

**Fossil Fuel Pennies**

Concept / Topic to Teach: The difference between fossil energy sources and renewable energy sources

Target audience: Age 7 and up – variations given for different age groups

General Goal(s): Looking at differences between fossil fuels and renewable energy sources

  Specific Objectives:

* To provide students with the experience of looking for more of a depleting resource
* To get students thinking and discussing the fact that our society depends on finite and dwindling energy sources
* To make the point that no matter how much of a finite resource there is, it is still finite
* To start thinking about the ways we use energy and how we can reduce energy use.

Required Materials:

4 paper cups or normal cups with a blank sticker on each one; 200 pennies; a pinwheel; a piece of coal or turf; stopwatch or clock capable of counting seconds.

 Students’ pre-requisite knowledge and skills:

Counting, adding, drawing graphs

**Seven Steps link**: Curriculum work-

Energy and Forces strand of SESE Science

Environmental Awareness and Care Strand of SESE Geography and Science

**Preparation:**

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

 (Lead-In):

1. Begin by showing a piece of coal and asking the students to say what it is and what it is used for. Lead the students 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 toward 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 aged 9 and up should be able to recognize that the shape of the pinwheel creates the rotation when a current of air strikes it.
3. Ask the students, “which of the energy sources is more likely to run out of its supply?” In comparing the two energy sources, students 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).

Step-By-Step Procedures:

1. Arrange students in pairs and hand out paper cups and markers. Have them label the cups 1 to 4. Tell them that they are going to be searching for a nonrenewable source of energy (such as the coal discussedearlier) symbolized by pennies hidden throughout the classroom.
2. 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.
3. When the groups have completed their graphs, lead the class in 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. (see questions below)
4. Extend the discussion on renewable and nonrenewable energy sources, connecting the search for pennies to the search for nonrenewable energy sources.
5. Make a list of renewable energy sources and nonrenewable energy sources.
6. Ask students where most of our transport fuel comes from. What about our electricity?

**Questions: 6- 9 year olds**

Why did you find most pennies the first time (they were easier to find, easier to reach, easier to see)

Do you think you used more of your own energy to find the ones in the first cup or the ones in the fourth cup? (In the fourth cup because you had to move around and maybe move furniture and other objects to find them)

Once the pennies were all collected, could you find more?

**Questions 9- 12 year olds**

If the pennies were fossil fuel deposits, such as coal fields or oil fields, why do you find more when you start looking? (more obvious, closer to the surface)

You used more of your own energy to find the last pennies than the first- what do you think this means if you are mining coal or drilling oil? (You have to dig deeper mines, which means using more energy to get the energy; when you drill for oil, the pressure in the field means that you don’t have to pump it until you have taken out quite a bit ( ¼ to ½ depending on field) After that you have to pump water or gas in to force the oil out- more energy)

At the start, there were lots of pennies, so everyone could find some. At the last search, there were a lot less, and people started running and maybe fighting with each other to get them- Do you think that kind of thing happens when people are looking for fossil fuels?

If those pennies you found are the only energy the world has, how do you think we should “spend” it? We could burn it all up to make electricity and heat and drive our cars, and when it’s gone, it’s gone. Or we could use it to make wind turbines and build houses and schools that don’t need much heating, we could use it to plant lots of trees that we could then harvest in a sustainable way so we would always have heating fuel.

**Questions 12 years and up:**

As well as the above questions, you could go deeper into the idea of ERoEI and embodied energy- when people started drilling for oil, you could get 100 barrels out for every barrel worth of energy you put in. By the 1970s it had dropped to 30 to 1, these days it is about 11-18 back for every one put in.

**Closure:**

* 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.
* Then, have them identify ways in which they could conserve, reduce or eliminate the use of nonrenewable sources.
* Ask them what is the major difference between fossil fuels and renewable energy?

**Adaptations for students with learning difficulties:**

Use the simpler questions; rather than drawing a graph, pile up the pennies in towers to visually display the diminishing returns in searching for the pennies

**Links to other subjects**

SESE Geography and Science

Energy and Forces Strand

Environmental Awareness and Care Strand