

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About..." list. It might also be helpful to review the list by making each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Thought-provoking discussions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion topics.

- List the pros and cons of fossil fuels as energy resources.
- Brainstorm strategies for conserving energy in your daily life.
- Discuss the energy resources that are alternatives to fossil fuels. Select the most promising resource and defend your choice.
- Explain why the sun is the ultimate source of energy on Earth.

Follow-up Activities

- Have your students imagine that they are the mayor of a city trying to convince his/her city council and citizens to enact strict energy conservation strategies. What would they say, do and suggest to their many citizens who are not interested in changing their wasteful ways? Encourage students to write a persuasive speech that includes a concrete plan of action that will convince their citizens to conserve energy.
- Invite a representative from the local power company to visit your classroom to discuss energy usage and conservation in your region. Students should prepare questions in anticipation of the visit concerning the use of fossil fuels, alternative energy sources and conservation strategies.
- The Industrial Revolution marked a significant increase in the use of fossil fuels, which has had a significant effect on the Earth's environment. Encourage students to research the increases in pollution and the climate changes that have occurred since the Industrial Revolution. Students can write a proposal that details the importance of reducing the emission of pollution and strategies for accomplishing this reduction. (See the Environmental Protection Agency Web site for more information, www.epa.gov/climatechange/index.html.)

Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com

- www.energyquest.ca.gov/index.html/

The "Energy Quest" web site developed by the California Energy Commission presents an "Energy Story," which focuses on the role of fossil fuels as a primary source of the Earth's energy. Student activities about energy and fuel are also provided.

(Continued)

- www.teachcoal.org

The American Coal Foundation sponsors this web page of information and student activities about coal and other natural resources. The hands-on activities included on this page are multidisciplinary and provide students with an opportunity to gain a deeper understanding of the scarcity of natural resources.

- www.fe.doe.gov/education/index.html

This web page about fossil fuels from the U.S. Department of Energy offers an introduction to energy and details about coal, oil and natural gas. Frequently asked questions about fossil fuels are also addressed.

Suggested Print Resources

- Jefferys, David. *Green Power*. Crabtree Publishing Company; 2006.
- Landau, Elaine. *History of Energy*. Twenty-First Century Books, Minneapolis, MN; 2005.
- Richards, Julie. *Nuclear Power*. Smart Apple Media, Mankato, MN; 2004.

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TITLES

- ELECTROMAGNETIC ENERGY
- ENERGY: POTENTIAL & KINETIC
- ENERGY RESOURCES: USE & CONSERVATION
- HEAT & CHEMICAL ENERGY
- MECHANICAL ENERGY
- NUCLEAR ENERGY
- THE TRANSFER OF ENERGY

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Energy Resources: Use & Conservation

Grades 5-8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers at these grades need all the help they can get! This guide has been designed to help the 5-8 science teacher by providing a brief synopsis of the program, previewing and followup questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create an "Everything We Think We Know About..." list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About..." list. Discuss what else they learned and use the followup questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



Program Summary

Energy use has changed a great deal since people relied solely on the sun, their own strong bodies or beasts of burden as energy resources. Long ago, people learned how to use water power to turn paddle wheels and wind power for transportation and irrigation. People learned to use the chemical energy stored in materials like wood to cook and heat their homes. Machines and technologies introduced during the Industrial Revolution of the late 18th century required the use of other energy resources, especially fossil fuels.

Fossil fuels like coal, oil and natural gas are considered to be nonrenewable energy resources. Fossil fuel reserves have formed over millions of years from decaying plants and animals. The energy from the sun is the ultimate source of the chemical energy in fossil fuels. With the modern world depending upon coal, oil and gas for a majority of its energy needs and the prediction that the world will nearly double its need for energy resources in several decades, it is important to conserve energy and to investigate alternative energy resources.

