OUR ENERGY DIET

Lesson Concepts: Students will examine data in a table (with the option to plot data on graphs). Students will answer questions about the data (and graphs) of the world's population and oil consumption. Students will look at several things in their lives and suggest ways to reduce energy consumption and their impact on the environment.

Learning Objectives — Students will be able to:

- **Explore the population of various countries and their consumption of oil. Students can make optional graphs.**
- **Look at their lives and determine ways to reduce energy consumption and their own impact on the environment.**

Link to Air -The Search for One Clean Breath from Executive Producer Barbara L. Page

The movie shows that a major source of air pollution and greenhouse gas emissions is the burning of fossil fuels. This is a critical problem in the United States and around the world. Texas, California and Pennsylvania produce the largest amounts of greenhouse gases in the nation. What can we do to reduce these emissions that threaten our health and our environment?

Materials

- Copies of *The World's Oil Consumption Data, The World's Oil Consumption Data Questions, The American Energy Diet,* and *Your Energy Diet Questions* for each student.
- Copies of *Making Choices About Your Energy Diet* for each group.
- Overhead of *Making Choices About Your Energy Diet*.
- Graph paper (optional).

Advanced Preparation

Make copies of above handouts.

Time and Student Grouping

Two class periods; groups of two or three students.

Procedure

Day 1: The World's Oil Consumption Day

1. Students complete a quick write about the world's energy consumption.
2. Review the quick write. Ask the students which countries they think consume the most and then the least amount of energy. Also ask them to explain their answers.
3. Explain to students that when fossil fuels (such as oil, natural gas, and coal) are burned they produce air pollution and greenhouse gases as a by-product. Ask students which countries produce the most and the least air pollution and greenhouse gases. Again ask them to explain their answers.

Grade Level: 6-12

California Science Standards

Grade 6, 6.a. Students know the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.
HS Ecology, 6.b. Students know how to analyze changes in the ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.

California History Social Science Standards

Grade 9-12, 11.11. Students analyze the major social problems and domestic policy issues in contemporary American society.

National Science Standards

Grade 5-8 Science & Technology Content Standard E
Grade 9-12 Science & Technology Content Standard E

National Geography Standards

Grades 5-8, 14.2.c. The role of technology in the human modification of the physical environment.
Grades 9-12, 14.3.c. How to apply appropriate models and information to understand environmental problems.

Education and the Environment Initiative Educational Principles and Concepts

Principle IV: The exchange of matter between natural systems and human societies affects the long-term functioning of both. As a basis for understanding this principle:
Concept a. Students need to know that the effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.
Concept b. Students need to know that the byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.

Teacher Tips

The answers to The World's Oil Consumption Data Questions and Making Choices About Your Energy Diet and Your Energy Diet Questions are suggestions. Students may have different answers. More data can be found at http://www.nationmaster.com.

Teacher Background

When burned, fossil fuels (such as oil, natural gas, and coal) produce air pollution and greenhouse gases. Oil was used for this exercise because the data was easy to find. Keep in mind, there are other sources of energy (including clean ones such as solar, wind, and geothermal) that are used throughout the world. The use of oil is not evenly distributed throughout the world. The greatest imbalance is with oil consumption in the United States. The United States has 4.5% of the world's population but uses about 27% of the oil. Energy use is related to economics of a country and the lifestyle of its citizens. If a large percentage of the world lived a similar lifestyle to those in the United States, the demand for energy could not be met.

Procedure continued

Day 1: The World's Oil Consumption Day

4. Give each group the *The World's Oil Consumption Data* and *The World's Oil Consumption Data Questions*.
5. Optional: Have students make bar graphs of the different countries' percent of world population, energy consumption percentage, oil consumption per 1,000 people, and/or carbon dioxide emissions. More data about energy consumption can be found at http://www.nationmaster.com.
6. Have students complete *The World's Energy Consumption Data Questions*.
7. After the students have finished the questions, discuss their answers.

