Lesson 1
Life Without Fossil Fuels
Created for SPICE by Michael Cottam and May Steward

KEY QUESTION(S):
1. What some examples of alternative energy resources?
2. What are advantages and disadvantages of using these resources?

SCIENCE SUBJECT: Energy

GRADE LEVEL: 6th

SCIENCE CONCEPTS:
Renewable and non-renewable sources of energy

OVERALL TIME ESTIMATE:
This lesson takes 3 classes:
1-50 minute class   (Fossil Fuels video and discussion questions)
1-50 minute class   (poster research in textbooks and library books)
1-50 minute class   (poster construction using markers, crayons, and colored
    pencils)

LEARNING STYLES: Visual and Auditory

VOCABULARY:
    Energy is what it takes to change something. For example, you could use
        energy to change the temperature, speed, or direction of motion of
        an object.
    Fossil fuels are energy resources formed from the decaying remains of
        ancient plants and animals. Examples of fossil fuels are coal, oil,
        and natural gas. (Oil is used to make the gasoline that runs your
        parents' cars. Natural gas is used, among other things, to heat
        many homes.)
    Pollution is an introduction of harmful waste, chemicals, and substances
        into the environment.
    Nonrenewable resources are resources that we can not replace by
        natural processes in less than 100 years.
    Renewable resources are resources that can be recycled or replaced by
        natural processes in less than 100 years.
    Solar energy is energy from the sun.

Wind energy is energy from the wind.

Hydroelectric energy is energy from moving water. It can be used to generate electricity.

Geothermal energy is heat from rock and water that surrounds magma deep inside the earth. The heat can be used to generate electricity.

Nuclear energy is produced through the splitting of the nuclei of certain elements.

LESSON SUMMARY: "Life Without Fossil Fuels" covers several different types of both renewable and non-renewable sources of electricity. Using lecture, discussion, and individual research, we will explore the positive and negative effects of these resources on our lives.

STUDENT LEARNING OBJECTIVES:

    The student will be able to...

1. communicate the need to reduce our fossil fuel production
2. articulate the advantages and disadvantages of several types of energy resources
3. understand his or her role in resource conservation

MATERIALS:

Essential:

    Earth Science in Action: Fossil Fuels Video (1)

    Textbooks with information on alternative energy resources (Per student)

    Worksheet with research questions (Class set)

    Construction paper (Per student)

    Markers, crayons, or colored pencils (Per student)

SUPPLEMENTAL:

    Library books on alternative energy resources (Per student)

    Information on alternative energy resources printed from the internet

    Computers with internet connection (Per student)

ADVANCE PREPARATION:

1. Pick up a copy of Earth Science in Action: Fossil Fuels video. It is a part of a 14-volume set and is 23 minutes long. Here are several places you may obtain the video:
   a. Your school's media center.

b. If you are in Alachua County School District in Florida, you may borrow the video from the Sivia Center or Lincoln Middle School. Contact the Media Specialist at your school to make arrangements.

c. You may order the video from the publisher, Schlessinger Media. Their website and telephone number are: libraryvideo.com, (800) 843-3620. The ISBN number for the video is 1-57225-343-6.

2. Make an overhead of the video discussion questions for the class. (These are in the file "Video Questions.doc".)

3. Make handouts of the Poster Questions (from the file "Poster instructions.doc"). Alternatively, one may make a class set of these questions and collect them at the end of each class.

4. It is helpful to have library books pulled off of the shelves for students and to have computers on informative websites for students. See the Resources and Reference section of this lesson plan for website suggestions.

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES:

1. DAY 1: (10 minutes) Give a copy of the video questions to students. It works well to have students copy down the questions from the board and leave 2 lines in between each question.

2. Here are the video questions and possible answers:

   a. What are fossil fuels?
      i. They are energy resources formed from the decaying remains of ancient plants and animals.

   b. When were fossil fuels formed?
      i. They were formed millions of years ago.
         - Note: the video doesn't do a very good job of giving students a feel for just how long ago that is. Grasping how big one million actually is is a rather difficult concept, even for most adults. Here are some suggestions for illustrating how big one million is:
         - If you brushed you teeth twice a day, every day of your life, you would not brush you teeth 1 million times. (In fact, you would have to live almost 1,370 years to brush 1 million times!)

