

Energy Sources



Target Grade Levels

Third - Sixth

Time

30 minutes to start, then as a homework assignment.

Materials

- sun picture (optional)
- fruit or vegetable
- container of vegetable oil
- piece of firewood
- piece of charcoal or coal
- container of motor oil
- gas lighter
- cup of water and an empty cup
- child's pinwheel
- lightning Picture or light bulb
- nuclear power plant picture
- piece of discarded trash
- battery

Knowledge and Skills (TEKS)

- Science:
 - Demonstrate safe, environmentally appropriate, and ethical practices;
 - Learn to use and conserve, dispose and recycle resources;
 - Plan and implement investigations, as well-defined questions, formulate hypotheses, select and use equipment, collect, analyze and interpret information, observe and measure, and communicate valid conclusions;
 - Describe light, sound, heat, and electricity as forms of energy; and
 - Differentiate forms of energy.
- Math:
 - Construct graphs, maps, and charts to organize and evaluate information. Investigate physical states of matter.

Overview

Students will observe different types of energy sources and learn more about energy and where it comes from. Students will then conduct their own research reports on energy sources.

Background Information

Sources of energy are all around us, and come in a variety of different forms. Energy for a person is different than energy for an automobile. In this activity, the teacher demonstrates several different types of energy, and assigns a research report topic for small groups of students.

Procedure

1) Vocabulary

- | | |
|--------------------|---------------------|
| a) energy | g) natural gas |
| b) solar energy | h) hydropower |
| c) chemical energy | i) electricity |
| d) fossil fuel | j) fission |
| e) coal | k) potential energy |
| f) oil | |

2) Activities

- Using the information on pages 114-115, demonstrate the different energy sources. Write the names of the different types of energy sources on the chalkboard.
- Once students have received their introduction to energy sources, inform them that they will be conducting research reports to find out more about their energy sources.

- c) Break the class into groups of two or three students and assign each group a different energy source. Instruct each group to complete a three-page report about the energy source. Since the project will be a collaborative effort between two or three students, encourage the students to divide the work, so that each student contributes a section to the final report.
- d) Take a trip to the library. Work with the librarian to show the students how to find the information they need to complete the report on their energy source. Be sure they know how to use the encyclopedia and other resources. Provide time for the students to do their research, work together in their groups and write the report.
- e) After all the presentations have been given, initiate a discussion with your class about what they learned. Ask your class to choose the safest energy source, the most efficient energy source, the energy source that's least destructive to the environment and the cheapest energy source. Then, write a list of the energy sources on the board, and have the class vote for the "best" source. You may have them vote for the top two or three.

3) Review

After the reports are completed, have each group give a five-minute presentation about the energy source they studied.

4) Evaluation

- a) Students can be quizzed on vocabulary.
- b) Students can perform the following extension activities as graded exercises.
- c) Each group that presents could also submit quiz questions that go along with their presentation. The students can receive a grade based on the quality of the questions they submit and whether or not the answer was given during their presentation.
- d) Students can turn in their notes for each presentation as a graded activity.
- e) Students can be quizzed using the questions submitted by each group, compiled into one large quiz.

5) Extension

- a) As a simpler version of this activity, assign the energy words as homework vocabulary assignments to your students. Have them complete sentences using the words.
- b) An even simpler version of the activity would be to simply conduct the demonstration as described in the activity.
- c) To extend this activity, have each student write a one-page essay on which three energy sources they would choose as the "best" sources of energy for the world. Tell them to explain why they chose what they did. This can be given as an in-class assignment or as a homework assignment. When the essays have been completed, ask some students to read theirs aloud. Display the completed essays in the classroom.

- d) Students can keep an energy diary for a day, listing their activities and the types of energy used to do them. Examples:
- i) Ate breakfast
 - (1) Consumed chemical energy in the form of food.
 - (2) Kitchen lights were on, powered by electrical energy.
 - (3) Used chemical energy stored from previous food consumed to run body.
 - ii) Took bus to school
 - (1) Bus consumed chemical energy in the form of fossil fuel and converted it to mechanical energy to make the wheels run.
 - (2) Used chemical energy stored from previous food consumed to run body.

Adapted from: "Energy Sources" *Alliance to Save Energy (ASE)*.
www.ase.org/educators/download.htm.

Credit: The National Wildlife Federation's Animal Tracks Activity Guide for Educators.
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Energy Sources

Sunlight: Look at a picture of the sun. The light that comes to the earth from the sun is pure energy, the original energy source. Nearly all other energy sources got their energy from the sun. Organic matter, like plants, convert solar energy into leaves, flowers and fruits. Animals, which eat organic matter, convert the energy into body mass. When animals die, their energy is decomposed and, over extensive time, becomes stored as oil, coal or natural gas.

