Community in the Classroom Presentation Plan

Lesson Name Energy Comes from the Sun
Presenter(s) David Lehrer, Stefanie Gitler, Gaelle Cognet, Laurie Reemeyer

Grade Level 3 **Standards Connection(s)** Physical Science

Abstract:
Learn that the ultimate source of all energy for electricity and human energy is the sun.

Vocabulary/Definitions:
3 – 6 important (new) words
Fossil fuel
Conversion
Renewable

Materials:
Laminated pictures, plants, extension leads, lamps and backing sheets, thermal gun, magnifying glass, solar calculator, solar gadget, solar panel. Workbooks.
Students should have ready (pencils)

Classroom Set-up:
3 Student groups for the workstations, Power, Sun, whiteboard, set-up/clean-up time needed

Classroom Visit

1. Personal Introduction: **4 Minutes**
All graduate students from different departments at Berkeley with an interest in energy. We want students to understand where energy comes from and how the sun's energy is harnessed and used. Connect energy with everyday things and activities that they see around them.

Topic Introduction: **5 Minutes**
Get the students to think about energy in everyday life. Introduce them to the workbook.

2. Learning Experience(s): **30 Minutes**
8-10 min per workstation. 3 stations. Stored Energy – describe fossil fuels, conversion to electricity, comparison of conventional and high efficiency light bulbs. Solar Energy – Direct and indirect use of sunlight in our everyday lives. Human Energy – how energy we use to move and work comes ultimately from living things that are powered by the Sun's energy.

3. Wrap-up: Sharing Experiences and Building Connections **15 Minutes**
On the whiteboard, get the students to help us put together the links between the sun, conversion and end use of energy. Key concepts for them to leave understanding: all energy comes from the sun, conversion of energy so humans can use it, there are impacts and byproducts from using energy. Confirm the meaning of the new vocabulary.

4. Close: **5 Minutes**
Ask for questions. Leave teacher with some follow up questions for homework. Thanks and good-bye! Clean-up.

TOTAL 50 – 60 Minutes

Follow-up – After Presentation

Suggest students write a letter explaining "How we learned about _____?"
List or attach examples of activities, websites, connections for additional learning.
Attach worksheets, hand-outs, visuals used in classroom presentation.

CRS Team
Notes for introduction
Draft 11/02/08

Goal: Get students thinking about energy (without giving away the final discovery, that all energy comes from the sun)

Introduction: Energy is all around us, and in many forms. How many kinds of energy can you think of?

1. Make an unsorted list on the board as students have ideas. If they have trouble getting a lot of ideas suggest:

    - Energy that we use in buildings? (Lights, heating and cooling, appliances, things that we plug in.)
    - Energy we use for transportation? (Cars, planes, BART trains, bicycles)
    - Energy we use in our bodies? (For walking, running, all the time.)
    - Energy around us outside? (From the sun, light, heat)

2. Explain the three stations, about 1) energy from plants, 2) energy we get from the ground, called fossil fuels, and 3) energy from the sun.

3. Hand out workbooks, and explain that they are to fill these in at each of the three stations.

4. Divide class into three groups, and give each group a number 1-3. Send them to three stations.

The Sun = Human Energy

1. Everyone, jump up and down in place
    a. When we jump, we are using energy
    b. How do we get energy to do the things we do all day?
        i. Answer: food!
2. Lets name some of our favorite foods!
    a. [allow kids to say a few]
    b. if none offer hamburger, ask how many kids like hamburgers or cheeseburgers
3. What is in a cheeseburger?
    a. Bun
        i. Wheat
        ii. Air, soil, water
        iii. sun
    b. Lettuce
        i. Lettuce plan
        ii. Air, soil, water
        iii. sun
    c. Hamburger
        i. Cow
        ii. Cow eats grass
        iii. Air, soil, water
        iv. sun
    d. Cheese
        i. Cow milk
        ii. Cow eats grass
        iii. Air, soil, water
        iv. sun
4. Go through bioburgers activity as listed
    a. Everything ends up connecting back to the sun
    b. Without the sun, we would not have hamburgers or any other food!
5. Show kids that I tried to grow my own lettuce
    a. Used two pots with the same plants and the same amount of water
    b. I placed one in the sun and one in my closet
    c. Can you predict what happened to each?
    d. Can you guess which of the plants I am holding up was in the closet, and which was in the sun?
6. So what did we learn today?
    a. Without the sun, there would be no food, and we would have no energy to do the things we do every day!