- So how many times would you have to brush every day to get to a million? Assuming you live to be 80 years old, 34 times every day! (Actually you'd have to brush 35 times every 4th day or so.) And that's never missing a day, beginning from the day you were born. Start brushing!
- http://www.themathlab.com/Pre-Algebra/basics/million.htm This is a very cool description of one teacher's quest to explain how big a million is. It contains a number of ideas that are adaptable to any classroom.

c. How were fossil fuels formed?
   i. They were formed as a result of a natural process in which the remains of dead plants and animals were buried and placed under extreme pressure and heat.
   ii. Coal is formed from the remains of trees and other plants that lived between 300 and 400 million years ago.
   iii. Natural gas and oil are formed from the remains of billions of marine plants and animals.

d. What are the most important fossil fuels?
   - The most important fossil fuels are coal, oil, and natural gas.

e. What are fossil fuels used for?
   i. They are used for generating electricity to use in homes, cars, and factories.

f. How do we find fossil fuels?
   i. Coal is mined by deep mining and strip mining processes.
   ii. Engineers drill through layers of rock to reach underground deposits of oil and natural gas.

g. What can we do to preserve (means save) fossil fuels?
   i. Since the process of fossil fuel formation can take millions of years, we need to conserve electricity. This will help us save fossil fuel. We can also use alternative energy resources in addition to fossil fuels.

h. What specific things can you do personally to conserve energy?
   i. There are many possible answers. Two examples are turning off lights when you are not in the room and taking shorter showers, which means less water has to be heated.

3. (23 minutes) Instruct students to answer the questions as they watch the video.

4. (10 minute) After the video, review the answers to the questions and allow students who missed any to write down the answers.
5. DAY 2: (5 minutes) Explain that the entire class has now had a short introduction to "non-renewable energy resources". Ask students what they think "non-renewable energy resource" means.
6. Tell students that each of them will now become an expert on one type of renewable energy resource, and will prepare a poster to share what they learn with the rest of the class.
    a. Creating a Powerpoint presentation is an excellent alternative to posters and introduces students to in important technology. If your students create Powerpoint presentations, you will need to print them so they will be available as resources for all students in later lessons. To do this, on the "File" menu, select "Print…". From the "Print what:" drop-down menu on the lower left side of the screen, select "Handouts". The "Handouts" menu on the right will now become un-greyed. Select "4" from the "Slides per page:" drop-down menu. Click on "OK" to print the presentation. (These instructions are for Powerpoint 2002. They may vary slightly for other versions of Powerpoint.)
7. (45 minutes) Using his or her textbook, the internet, or the library, each student needs to answer the following questions about an alternative energy resource of his or her choice (solar, wind, hydroelectric, geothermal, nuclear, or biomass). These questions are in handout format in the file "Poster instructions.doc".
    a. Is this kind of energy considered "renewable"? Why or why not? (Example: Solar energy is considered "renewable" because we don't actually use it up. We just take energy that the sun is already putting out and convert it into a form we can use.)
    b. Give some interesting historical facts about this type of energy. (Example: Geothermal energy was used 10,000 years ago by the Paleo Indians for cooking and cleaning.)
    c. How is this resource used to generate power? (Example: Biomass energy is the energy stored in organic matter. "Organic matter" is a very broad category; it includes trees, agricultural waste, and fumes from landfills. One way to convert the energy into a form we can use is to burn the biomass. There are several other ways, too.)
    d. List three advantages of using this type of energy. (Example: Using hydroelectric power does not create greenhouse gases. 70% of the earth's surface is water, so there are lots of

potential places to collect this kind of energy. Hydroelectric dams can be built large enough to power a city or small enough to power a single home.)

    e. List at least three negative consequences of using this type of energy. (Example: Wind turbines take up lots of room because you have to have so many of them to produce enough energy. They only work in large, flat areas that have lots of wind, like hilltops and plateaus. Many people think this makes the hilltops plateaus ugly to look at. Wind turbines can be very dangerous to flying animals like birds and bats.)

