ADAPTATION OF "ENERGY CHAINS"

In Energy and Society Activity Kit

Preparation:

1. Decide where caches will be hidden on your school campus. Go to those sites to mark and label waypoints on all of the GPS receivers. 4 to 6 caches are adequate for most classes.
2. Create energy links. You will need at least one energy link for each cache.
3. Copy energy link sheets (found in Energy and Society Activity Kit guide), Energy Chain Geocache log sheet, Geocache record of visit sheet, and Using GPS Receiver Quick Tip Sheet (optional). You will need one energy link sheet and record of visit sheet for each cache. You will need a log sheet and tip sheet for each group of students. Cut energy link sheet apart into strips.
4. Label the cache containers. You want to put a label on the outside of the cache so that teams know when they have found the correct cache. You want to put the color or name of the next cache the group is to visit on the inside of the container.
5. Put one energy chain link and record of visit sheet in each cache.
6. Stash the caches.

Student preparation:

Be sure students know how to navigate using the receiver. Review the quick tip sheet with the students and have them practice navigating until you are sure they know how to use the receiver.

Also students should be able to name and describe the following types of energy: heat, mechanical, electrical, radiant, thermal, chemical, and nuclear.

Procedure:

1. Complete steps one through three as described in Activity 3-Energy Chains in the Society and Energy activity guide.
2. Divide into groups. Give each group a receiver, log, clip board, and pencil. Assign each group a different cache to begin. Instruct the students to collect an energy link and leave an energy observation at each cache.
3. Allow groups to visit each cache and complete assigned tasks.
4. When the groups have collected all the links and completed assigned tasks, they must decide on an order for the links and glue them together in the correct order. Once the initial chains have been linked, have each group continue the chain by adding links that illustrate more energy transformations.
5. Allow groups to share their chains and discuss how energy was transformed as it moved from one link to the next.

Variation/Extension:

**Create different kinds of energy chains*. Have students research transformations and describe a series of energy formations in various topics. For example, one group can identify energy transformations in cars, another in factories, another in nutrition, and another in weather. Choose the best links and copy them. Put label the links and assign each group a different energy chain. For example, the "weather" group would take the link labeled "weather" at each cache and complete their chain as described in step four above.

ENERGY CHAINS INSTRUCTION SHEET

When you use one form of energy, it changes from one form of energy into one or more other forms of energy. Energy cannot be created or destroyed. It just keeps changing from one form into another. It is impossible to convert one form of energy into another without wasting some energy because some energy is always converted into unwanted or unusable forms. The different forms of energy include chemical, electrical, mechanical, radiant or light, or thermal energy.

Write as many examples for each kind of energy as you can:

Chemical

Electrical

Mechanical

Radiant or light

Thermal

In each cache is a link in an energy chain. After you have collected all four chains, decide what order shows how energy is transformed or transferred. Put the chain in order and see if you can continue to add to your energy transformation chain.

One copy of this was in each cache. It was the "something you leave" part of the activity.

Group Name	Time of Discovery	Energy observation What evidence do you see of energy at this waypoint

Shutter-Spot Variation for Energy Detectives

(This activity was adapted using an activity from www.gpsgames.org as well as PLT's Energy and Society Activity Guide.)

Materials Needed:

For each group of students: picture of a site on the campus; directions; envelope; clipboard; pencils or pens; quick tip sheets; GPS receiver

Preparation:

1. Select sites around the school and take pictures of them. Be sure to record the location for future reference (Teacher's Cheat Sheet).
2. Print or copy pictures, directions; quick tip sheets for each group of students. Prepare envelopes by putting a shutter spot picture in each envelope.

Student preparation:

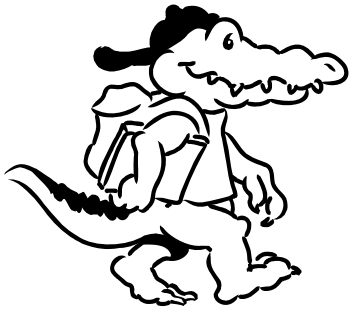
- Be sure students know how to navigate using the receiver. Review the quick tip sheet with the students and have them practice navigating until you are sure they know how to use the receiver.
- Also students should be able to name and describe the following types of energy: potential, kinetic, mechanical, electrical, light, thermal, chemical, elastic, and nuclear.

