ideas from the list developed in “Pre-Activity Questions” C. They should:
 - List all the objects they need to do this activity.
 - Get into groups with similar interests.
 - As a group, identify and compile lists of energy sources and other natural resources used to make the objects used in the activity and include:
 - The natural resources probably used to manufacture the object (Do not forget to include air and water.)
 - The possible negative impacts to the environment when energy sources and other natural resources are extracted from the Earth
 - Develop a way to show the rest of the class what energy sources and natural resources are needed for the selected

activity. For example, use illustrations, cutouts from magazines, charts, or other visuals.

D. Have groups report to the class.

- Have the class identify what renewable and nonrenewable energy sources and other natural resources are used in each selected activity.
- Discuss with students that minerals are considered nonrenewable natural resources (but they can be made to last a long time if they are recycled).
- Discuss with students what will happen to the objects used in their activities when they break or when students no longer want them. How can they be made to last or be prevented from going to a landfill? *They can be reused, repaired, or recycled.*

E. Have groups assume that a natural disaster eliminated the energy source and other natural resources needed for their activity. Discuss what their options would be (e.g., try to make their things last as long as possible; then look for alternatives to the items they need.)

Homework Assignment: Ask students to find out some things that a member of their family likes to do that requires the use of some type of object and to list the energy sources and other natural resources needed to do this activity.

F. Ask students to share their homework assignment. Discuss what activities require minimum props (or objects).

DISCUSSION/QUESTIONS

Discuss with students:

- Why should we care about conserving natural resources and energy? *Because we could run out of nonrenewable energy sources and would not be able to have things we like, live the way we do now, or be able to live the way we want to.*
- If you know that there are only so many nonrenewable energy sources, such as fossil fuels, what decisions can you make to keep those resources lasting for your lifetime and your children's lifetime? *I would conserve electricity and not buy things that would be thrown away right away.*
- In what ways is energy tied up in waste? *In acquiring the raw materials; in using energy for the manufacturing and transporting of products.*

- How does placing an object in a landfill waste energy sources? *It took energy to make it and to transport it. In a landfill it can no longer be used. New resources will be needed to make a new object (unless recycled materials are used).*
- How does what we have learned in this lesson apply to our everyday lives?

APPLICATION

- A.** Ask students to look at the definition of *energy* that they developed at the beginning of this lesson and decide whether anything should be changed. Then ask students to look at the sources of energy found on Earth that they listed at the beginning of the lesson and see whether they want to make any changes.
- B.** Brainstorm some ideas for games that could teach others about nonrenewable energy sources and other natural resources and the importance of conserving them.
- C.** Tell groups of students that they will be asked to design a game to teach others about nonrenewable energy sources and other natural resources and the importance of conserving them. Students might need to do some research first. For example, they can invite a speaker from a local utility company to discuss what energy sources are used to provide power to their community. They can also find out the consequences to the environment (e.g., air, land, and water pollution) of converting energy sources into electricity. They can do this by doing research in science textbooks and on the internet.
- D.** Groups of students should first decide on the focus of their game. Then each group will need to determine what type of game it will design. Some examples are provided below. Students should write, or input on the computer, the rules or guidelines to the game that they design.
1. Students can develop a card game. One idea is described below:
 - Use a standard deck of cards. A suit represents one nonrenewable energy source (e.g., spades represent petroleum; clubs, coal; diamonds, natural gas).
 - Hearts are used as trump or award cards; the numbered cards represent people conserving energy; and the

jack, queen, king, and ace represent people wasting energy sources.

- Each number on a card represents energy units.
- The object of the game is to be the player left with the most units of energy.
- Determine a way to select who will be the dealer; then all other players will play in a clockwise direction. For the next round, the player next to the dealer's left will take the role of the dealer.
- Six cards are distributed to each of four to six players by the dealer. The remaining cards are placed face down. The dealer turns one card face up, and that is the suit that all players must follow. The game is played by having each player lay down a card of the same suit, and the player who plays the card with the smallest number (units of energy) collects all cards played and can use them for future play. If a player does not have a card of the suit being played, he or she can use a heart suit. If the player does not have a heart suit, then the player draws one card from the face-down pile. If the player cannot play the card drawn, the next player tries to play a card.
- If no players have the suit of the face-up card, and each has drawn one card

that each cannot play, then the face-up card goes to the dead pile and another card is drawn by the dealer of the round.

- If during the beginning of a round the first player turns up a heart from the deck, the player keeps the heart and turns up another card. The player may continue to keep any upturned hearts until another suit is placed face up from the deck.
 - A heart face card or ace can be played to beat all other suits, but once it is played, all the played cards (including the face card) go into a dead pile and can no longer be played. The numbered heart cards are wild cards and can be played if a player does not have a suit that is in play.
 - The player wins the round if the card he or she plays is the smallest numbered card in play.
 - When a round is over, another card is placed face up from the face-down pile.
 - Students will need to develop additional rules, as needed, to make the game work to their satisfaction.
2. Students can design a video game. They can use an existing video game and change the players in the game into those who are conserving energy

Picture intentionally deleted.