8. DAY 3: (50 minutes. This section may be extended for another day if need be.) Once each student answers the above questions, he or she needs to create a poster (or Powerpoint) that conveys these answers. One (somewhat uncreative) strategy would be to rewrite the answers on a piece of construction paper. Encourage students to use drawings to convey information as well as words.

9. Keep these posters. They will be used for the following two lessons. If your students made Powerpoint presentations, print them.

RESOURCES/REFERENCES:

http://www.welcometotheweb.org.uk
Welcome to the Web is an internet resource for teaching children how to navigate and find information on the internet. A full lesson plan is included with this module.

http://www.arlington.k12.va.us/schools/gunston/library/students/links/energy/index.html
Gunston Middle School, in Arlington, VA, provides this excellent site at which to begin research about alternative energy resources. The site was written entirely by 6th graders!

http://yahooligans.yahoo.com/Science_and_Nature/Physical Sciences/Energy/
The Gunston sixth graders found many of their references on Yahooligans! This is the URL for the yahooligans energy directory, which provides links to a number of other excellent sites that young learners can use in their research.

<u>Earth Science in Action: Fossil Fuels</u>. Directed and produced by Burud Productions Inc. Videocassette. Schlessinger Media, 2000.

SUNSHINE STATE STANDARDS:

SC.B.1.3.2 - knows that energy can not be created or destroyed, but only changed from one form to another

SC.B.1.3.4 – knows that energy conversions are never 100% efficient

SC.G.2.3.1 - knows that some resources are renewable and others are nonrenewable

SC.B.2.3.2 – knows that most of the energy used today is derived from burning stored energy collected by organisms millions of years ago

SC.D.2.3.2 – knows the positive and negative consequences of human action on the Earth's systems

SC.G.2.3.1 – knows that some resources are renewable and others are nonrenewable

SC.G.2.3.4 - understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in the ecosystem.

SC.H.2.3.5 – understands that contributions to the advancement of science, mathematics, and technology have been made by different kinds of people, in different cultures, at different times, and are an intrinsic part of the development of human culture

SC.H.2.3.6 – knows that no matter who does science and mathematics or invents things, or when or where they do it, the knowledge and technology that result can eventually become available to everyone

LA.B.2.3.4 – uses electronic technology to gather information and communicate new knowledge

Provided by SPICE

Be sure to answer these questions on your poster.
If you find additional information, include it!

1) Is this kind of energy considered "renewable"? Why or why not?
    (Example: Solar energy is considered "renewable" because we don't
    actually use it up. We just take energy that the sun is already putting
    out and convert it into a form we can use.)

2) Give some interesting historical facts about this type of energy.
    (Example: Geothermal energy was used 10,000 years ago by the Paleo
    Indians for cooking and cleaning.)

3) How is this resource used to generate power? (Example: Biomass
    energy is the energy stored in organic matter. "Organic matter" is a
    very broad category; it includes trees, agricultural waste, and fumes
    from landfills. One way to convert the energy into a form we can use
    is to burn the biomass. There are several other ways, too.)

4) List three advantages of using this type of energy. (Example: Using
    hydroelectric power does not create greenhouse gases. 70% of the
    earth's surface is water, so there are lots of potential places to
    collect this kind of energy. Hydroelectric dams can be built large
    enough to power a city or small enough to power a single home.)

5)List at least three negative consequences of using this type of energy.
(Example: Wind turbines take up lots of room because you have to have
so many of them to produce enough energy. They only work in large, flat
areas that have lots of wind, like hilltops and plateaus. Many people think
this makes the hilltops and plateaus ugly to look at. Wind turbines can be
very dangerous to flying animals like birds and bats.)

Earth Science in Action: Fossil Fuels

1. What are fossil fuels?

2. When were fossil fuels formed?

3. How were fossil fuels formed?

4. What are the most important fossil fuels?

5. What are fossil fuels used for?

6. How do we find fossil fuels?

7. What can we do to preserve (means save) fossil fuels?

8. What specific things can you personally do to conserve energy?

Lesson 2
You're the Builder!
Created for SPICE by Michael Cottam and May Steward

KEY QUESTION(S):
3. How will you meet the needs of your town people?
4. How should land resources be used in your town?