Procedure:

1. Review important concepts related to energy as described in the Energy and Society Activity Guide, Activity One: Energy Detectives, part B, step 1.
2. Be sure students know how to navigate using the GPS receiver. Review any necessary procedures with the students.
3. Pass out the materials. Tell the students to find the spot on the campus shown in the picture and follow the directions on the task sheet. Remind them to use the quick tip sheets if they forget how to use the GPS receiver. Set a time limit for the activity.
4. (optional) If time permits, have groups swap the GPS receivers and let groups use the GPS receiver to navigate to the shutter spot. Challenge this group to find as many examples of energy use as they can in 10 minutes. Have the two groups compare lists to see if there are any differences in observations.
5. When all the groups have returned, share what they observed and debrief as described in the activity guide (Energy and Society Activity Guide, Activity One: Energy Detectives, part B, step 3). Have students turn in task sheets and other materials.

Variation:

- Have the students find the shutter spots and take a picture with a digital camera. Have the students write hints about the types of energy one may find at this spot. Let students create task sheet with these clues and prepare packets to swap with other groups. Conduct the rest of the activity as described above.



Energy Detectives at the Shutter Spot

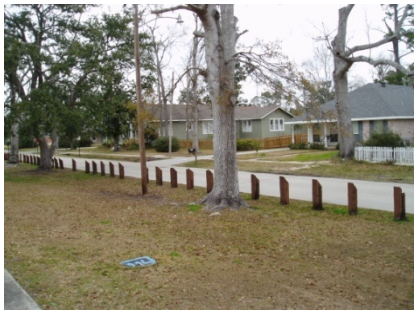
Energy has been spotted (or at least the signs that energy is present) at various spots on your campus. Our scouts have brought back pictures of places where energy is being used or transformed. The problem is that the scout forgot to mark the spot on a map or locate it with the GPS receiver. You and your team must find the spot in this envelope and record information that we will examine later in the classroom. Take a minute and complete the following steps before opening your envelope. Put a check by each step as you complete it.

1. Discuss with your group what energy is and how you will know when it is present. List examples of energy and some things you might look for that would tell you that energy is present on the back of this page.
2. Review how to mark waypoints on your GPS receiver and use the pointer page to find a direction. Ask your teacher for help if you do not know how to do this.
3. Assign roles in the group. One person should be the recorder, one person should be the time keeper and responsible for the envelope, and one person should work the GPS receiver. You can switch jobs when you are outside, if you wish.
4. Make sure you have all the materials you will need to complete your tasks. You will need a clipboard, envelope, pencil and GPS receiver.

You're ready to go! Show this page to your teacher and then go outside. Open your envelope and begin looking for your shutter spot. Complete all the tasks on the sheet.

Be back in the classroom by _____. If you finish early, report to the teacher. Be ready to share what you have discovered when everyone is back in the classroom.

Our Shutter Spot Energy Sightings



Our shutter spot was located at

(write the latitude and longitude of this location as it reads on your GPS receiver)

We had the following energy sightings

ADAPTATION OF "Water Wonders-Go to the Head of the Cloud"

In PLT Prek-8 Activity Guide

Preparation:

1. Place stations and mark waypoints on GPS receivers. Be sure to properly label each station so that it corresponds with the labels for the activity. For example, the groundwater waypoint should be labeled groundwater.
2. Complete the rest of the preparations for this activity as described in the activity guide.
3. Prior to doing the activity with the students, place the station labels and directions at the designated waypoints.

Student preparation:

Be sure students know how to navigate using the receiver. Review the quick tip sheet with the students and have them practice navigating until you are sure they know how to use the receiver.

Be sure students are familiar with proper group behavior while navigating using GPS receivers.

Procedure:

Follow the procedure as outlined in the activity guide with the exception that one person will be responsible for using the GPS receiver to navigate the group from one station to another.

Variation:

Incorporate more technology by having the students record what happened to them at each station by using a digital camera and group illustrations. For example, to illustrate that they are frozen at a glacier, the students in the group might dramatize that they are shivering and one group member will take a picture of it. These pictures can then be downloaded to a computer for preparation of a presentation using word processing or slide show programs.

Water Wonders: Go to the Head of the Cloud

Activity directions-Part A

1. Using the GPS to guide you, your group will go to the station assigned by your teacher.
2. Once you are at your station, the roller will roll the die and read the corresponding number on the chart at the station. The recorder will write an abbreviated version of the directions on the group recording sheet.
3. The group will decide how to best illustrate what happened to them at this station and the camera operator will take a picture of it.
4. The GPS operator will use the GPS receiver to guide the group to the next station.
5. When you arrive at the next station, you will repeat steps 2 through 5. Repeat these steps until you have filled your recording sheet.
6. When your recording sheet is filled, go to the teacher for further instructions.