Students in Barbara Cronin Hershberg's fourth-grade class at Hollister Elementary School play a card game about sources of energy.

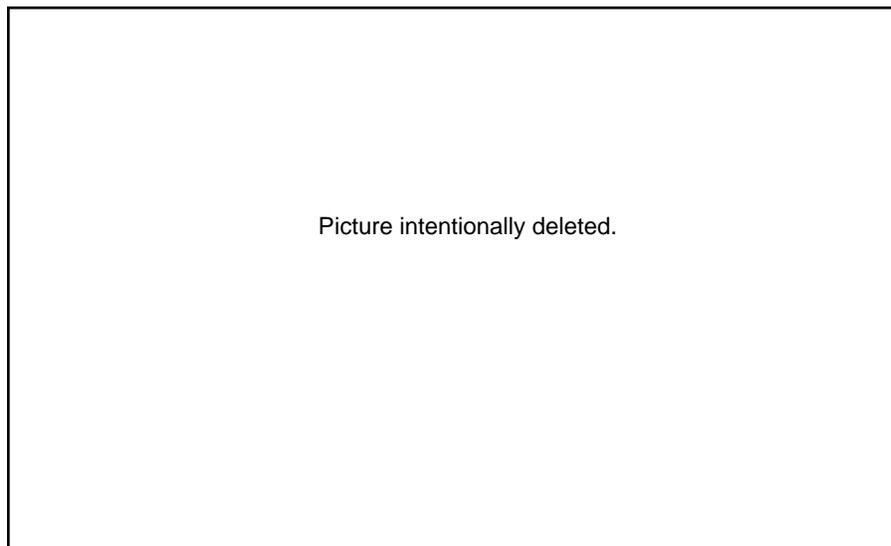
- sources and those who waste energy sources. They can also design a new game.
3. Students can develop a simulation game.
 - For example, the simulation is that they are on a desert island and have only a certain number of energy sources and other natural resources available for their use.
 - They will need to write a scenario of the situation and then describe how they will make certain of surviving for many years (or their entire lives).
 - They can have various students be experts on the island (e.g., solid waste manager, energy manager, natural resource manager, personnel manager, manager of the manufacturing of products, manager of air and water quality, manager of the group's choice). The plan for living on the island would be developed on the recommendations of each of the experts.
 - The scenario can then be shared with other groups, who can describe how they would make certain of surviving.
 - The different ways to survive on this island can be compared and discussed.

4. Students can make a board game. Dice or spinners can be used to move a player on the game board. All items in this game should be made from reused materials (e.g., large dice can be made from two milk cartons cut and fitted into each other to make a square; reused paper can be glued on the milk cartons, and the numbers of the dice can then be drawn).

- E. Have students share their games and allow time for groups to play some of these. Ask the class to determine what main ideas or concepts each game is teaching about the sources of energy and other natural resources and the importance of conserving them.

EXTENSION

- A. Have students determine how these games can be shared with other classes. Allow students to do so.
- B. Have students find out whether there are any manufacturing companies in their community. If so, students can do research to find answers to the following questions:
 - What products do these companies make?
 - Where do they get the raw materials to make the products?



Students from Janet Cohen's sixth-grade class at Gold Trail Elementary School design a game about conserving natural resources.

BACKGROUND INFORMATION FOR THE TEACHER

- What are their major sources of energy to operate the manufacturing plant and to make the products?

Humans use sources of energy in many ways; e.g., for heating and cooling buildings, generating electricity, powering vehicles and other machines, and manufacturing products. Unfortunately, almost all sources of energy used by people produce some type of waste, which could pollute air, water, or soil.

The concept of energy can be difficult for your students to comprehend. You could explain that energy is the ability or capacity for doing work by a body or system. Anytime a person walks, a rock falls, a river flows, or a machine moves, energy is being used. When energy is being used, we observe or sense light, heat, or motion.

Energy is also the essential force behind change. That is, in order for any change to happen, energy must be used; for example, aluminum being melted, products being shipped from one place to another, a tree growing.

The word *energy* also describes resources used for producing power. These energy sources include fossil fuels, solar energy, wind power, hy-

dropower, geothermal energy, and tidal energy.

Fossil fuels include crude oil, coal, and natural gas. Humans use fossil fuels as a source of energy to generate electricity or move machinery. The entire transportation system is dependent on petroleum products. Humans use petroleum and natural gas to make plastics from which many items are manufactured. Petroleum is also used in making many commonly used products, such as fertilizers, lubricating fluids, cosmetics, and pesticides. Fossil fuels are nonrenewable resources because they are finite and take a great length of time to form.

People depend on sunlight to provide energy for plants to live and grow. People depend on plants for food, fiber, building materials, and fuel.

Solar energy is also used to heat homes and to produce electricity. Solar energy is a renewable resource because it is available whenever the sun shines and will continue to be available as long as the sun exists.

Additional information on energy sources is provided in the 4–6 Module, Unit 1, Lesson 1,