Food: Hold up a piece of fruit or vegetable. People use food for energy. Food that we eat is digested, and the stored energy is used by the body to keep the heart beating, the blood pumping and the body growing. When a body has “low blood sugar,” the body needs to eat and process more energy, so we can continue working, playing and growing.

Organic Oils: Hold up a bottle of vegetable oil. Vegetable oils, like olive oil, corn oil or safflower oil, are often used in cooking. Jojoba oil (from the jojoba bean) is used in cooking or lubricating, as well as in lotions and soaps. Animal oil, like that from whales, seals and livestock, was used in the past for lighting lamps as well as for waterproofing.

Wood: Hold up a piece of firewood. Wood comes from trees, which are, of course, plants. The plants got their energy from the sun. When trees are cut down and burned, they release their energy in the form of heat and light. Many homes are heated with wood-burning stoves.

Fossil Fuels

The following three energy sources come from prehistoric fossils. Ancient plants absorbed the energy from the sun and converted it into more plants. Ancient animals, like dinosaurs, ate the plants. When the plants and animals died, their remains collected under mountains of earth to decompose over millions of years into a source of fuel. The remains of these plants and animals are what we refer to as fossil fuels.

Coal: Hold up a piece of charcoal, or, if possible, a piece of real coal. Coal is burned to heat homes and run electrical machinery. About 20 percent of the energy we use comes from coal. There are four grades of coal: lignite, subbituminous, bituminous, and anthracite. The first grade, lignite, is the youngest kind of coal; it has the lowest carbon content and the largest amount of impurities that add to air pollution. Each grade after that has an increased carbon content and reduced impurity content. Bituminous is the most plentiful kind of coal in the United States.

Oil: Hold up a container of motor oil (preferably in clear plastic so students can see the oil). Other petroleum products similar to motor oil are burned to fuel motor vehicles and heat homes. About 45 percent of energy used comes from oil.

Natural Gas: Hold up a lighter, and light it. Natural gas is used to heat the homes of many people. About 25 percent of the energy we use comes from natural gas. The fuel used in lighters is not the same as the natural gas used to heat homes, but the lighter can be used as an example. Most of the energy used by people today comes from these fossil fuels. But fossil fuels are limited in their supply, can pollute, and are sometimes hard to find.

Other Energy Sources

The following energy sources do not require the sun. They are derived from other aspects of the earth's ecosystem.

Water: Pour water from one cup to another, simulating a waterfall. Water is not an energy source, but water is used to generate energy. Water falling downhill is used to run turbines, which generate electricity. This is called hydroelectric power. About 5 percent of the world's power is now produced by hydroelectric dams. A similar type of energy comes from geothermal energy. Pockets of boiling water under the earth's surface send steam to the surface of the earth. This hot water also can be used to generate electricity. Dams can impede the movement of fish up and down river to reach spawning grounds or for other migratory purposes.

Wind: Hold up a pinwheel and blow on it. Winds that blow can be used to turn windmills, which generate electricity. Windmills have been used for centuries in some parts of the world, like Holland. Windmills are also used in the United States.

Electricity: Hold up a picture of lightning, and/or a light bulb. An electrical storm contains a great deal of natural electrical energy. Benjamin Franklin first proved that lightning was electricity in 1752. His discovery helped scientists learn how to harness electricity and how to generate electricity from other methods. The electricity we use today was created by other sources, not by the energy released by lightning.

Nuclear Power: Hold up a picture of a nuclear power plant. Nuclear power comes from the radioactive ore uranium. It produces far more power per ton than any other energy source. Nuclear power does not contribute to air pollution. However, radioactive waste is hazardous to living things. Exposure to radioactive materials can result in mutations, illness or death. The drawback to using nuclear power is finding a safe place to dispose of the nuclear waste. About 6 percent of the energy used in the world comes from nuclear power.

Refuse-derived fuel: Hold up a piece of discarded trash. Now, we are able to extract energy from garbage! Garbage is burned in a waste to energy facility. As it burns, water pipes are heated. This hot water is used to generate electricity. Most waste to energy facilities produce enough energy to run the plant and supply additional power to the community. This is a small but growing source of energy.

Chemical energy: Hold up a battery. Batteries create energy through chemical reactions. When different chemicals react with one another, energy is released. Eventually the reaction stops, and the battery must be replaced. Batteries are used in motor vehicles and many smaller appliances, such as clocks, hearing aids and toys.