

Fossil Fuels & Renewable Energy

Subject Area: Science, Social Science

Unit Title: Natural Resources

Grade Level: 4th & 5th grade

Objectives: To list the differences between renewable and nonrenewable energy resources and their availability, emphasizing the growing difficulty of finding energy whose supply is decreasing. To have each student investigate and identify his/her own use of renewable/nonrenewable energy sources.

Colorado Content Standards to be covered:

ECONOMICS

Standard I - Students understand that because of the condition of scarcity, decisions must be made about the use of scarce resources.

Standard II - Students understand how different economic systems impact decisions about the use of resources and the production and distribution of goods and services

Standard V - Students understand the effects of interactions between human and physical systems and changes in meaning, use, distribution, and importance of resources.

Standard VI - Students apply knowledge of people, places, and environments to understand the past and present and to plan for future.

SCIENCE

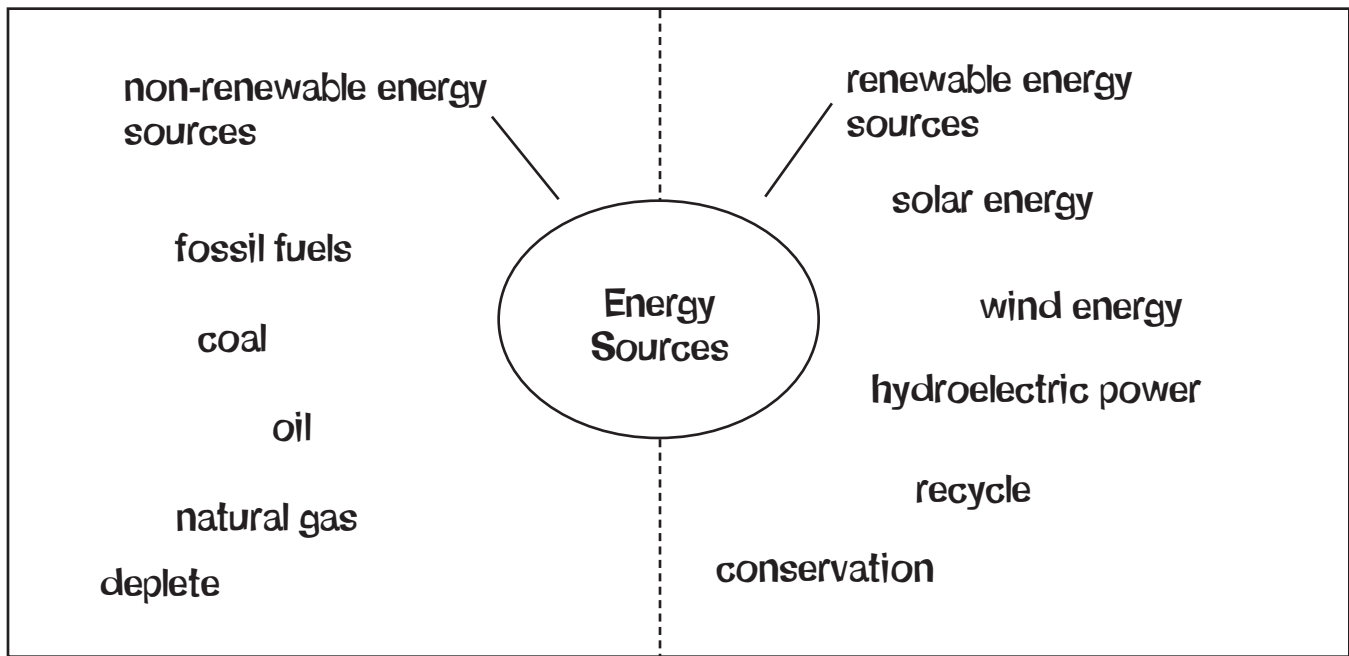
Standard I - Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

Standard IV - Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space.

Materials:

- 200 pennies
- piece of coal
- toy pinwheel
- data sheet
- 4 plastic cups per pair of students (reuse them each year or recycle)
- permanent markers
- overhead projector
- blank transparencies
- overhead transparency marker OR chalkboard

Anticipatory Set: Ask the students to fill in the first column of the included Vocabulary Knowledge Rating Chart indicating how well they know each vocabulary word before the lesson (first column).



Input:

Draw a concept map (see example on the next page) on the board to show the concepts that will be covered (i.e. **fossil fuels, renewable energy source, nonrenewable energy source, conservation, recycle, deplete, solar energy, wind energy, hydroelectric power, etc.**). Add any more that you or your students think of. Review definitions (see Vocabulary Knowledge Rating Chart Key) and write them down if needed. Discuss with students why it is important to use conservation practices and recycling when using fossil fuels/nonrenewable energy sources. Mention ways they can conserve and recycle.