The Solar Station (Gaelle)

Material:

- A thermo-gun?: *See with David*
- A loupe (magnifying glass): *to buy (See Long Drugs)*
- An "aluminum heater"?: *check Mountain Hiking store on Shattuck*
- A solar calculator: *to buy?*
- A solar moving toy: *See with David*
- A sample of solar panel, photovoltaic cell: *on Campus?*

Discussion and experiments with the children

1. **<u>Make them realize that the Sun energy in very important in our lives:</u>**

Thermo gun

   a. Make them feel what kind of energies the Sun produces..:
      i. Light: difference between day and night
      ii. Heat: how do you feel it? Feel the difference between being in the light and being in the shadow, temperatures during the day and during the night, during summer and during winter (because the sun is further from Earth)

   b. ..And that we use this energy very directly:

      For a long time, humans were completely dependent of the Sun, with no electricity to turn in by night… But aren't we still completely dependent of the Sun?

      i. We don't turn on the light during the day
      ii. We don't turn on the heater during summer.. but we turn in the air conditioner!

2. **<u>Introduce them to the modern uses of the sun energy:</u>**

Loupe

   a. Classic "boy scout" methods they may already know:
      i. Loupe to intensify light and make a fire: Beware!! Fires due to pieces of glass let in very dry places

Aluminum Heater

ii. Ways to intensify heat: aluminum heater?

b. Modern methods:

You can **CONVERT** the Sun light into something else, notably electricity

i. Solar calculator: put your finger on the cells, and it turns off!

ii. Solar toy: the light of the sun can be converted into motion

iii. Solar panels, Photovoltaic cells: can **STORE** the energy produced(difference with immediate use)and can be used on a very large scale to heat a house, a building, part of a city

1. Where have you seen solar panels already?
2. Is there a place close to Berkeley where you can see huge solar panels?
3. What limit?: when it's cloudy, dark!

Solar Calculator

Solar Toy

Pv sample

3. <u>Conclusion:</u>

- What do the children think about solar energy?
- Make them realize that it is free and you can use it limitless: in the class, how many children could use a solar calculator? What would be the limit? (introduce the notion of renewable?)

The Stored Energy and Efficiency Workstation (Laurie)

Material:

- A sample of coal:
- A fossilized fern in a rock to show old plants. *Which Dept?*
- A thermo-gun: *See with David*
- 2 desk lamps, one with a high efficiency bulb and one with a normal incandescent bulb:
- Project board with Black backing sheet marked with spot for measuring temperature.

Discussion and experiments with the children

1. **<u>Fossil fuels as stored energy from the sun:</u>**

Sample of coal and fossil plant

   a. Make them realize that fossil fuels are energy that came from living things grown a long time ago:
      i. coal – old plants, oil and gas from small living things
      ii. large but finite resource – new coal, oil and gas is being formed much, much slower than we are consuming.

   b. We burn fossil fuels to make electricity to power our lives:
      i. Excellent store of energy, but finite resource
      ii. Burning fossil fuels creates pollution (CO_2) that is warming the earth.

2. **<u>Introduce them to uses of electricity:</u>**
   a. Example – lighting for your house
      i. Plug in a standard light bulb and switch it on. Where does the energy come from? Talk about coal and gas – conventional sources of power. We will talk about other ways of making electricity.
      ii. Is electricity free? Think about what it takes to get the electricity (recap in the sharing experiences section.

Light, stand and black backing.

Thermal gun

   b. Efficiency:
   Lamps produce light (the useful output) and heat (the wasted output)

i. Compare the brightness visually
ii. Feel the bulbs to compare waste heat given off
iii. Measure temp of backing with thermal gun.
iv. Which light bulb uses more energy? How many times more (14W vs 60W – more than 4 times more)?

3. **<u>Conclusion:</u>**
   - What do the children think about what allowed fossil fuels to form in the first place (sun)?
   - Make them realize that energy costs money and has an impact on the environment so it is important to use it sparingly and efficiently.

Human Energy:

What is one of your favorite foods?

Where do the ingredients (fuel for your human energy) come from?

(Images here of various food sources.)

Energy Workshop Notebook

Name:
Date:

Final Questions:

What is the original source for all the types of energy discussed in this class?

Which types of energy are renewable?

Which types of energy are clean?

Can you name other types of clean or renewable energy?

Stored Energy (Carbon):

Do you think this energy source is: (circle your answer)

Renewable?

Non-renewable?

Easy to store?

Hard to store?

Clean?

Dirty?

Temperature

_____

Wattage

_____

Temperature

_____

Wattage

_____

How many times more wattage does the incandescent use? _____

Solar and Wind Energy:

Do you think this energy source is: (circle your answer)

Renewable?

Non-renewable?

Easy to store?

Hard to store?

Clean?

Dirty?