Water Wonders: Go to the Head of the Cloud

Activity directions-Part B

1. Remove the memory card from your camera and plug it in to the computer.
2. Create an illustrated story showing your travels through the water cycle using either a word processing or slide show program and the pictures you took at each station.
3. Be prepared to share your story with the rest of the class.

Water Wonders: Go to the Head of the Cloud

Activity directions-Part B

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Some suggested ways to use GPS with PLT Prek-8 activities

MARK WAYPOINTS AND TRANSLATE TO A MAP

Trees in Trouble
Improve your place

GO TO WAYPOINTS TO COLLECT DATA

Sounds Around
Poet-tree
Planet Diversity
Trees as Habitats
Pollution Search
Forest, Field and Stream
Take a Closer Look
How Big is Your Tree
Air We Breathe: Part A-Particle Pursuit—have students go outside to waypoints to collect data

CREATE GEOCACHE ACTIVITIES

Can it be Real?
`We All Need Trees

OTHER WAYS TO USE GPS

Go to the Head of The Cloud: Put stations further apart and mark with waypoints. The group navigator must use the GPS to guide the group to the next station.

Planning the Ideal Community: Instead of distributing a map, have students go to waypoints marked on GPS

WEB SOURCES FOR GPS LESSON PLANS

GEOTREKKING.NET: http://web.uvic.ca/~tpelton/geotrekking/teacher.php

Site states that its purpose is to integrate "localized webs of geocaches, problem solving and educational content to support learning and is a flexible **instructional design model** that can help teachers to plan, create, and implement meaningful and engaging learning opportunities."

THE SCIENCE SPOT: http://sciencespot.net/Pages/classgpslsn.html

A website maintained by Mrs. Tracy Trimpe, 8th Grade Science Teacher @ Havana Junior High, Havana, IL.

GPSGAMES.ORG: http://www.gpsgames.org/

Offers ideas for variations on standard geocaching. Many of these games can easily be adapted for classroom use.

WEB SOURCES FOR ENERGY-RELATED LESSON PLANS AND BACKGROUND INFORMATION

Mass. Technology Collaborative:

http://www.mtpc.org/cleanenergy/curriculum/resources.htm

Teaching Resources-provides links to energy related information and teaching guides

Geological Society of America:

http://www.geosociety.org/educate/LessonPlans/i_energy.htm

Offers a list of lesson plans for intermediate students on energy and energy issues.

Bureau of Land Management: Energy-Fuel for Thought

http://www.blm.gov/education/00_resources/articles/energy/index.html

Lesson plans on how energy is dependent on resource management. Good background information for students.

WEBSITES THAT YOU OR YOUR STUDENTS CAN USE FOR COMPLETING THE FOLLOWING ACTIVITIES:

ENERGY AND SOCIETY ACTIVITY GUIDE

2: May the Source Be With You: http://www.re-energy.ca/t_renewablebasics.shtml

A good site that offers basic information on alternative energy sources

3: Energy Chains: http://electronics.howstuffworks.com/ (How Stuff Works)

4: What Powers the Move?

http://www.eia.doe.gov/kids/energyfacts/science/energy_calculator.html

Calculators for Energy Used in the United States-Good foronline calculating; it uses scientific notation and a variety of measurement units

5: In the Driver's Seat: http://www.fueleconomy.gov/

US Dept. of Energy comparison of fuel economy on a variety of vehicles

PRE K – 8 ACTIVITY GUIDE

39: Energy Sleuths: http://www.eere.energy.gov/

USDOE Energy Efficiency and Renewable energy: Looks at alternative energy sources and conservation.

55: Planning the Ideal Community: http://eed.llnl.gov/flow/02flow.php

Energy and Environment Directorate- great graphics showing how energy is created and flows within society.

57: Democracy in Action:

http://www.nationalgeographic.com/xpeditions/lessons/16/g912/energydebate.html

This is a similar lesson to the one in activity guide but lists many on-line resources.

86: Our Changing World:

http://www.gsfc.nasa.gov/gsfc/service/gallery/fact_sheets/earthsci/terra/earths_energy_balance.htm

The article "Earth's Energy Balance" explains how energy maintains global systems.

All websites last accessed 1/18.07