Day 2: Our Energy Diet Day

1. Have students read *The American Energy Diet*.
2. Hold a class discussion about *The American Energy Diet*. The students should suggest ideas to reduce and reuse. These suggestions can be listed on the board or overhead.
3. In groups, have students complete *Making Choices About Your Energy Diet*. They should place an "X" in one of the first three columns and use the last column to record their suggestions for limiting energy use. Remind them the slogan is **Reduce**, **Reuse**, and **Recycle**.
4. When students finish the activity, they should put their answers on a copy of *Making Choices* on the computer projector or overhead.
5. Hold a class discussion about *Making Choices About Your Energy Diet*.
6. Assign homework *Your Energy Diet Questions*.

Closure: Have students do a quick write-up explaining what they learned from this lesson.

Assessment: *The World's Oil Consumption Data Questions, Making Choices About Your Energy Diet, and Your Energy Diet Questions.*

Extension: Have groups of students trace an item (or food) from raw materials to the store shelf. Students can explore the amount of energy, resources, and air pollution involved in the process.

Homework: *Making Choices About Your Energy Diet*

Resources:

Ventura County Air Pollution Control District: http://www.vcapcd.org
California Air Resources Board: http://www.arb.ca.gov

Related Web Sites:

The data used in this lesson can be found at: http://www.nationmaster.com
Information & graphs about greenhouse gases: http://www.umich.edu/~gs265/society/greenhouse.htm
Graph of the world and United States population growth: http://www.susps.org/overview/numbers.html
Graph of different countries' per capita energy usage:
http://en.wikipedia.org/wiki/File:Energy_consumption_versus_GDP.png
U.S. Department of Energy: http://www.energy.gov/foreducators.htm

The World's Energy Consumption Data*

Country	Population in Millions	Percent of World's Population	Percentage of Energy Consumption	Oil Consumption Barrels Per Day per 1,000 People **	Percentage of Carbon Dioxide Emissions
China	1,330	19.8	14.3	5.7	15.2
India	1,148	17.1	3.9	2.4	4.4
United States	304	4.5	24	68.7	25.2
Indonesia	237	3.5	1.1	5.5	1.3
Brazil	196	2.9	1.8	12.5	1.4
Pakistan	173	2.6	Less than 1	2.2	Less than 1
Bangladesh	154	2.3	Less than 1	0.6	Less than 1
Russia	141	2.1	6.9	20.2	6.7
Japan	127	1.9	5.3	39.3	5.4
Mexico	110	1.6	1.5	19.5	1.7
Philippines	96	1.4	Less than 1	4.0	Less than 1
Ethiopia	83	1.2	Less than 1	0.4	Less than 1
Germany	82	1.2	3.4	29.8	3.7
Egypt	82	1.2	Less than 1	8.7	Less than 1
Iran	66	1	1.6	24.3	Less than 1
Thailand	65	1	Less than 1	14.3	Less than 1
United Kingdom	61	0.9	2.3	29.0	2.4
Argentina	40	0.6	Less than 1	13.4	Less than 1
Canada	33	0.5	3.2	71.0	2.3
Saudi Arabia	28	0.3	1.4	83.7	1.2
Iceland	.3	Less than .01	Less than 0.5	70.0	Less than 1

* This data and more can be found at http://www.nationmaster.com.

** This data was available for oil but not energy.

The World's Oil Consumption Data Questions

1. Look at the percent of the world's population and oil consumption percentage. Which country(ies) consume:
   a. A higher percentage of oil than its population percentage?

   b. A lower percentage of oil than its population percentage?

2. Looking at your answer in question 1:
   a. List three possible explanations for the countries that have a higher percentage?

   b. List three possible explanations for the countries that have a lower percentage?

3. Look at the oil consumption in barrels per day per 1,000 people.
   a. Put in order the top five oil consumers.

   b. What do you find surprising about this answer?

4. Look at the percentage of carbon dioxide emissions for each country.
   a. Which two countries are the biggest producers of carbon dioxide?

   b. Explain why you think each of these countries are the biggest producers of carbon dioxide?

   c. The two countries with the highest oil consumption per person are NOT the top two carbon dioxide producers. Explain.

   d. People often try to make it sound like the United States is not the big producer of greenhouse gases and air pollution by saying that China is catching up. What is wrong with this argument?