Checking for Understanding: At the end of this section choose one of the following for a quick check: ask the students to partner share and think, pair and share, do a quick 3 word write up as an exit slip, do a quick sketch or give each other a quick thumbs up or down to check for understanding. Determine the level of mastery for each student and provide individual remediation as needed.

Procedures/Activities:

What’s the Difference? Fossil Fuels & Renewable Energy

Prep:

Prior to the class, hide 200 pennies around the room. Make sure that some are hidden in very obscure places.

Directions:

1. Begin by showing a piece of coal and asking the students to tell what it is and what it is used for. Lead them to classify it as a source of energy and that it must be burned in order to create energy.
2. Demonstrate the movement of the pinwheel by blowing towards it. Again, ask students to identify the source of the energy. (If they say “you” be sure to translate that into “wind” or “nature”) Also, ask how the pinwheel uses the wind—how it is captured or harnessed. Students should be able to recognize that the shape of the pinwheel creates the rotation when a current of air strikes it.
3. Ask, “Which of the energy sources are more likely to run out of its supply?” In comparing the two energy sources, they should explain why they think one will likely run out and the other is not likely to run out. Label the two energy sources: **nonrenewable (coal) and renewable (wind)**. Put up the overhead to review the definitions of renewable and nonrenewable sources.
4. Arrange students in pairs and hand out the worksheet (make copies of next page), plastic cups and markers.

- Have them label the cups 1 through 4. Tell them that they are going to be searching for a nonrenewable source of energy (such as the coal discussed earlier) symbolized by pennies hidden throughout the classroom.
5. Give students four 30-second opportunities to find pennies. After each search have them count, record and deposit the pennies into a cup (one labeled for each search). At the end of their four searches, they should make a bar graph and analyze the data.
6. When the pairs have completed their worksheets, ask them to share their results. After a few pairs share similar results, lead the class into a discussion. Through their findings, the students should be able to deduce that due to a limited supply to begin with, the search yielded smaller returns each time. Variation: Use Excel to quickly combine and display everyone's combined data as a graph. Also discuss variants and why some were more successful than others.
7. Extend the discussion on renewable and nonrenewable energy sources, connecting the search for pennies to the search for nonrenewable energy sources. Using an overhead or chalkboard, begin making a **list of renewable energy sources and nonrenewable energy sources**.
8. Ask the students to identify the number of times and ways they use a nonrenewable energy source in one day such as, watching television, turning on lights, taking a shower, etc.
9. After the students have identified several ways that they use nonrenewable energy sources, find out if they use more or less energy than they thought they would. Then, have them identify ways in which they could conserve, reduce or eliminate the use of nonrenewable sources.

*Experiment from Jennifer Luitjens Bahr, Director of Education, NFU
Adapted from Alliant Energy/Powerhouse Kids*

Closure:

Review and clarify the key points of the lesson including the new vocabulary words. Have the students return to the Vocabulary Knowledge Rating Chart and rate their understanding of each vocabulary word after the lesson. Then have them write down the definition and provide at least one example. Have students compare and contrast the two types of energy sources, explaining the similarities and differences. Students can create a glossary of these terms for understanding. Review fun facts on the next page with students and have them pledge to do one thing to conserve energy and post it on the board.