There are many renewable energy sources that are alternatives to fossil fuels. Nuclear energy is released when the nucleus of an atom is split by a process called fission, or when atoms are combined through a process called fusion. Nuclear power is used to generate about 25% of the world's electricity, but it has inherent risks, especially in the disposal of radioactive waste. Hydroelectric plants use running water to generate electricity. However, dams can flood nearby lands and can disrupt the normal flow of water, both of which negatively affect the environment. Wind power is increasingly being used as a clean source of renewable energy. Turbines harvest wind on wind-farms and generate electricity. Solar power is a promising, renewable energy resource that can be turned into electricity, and it is used in many tools, toys and even in home heating. Many other alternative energy sources like geothermal power, which draws upon the Earth's natural heat, and biomass, which produces an alternative to gasoline, are being considered in the movement away from fossil fuel dependence.

In our everyday lives, we can also work to conserve energy. Insulating, turning off lights and only using appliances like dishwashers when they are full are just some of the many ways people can limit energy use in their homes. Also, carpooling, bicycling and taking public transportation are effective energy-saving ideas. The Earth's inhabitants must take a serious look at energy resources, use and conservation!

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

matter — Any substance that takes up space. Matter is made of small particles called atoms, and can be in the form of a solid, liquid, gas or plasma.

energy — The ability to make things happen or to do work.

work — To move or change something. Doing work takes energy.

water power (hydropower) — Energy that is produced by running water. Hydroelectric plants convert the energy of flowing water into electricity. Water power is a renewable energy resource.

wind power — Energy that is produced when the wind blows. Wind energy turns windmills to generate electricity and is a renewable energy resource.

biomass — Energy that is created from the burning of wood, garbage and other previously living things that have stored the sun's energy. Biomass energy is a renewable energy source.

Industrial Revolution — The era in the late 18th century that ushered in the age of machines and factories, replacing human and animal power, and making work easier.

fossil fuels — Energy resources formed within the Earth from the remains of plants and animals of millions of years ago. Coal, oil and gas are examples of fossil fuels.

nonrenewable resource — An energy resource that cannot be replaced as quickly as it is used. Fossil fuels like coal, oil and natural gas are examples of nonrenewable resources.

mining — The process of extracting minerals from the Earth, which usually requires tunneling, digging or drilling deep into the Earth to where the reserves are stored.

conservation — Efforts undertaken to reduce the amount of use or unnecessary waste of resources, through use restrictions and development of alternative energy resources.

nuclear power — Energy that comes from the powerful forces holding the nuclei of atoms together, either through fission or fusion.

fission — The process of splitting an atom to obtain nuclear energy.

fusion — The process of combining two atoms to obtain nuclear energy.

renewable resource — An energy resource that can be replaced as it is used. The sun, wind and moving water are examples of renewable resources.

geothermal power — Energy that is generated using the heat from inside the Earth. Geothermal energy is a renewable resource.

solar power — Energy that comes from the sun. Solar energy is the Earth's greatest source of heat and light energy, and is a renewable energy resource.

Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About..." for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What are the sources of the energy that we use every day to operate machines like cars, toasters and computers?
- If we used up all of the Earth's coal, oil and gas supplies, what energy resources could we use?
- How can we conserve our use of energy?

After the class has completed their "Everything We Think We Know About..." list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. What is energy? Why is it important for life on Earth?
2. What are energy resources?
3. How have energy resources been used over the past few thousand years?
4. How have humans used water as an energy resource over time?
5. What is biomass energy, and how has it been used throughout history?
6. Why was the Industrial Revolution an important turning point in the history of energy use and consumption?
7. What are fossil fuels? How are they formed?
8. Why are fossil fuels considered to be a nonrenewable energy resource?
9. What are the positive and negative results of mining?
10. What is energy conservation, and why is it especially necessary now?
11. What is nuclear energy? Describe fission and fusion.
12. What are the drawbacks to using nuclear energy as alternative to fossil fuels?
13. Compare renewable and nonrenewable energy resources. Provide examples of each.
14. How is wind power harnessed?
15. What is geothermal energy? Where can it be found?
16. What is solar power? How can solar power be used as an alternative energy source?