The American Energy Diet

The United States has about 4.5 % of the world's population but consumes about 24% of the energy and produces 25.2% of the world's emissions of carbon dioxide, a greenhouse gas. The use of energy per person in the United States is among the highest in the world. We can make choices to help reduce the use of energy and resources.

There are many hidden uses of energy. Much of the products that we purchase in the United States have been manufactured in other countries, like China. Not only is energy involved in producing an item, it takes a lot of energy to get the item from the other countries to the United States and then it has to be shipped throughout the country. All of this energy produces air pollution and carbon dioxide.

We often hear the saying "reduce, reuse, and recycle" as ways to help the environment. Do you know where plastic water bottles go when they are recycled? Often our recycled products are sent to other countries where they are processed for reuse. There is a lot of energy involved in shipping and processing these recycled products. Is there a way to avoid the use of plastic water bottles? People seem to target recycle but they forget reduce and reuse.

"Reducing" means to bring down the amount and to simplify. Do you need a closet full of clothes? How about a garage full of unused stuff? Do you need to have the water so hot that you can't put your hands in it? Do you need to drive three blocks to a friend's house? If you use a public rest-room, what is your choice: paper towel or hand dryer? A paper towel involves cutting the tree down, transporting it for processing and packaging, and then transporting it to the store and finally the public restroom. Even if the paper towel is made with recycled paper, it goes through a similar process. There is some energy used in making the hand dryer, but once it is installed in the public restroom it can dry thousands of hands with a small amount of electricity.

Another part of the saying, "reduce, reuse, and recycle" is to reuse. A great way to reuse and save money is to shop at second hand stores and yard sales to buy good used items that need a new home. You can find such things as the latest fashions, furniture, and dishes. When you go to the grocery store, how often do you hear "paper or plastic?" During a busy time, a grocery store can go through a tree's worth of paper bags. How much energy and resources are used as a result of using paper or plastic? Once made, canvas bags can be used for 20 years. Think about your school: have you ever looked at the trash after lunch? There is a lot of waste. When you pack your lunch, what do you use? What is reusable? What do you throw away? What can you reuse to reduce the amount of trash?

We can't reduce or reuse food but there are some things to consider. Where does your food come from? Do you eat produce from your own garden? Do you buy from a local farmers market? Or, do you buy produce that is shipped from hundreds of miles away or half a world away? Does food sit in your refrigerator until it spoils and is tossed? Think about a nice big steak. Less than one pound of meat is produced for every ten pounds of food that a cow eats. Cows produce a large amount of greenhouse gases. And remember there is all the energy involved in raising and transporting these cows. When you go to the grocery store do you think about how much processing is involved in producing the food? Is there a lot of packaging? Do you buy foods that have been sliced and/or peeled for you? Or do you do it yourself?

New technology is helping to reduce energy usage and the production of greenhouse gases and air pollution. For example, vehicles are getting more miles per gallon and we are seeing more buildings with solar collectors. These efforts along with many others, contribute to energy conservation, reduction of greenhouse gas emissions, and saving our resources.

Making Choices About Your Energy Diet

Fill out the following table. Place an X in one of the first three columns. Write your ideas to limit energy use in last column. Remember: reduce, reuse, and recycle.

Things in Our Everyday Lives	Must Have	Would Like	Don't Need	Ways to Limit the Energy Use and Impact on the Environment
Lighting				
Water Heater				
Air Conditioner				
Kitchen Stove and Oven				
Clothes Dryer				
Television and Video Games				
Bottled Water				
Microwave Dinner				
Watermelon in Winter				
Sliced Lunch Meat				
Paper Plates				
Paper Napkins				
Disposable Ink Pens				
AA Batteries				
Daily News Paper				
Five pairs of Athletic Shoes				
Bicycle				
All Terrain Vehicle				
New Car				

Your Energy Diet Questions

1. The items on the "Making Choices About Your Energy Diet" list helps make our lives easier or more comfortable. Do you want to live without these things? Explain your answer.