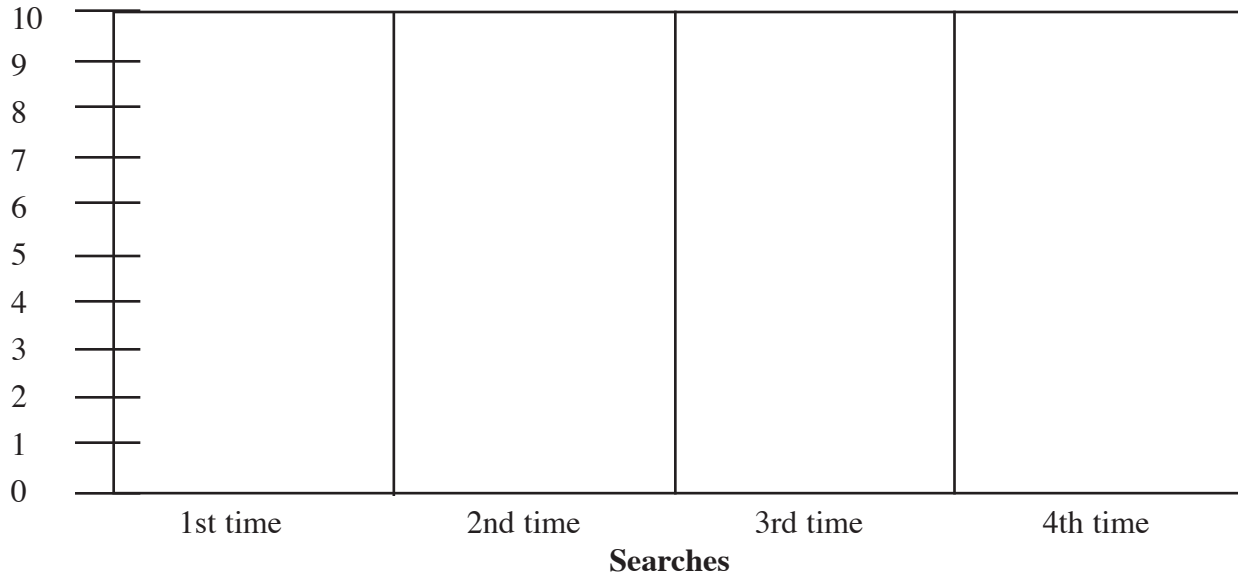
Fun Facts about Saving Energy

- A heavy coat of dust on a light bulb can block up to half of the light.
- Across America, home refrigerators use the electricity of 25 large power plants every year.
- A hot water faucet that leaks one drop per second can add up to 165 gallons a month. That's more than one person uses in two weeks. (Teacher can hold up a gallon jug to show how big it is.)
- An energy-smart clothes washer can save more water in one year than one person drinks in an entire lifetime!
- When you turn on an incandescent light bulb, only 10 percent of the electricity used is turned into light. The other 90 percent is wasted as heat. A compact fluorescent light bulb uses 75 percent less energy than a regular bulb – and it can last up to four years. (Teacher can show examples of both.)
- A crack as small as 1/16th of an inch around a window frame can let in as much cold air as leaving the window open three inches!
- Some new refrigerators are so energy-smart they use less electricity than a light bulb!
- An automatic dishwasher uses less hot water than doing dishes by hand - an average of six gallons less, or more than 2,000 gallons per year.
- Every time you open the refrigerator door, up to 30 percent of the cold air can escape.
- Every year, more than \$13 billion worth of energy leaks from houses through small holes and cracks. That's more than \$150 per family!

Adapted from Alliant Energy/Powerhouse Kids; www.powerhousekids.com

How many pennies did you find the 1st time? _____ 2nd time? _____ 3rd time? _____
 4th time? _____ Total pennies found in all searches. Now graph your results in the chart below:

Number of pennies found over time



Vocabulary Knowledge Rating Chart

Before the Lesson:

In the first column indicate how well you know each vocabulary word by using “1” to represent “I know what it means,” “2” “I sort of know what it means,” or “3” for “I don’t know what it means.”

After the Lesson:

In the second column indicate how well you know each vocabulary word after the lesson, by using “1” I know what it means, “2” I sort of know what it means, or “3” I don’t know what it means. Next write down the definition and give at least one example.

Vocabulary Word	Before Lesson	After Lesson	Definition	Examples
fossil fuels				
renewable energy source				
non-renewable energy source				
conservation				
recycle				
deplete				
solar energy				
wind energy				
hydroelectric power				

Vocabulary Knowledge Rating Chart KEY

Before the Lesson:

In the first column indicate how well you know each vocabulary word by using “1” to represent “I know what it means,” “2” “I sort of know what it means,” or “3” for “I don’t know what it means.”

After the Lesson:

In the second column indicate how well you know each vocabulary word after the lesson, by using “1” I know what it means, “2” I sort of know what it means, or “3” I don’t know what it means. Next write down the definition and give at least one example.

Vocabulary Word	Before Lesson	After Lesson	Definition	Examples
fossil fuels			fuels formed millions of years ago by the remains of prehistoric plants and animals	coal, natural gas, or oil
renewable energy source			renewable energy is energy that can be replaced	solar energy, wind energy, geothermal energy, or hydropower
non-renewable energy source			non-renewable energy is energy that cannot be renewed or replaced	coal, natural gas, or oil
energy conservation			saving energy	turning off a light or closing the refrigerator door
recycle			to reuse or use again	recycling newspapers, cans, etc.
deplete			use up or lessen	fossil fuels can become depleted, renewable energy sources can not
solar energy			using the power of the sun to create heat or electricity.	using solar energy to heat buildings and generate electricity
wind energy			using the power of wind to generate electricity	wind farms
hydroelectric power			using the energy of water to generate electricity	hydroelectric power plants