LESSON: Energy Mathematics   **GRADE**:   **3**

OBJECTIVES:

Operations & Algebraic Thinking
Understand properties of multiplication and the relationship between multiplication and division.

- **3.OA.5** Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

MATERIALS & RESOURCES:

- Access to Internet; Kids Energy Calculator (http://www.eia.gov/kids/energy.cfm?page=about_energy_conversion_calculator-basics)
  Graph paper and pencils
- Energy information sheets (included)

PRESENTATION:

Everyone uses energy. We use energy to move about, for cooking, heating, traveling, manufacturing, and many other uses. All of this energy comes from different sources. Humans get energy from food calories; cars use gas; lights are usually electric which comes from coal or nuclear. Solar energy can provide electric power.

Have you ever considered the amount of energy that we get from gas or coal? How powerful is it compared to the work humans can produce? If we conserve this valuable resource, we might leave some for future generations.

DIRECTIONS:

1. Have students guess the amount of energy produced by gas, coal and humans. The class could add other sources of energy to the graph.
Start with the question; "How many calories equal the energy in a gallon of gasoline?"
2. Have students graph their guesses or predictions on the Predictions Graph.
3. Now give students the Answer Graph.
4. Have students fill in the answers (data) on the Prediction Graph under the column heading 'Answer'. Now they can compare their predictions to the data.
5. Discuss how long it would take a human (or even 10 humans!) to use the amount of calories equal to 1 gallon of gasoline or 1 pound of coal. It would take weeks, even months depending on the task, to do the work of 1 gallon of gasoline. How much value is in fossil fuels like gas or coal? Are we using this very valuable and finite resource in the best way possible? Could we be more efficient and conserve it?
6. Use the Kids Energy Calculator (URL in materials list) to compare other forms of energy.
7. Learn about energy at Kids Energy http://www.eia.gov/kids/energy.cfm?page=6)

TIME: 45-90 min.

PROCESSING THROUGH THE SIX PILLARS:

WHAT HAPPENED?
- Were your predictions correct? Were they close?
- What did you learn about energy?

SO WHAT?
- How did you feel when you learned how much energy gasoline and coal produce?
- When you think about the energy we use, what pillars come to mind? Why?

NOW WHAT?
- How can fossil fuels be used more efficiently?
- How can we conserve fossil fuels? What can you do? Who can help?

Use Predictions Graph first. Students will graph their guesses about energy in the Guess column. Then after looking at the Answer Graph below they can fill in the "data" or answers and compare side by side their predictions with the data.

Type of Energy	Guess	Answer
Gasoline	1 gallon	
Humans (Kilo Calories)		
Coal		

Use the Answer Graph second. Give it to the students so they can compare actual energy produced by gas, coal, and humans.

Type of Energy	Answer
Gasoline	1 gallon
Humans (Kilo Calories)	31,307 Kilo calories (this is the unit used for counting food calories)
Coal	12.34 lbs (approx.)

Example Math Problems:

If a human uses 560 calories/hour running, how many hours would the human have to run to use 31,307 calories?

How many apples would you need to eat to consume 560 calories? (Assume an apple =100 calories)

31,307 kilocalories is the same amount of energy as a gallon of gas. How long do you think it would take to burn the gallon of gasoline? Pretend you can drive your car 20 miles on 1 gallon of gas, how long to you think it would take to drive 20 miles? If you drove 20 miles/1 hour it would take 1 hour. What if you drove 40 miles per hour?

How long would it take you to <u>run or walk </u>20 miles?

Let's pretend a car can run on gas or coal and gets the same mileage with either fuel. If a car that usually gets 20 miles per gallon of gas, how many pounds of coal would it take to go 20 miles? Consult your graph to find how much coal is equal to 1 gallon of gas.