2. Could you live without these items on the Making Choices About Your Energy Diet list? Explain your answer.

3. What are three favorite things that make your life easier, more comfortable, or that provide entertainment?

4. What energy is involved in having and/or using your three favorite things?

5. What would your life be like without these three things?

6. Generally speaking, countries that have higher income per person use more energy per person. Why do you think this is so?

7. If you had more money to spend, how would that affect your energy usage?

8. Generally speaking, countries that have lower income per person use less energy per person. Why do you think this is so?

9. If you have less money to spend, how would that affect your energy usage?

10. What are you willing to do to reduce your energy usage?

The World's Oil Consumption Data Question Key

1. Look at the percent of the world's population and oil consumption percentage. Which country(ies) consume:

   a. A higher percentage of oil than its population percentage?
   United States, Russia, Japan, Germany, Iran, United Kingdom, Canada, Saudi Arabia
   b. A lower percentage of oil than its population percentage?
   China, India, Indonesia, Brazil, Pakistan, Bangladesh, Mexico, Philippines, Ethiopia, Egypt, Thailand, Argentina, Iceland.

2. Looking at your answer in question 1:

   a. What are three possible explanations for the countries that have a higher percentage?
   Answers may vary. Here are some possible answers.
   These countries have stronger economies so the citizens of these countries have more conveniences (air conditioning, televisions, computers, lights, instant and pre-packaged foods, washing machines, refrigerators, etc.), drive more and bigger vehicles, have more disposable items in their lives (razors, pens, paper plates, etc.), have too much "stuff" (such as clothing and junk in the garage), have hobbies or pastimes that burn more energy (for example riding ATVs or camping in big recreational vehicles), and/or use stuff that requires unnecessary energy (like electric potato peeler or electronic board games). Also these countries may also have more industry that uses energy.
   b. What are three possible explanations for the countries that have a lower percentage?
   Answers may vary. Here are some possible answers.
   These countries have smaller economies so the citizens of these countries have fewer conveniences, vehicles, disposable items, excess junk, hobbies or pastimes that burn energy, and/or use unnecessary energy stuff. The citizens may use lower technology items (such as washing clothes and dishes by hand). They may also walk or ride a bicycle rather than drive, use public transportation, and/or grow their food. The country may also use clean energy or use various methods to conserve energy. Also, these countries may also have less industry.

3. Look at the oil consumption in barrels per day per 1,000 people.

   a. Put in order the top five oil consumers.
   Saudi Arabia, Iceland, United States, Japan, Canada
   b. What do you find surprising about this answer.
   Answers may vary. Here are some possible answers.
   The United States isn't the highest. Iceland is so high (especially after watching the movie). Saudi Arabia is the biggest oil consumer.

4. Look at the percentage of carbon dioxide emissions for each country.

a. Which two countries are the biggest producers of carbon dioxide?
United States and China

b. Explain why you think each of these countries are the biggest producers of carbon dioxide?
Answers may vary. These are the most common answers.
The United States has a smaller population but uses a lot of energy or oil per person.
China uses a small amount of energy or oil per person but it has a huge population.

c. The two countries with the highest oil consumption per person are NOT the top two carbon dioxide producers. Explain.
The two countries with the highest oil consumption per person have small populations.

d. People often try to make it sound like the United States is not the big producer of greenhouse gases and air pollution by saying that China is catching up. What is wrong with this argument?
Answers may vary. These are the most common answers.
China still has a long way to go to catch up with the United States. China has a lot more people than the United States, but individuals in China do not use as much energy/oil as individuals in the United States. The following answer is a higher level of thinking: China produces a lot of goods that are for people in the United States. This requires a lot of energy and produces a lot of air pollution and greenhouse gases. The air pollution and greenhouse gases are being produced because of the United States.

Making Choices About Your Energy Diet Key

Answer may vary. These are possible answers.

Things in Our Everyday Lives	Must Have	Would Like	Don't Need	Ways to Limit the Energy Use and Impact on the Environment
Lighting	X			Turn off lights when you leave the room; use compact fluorescents; use exterior motion sensor lights; put timers on light switches.
Water Heater	X			Turn water heater thermostat down; put insulation around the water heater; turn the thermostat down when on vacation; turn the water off when not in use; use cold water when hot water is not necessary.
Air Conditioner		X or	X	Turn the thermostat off or turn it up; insulate house; put in an attic fan; close window shades or blinds during the sunny part of the day; open the windows when it is cool outside and shut windows when it is hot.
Kitchen Stove and Oven	X			Turn the stove off when it is not in use; don't over cook food; use a microwave to heat up the water or food; use a toaster oven for smaller oven needs.
Clothes Dryer		X or	X	Hang clothes to dry.
Television and Video Games		X or	X	Turn off the TV and video games when not in use; watch less TV and play video games less; watch TV with a friend; do something else.
Bottled Water			X	Carry your own water bottle that can be refilled, recycle empty bottles.
Microwave Dinner			X	Make your food from scratch, buy dinners with the least amount of packaging.
Watermelon in Winter			X	Eat watermelon in the summer from your own garden or farmers market; eat more locally produced food; eat fruit in season; compost the rind.
Sliced Lunch Meat			X	Buy meat and slice it; purchase lunch meat with the least amount of packaging; eat less meat.
Paper Plates			X	Use regular plates.
Paper Napkins			X	Don't use a napkin, use cloth napkins.
Disposable Ink Pens			X	Use refillable pens and pencils; use pen until there is no ink; remove the tip & recycle the pen.

Things in Our Everyday Lives	Must Have	Would Like	Don't Need	Ways to Limit the Energy Use and Impact on the Environment
AA Batteries		X or	X	Use rechargeable batteries; avoid draining the battery by turning things off when not in use; purchase items that don't need batteries (a hand crank flashlight).
Daily Newspaper			X	Watch the news on TV; listen to the news radio; recycle the newspaper when finished.
Five pairs of Athletic Shoes			X	Have one or two pairs of athletic shoes, use your athletic shoes until they are worn out.
Bicycle		X or	X	Use the bicycle as much as possible; maintain the bicycle; pass the bicycle on to someone else when finished with it.
All Terrain Vehicle		X or	X	Turn off the ATV when not in use; ride the ATV less; do something else; maintain the ATV; pass the ATV on to someone else when finished with it.
New Car		X or	X	Use a older car; walk or ride a bicycle; maintain the car (tune up and correct tire pressure); pass the car on to someone else when finished with it.

Your Energy Diet Questions Key

1. The items on the "Making Choices About Your Energy Diet" list helps make our lives easier or more comfortable. Do you want to live without these things? Explain your answer.
   Answers will vary.
2. Could you live without these items on the Making Choices About Your Energy Diet list? Explain your answer.
   Answers will vary. The students could probably live without these things but their lives would be uncomfortable.
3. What are three favorite things that make your life easier, more comfortable, or that provide entertainment?
   Answers will vary.
4. What energy is involved in having and/or using your three favorite things?
   Answers will vary.
5. What would your life be like without these three things?
   Answers will vary.
6. Generally speaking countries that have higher income per person use more energy per person. Why do you think this is so?
   Answers will vary. Students may mention that the people in these countries can afford to buy vehicles and items that make their lives easier or more comfortable. These items require energy in producing and using them.
7. If you had more money to spend, how would that affect your energy usage?
   Answers will vary. Most likely students would say having money would increase their energy usage because they would buy more things that make their lives easier or more comfortable. Or students may want things for their entertainment that involve more energy, for example larger vehicles that burn more gasoline.
8. Generally speaking countries that have lower income per person use less energy per person. Why do you think this is so?
   Answers will vary. Students may mention that the people in these countries can't afford to buy vehicles and items that make their lives easier or more comfortable. Often these countries may not have electricity or well-developed roads for vehicles.
9. If you have less money to spend, how would that affect your energy usage?
   Answers will vary. Most likely students would say having less money would decrease their energy usage because they would not be able to buy things that make their lives easier or more comfortable. Or students may want things for their entertainment that involve more energy, for example larger vehicles that burn more gasoline.
10. What are you willing to do to reduce your energy usage?
    Answers will vary. Hopefully, students mention ways to reduce and reuse besides recycling.