SCIENCE SUBJECT: Resources, Energy

GRADE LEVEL: 6th-8th

SCIENCE CONCEPTS:
Renewable and non-renewable energy resources
Land use
Scale drawings (for younger students)

OVERALL TIME ESTIMATE:
This lesson takes 2 classes:
        1-50 minute class (map and legend construction)
        1-50 minute class (answer and review discussion questions)

LEARNING STYLES: Visual and kinesthetic.

VOCABULARY:
See vocabulary list in "Life Without Fossil Fuels"

LESSON SUMMARY: The student challenge is to design a plan in which 120 units of land can be turned into a town. How should the land resources be used? How will you meet the needs of your town people? Students address these questions by designing a town, making a land use map for their town, and discussing their specific choices for the spatial arrangement of various land uses.

STUDENT LEARNING OBJECTIVES:
        The student will be able to...
        1. assess the needs of citizens and organize a town to meet those needs
        2. compose a map, including a legend, displaying different locations involving land resources

3. Evaluate land use in terms of amount of land used (relative to another use)
4. Evaluate land use in terms of spatial arrangement

MATERIALS:
Essential:
City Planning 101 handout (Class Set)
Markers, crayons, or colored pencils (9 different colors per student)
City Map Worksheet
Ruler (1 per student)

ADVANCE PREPARATION:
1. Make a class set of the "City Planning 101" handout.
2. If you will be using the pre-made City Map, make one copy for each student.
3. If you are teaching younger (6th grade) students, review the questions in step 3 on the City Planning 101 handout. Some teachers may wish to skip these questions during the planning phase to allow more time to be spent building the city grid. Based on the needs of your class, decide to what extent to include step 3 on the City Planning 101 handout in your activity.

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES: Procedure:
1. Grid Construction: Tell the students that the first step in being a city planner is to draw a map of their city on which they can plan for various uses of land. Younger students may benefit from the exercise of creating the map grid themselves. For older students, we have provided a pre-made map to allow for more time for thoughtful city planning. (For the teacher only: note that the scale of this map is not explicitly defined. Defining a specific scale for this activity tends to encourage students to focus on the *absolute* amount of land that is devoted to a particular use. The goals of the lesson, however, focus on understanding *relative* spatial relationships; thus, the activity has been designed with only the relative relationships in mind.)
2. *For younger students:* Explain that they will be using cities that are big enough to hold 120 units of land. Ask what the dimensions of a grid would be that has 120 spaces. (10X12)
3. *For younger students:* (15 minutes) Students can create a grid (12 down X 10 across) by following these instructions. (We did this together as a class. Adjust as necessary for your class.)

a. On a sheet of notebook paper, count 13 lines, beginning with the top line on the paper. (Literally, we mean the *lines*, not the spaces between the lines.) Note that these 13 lines have 12 blank spaces between them. These will the "12 blocks down" in your city grid.

b. Using the left-hand margin line (the red line on most notebook paper) as a guide, draw a vertical line from the first to the 13th line.

c. Place 10 small marks along the first line of your notebook paper. The first mark should be 1cm to the right of the vertical line you just drew, the next mark 1 cm to the right of the first mark, and so on.

d. Place 10 small marks in the same way along the 13th line.

e. Connect the first mark on the top of the grid to the first mark on the bottom. Use your ruler to make straight connecting lines. Connect the second mark to the second mark. Continue for all 10 sets of marks. Note that you now have 10 columns. These are the "10 blocks across" in your city grid.

f. The city grid is now complete, but can be confusing because the vertical and horizontal lines are different colors. Trace over each of the 13 lines you counted in part (a) to make them look the same as the vertical lines you drew.

4. *For older students:* Hand out the pre-made City Map.

5. *For all students:* (<5 minutes) Make a legend by writing a list of the 9 land uses underneath your map grid. Later, you will add colored marks to this list to show which color on your map represents each land use.

6. Distribute "City Planning 101" handout.

7. *For older students:* Distribute the "City Planning Note Sheet."

8. Review the handout with the students to be sure that they understand the information provided in the table. (5 minutes)

9. Allow students to create their land use maps. (Older students should use the City Planning Note Sheet" for step 3 of City Planning 101. Younger students may discuss the ideas in step three briefly, or may skip them. Decide which is appropriate for your class.) Remind students that the reflection questions on the City Planning 101 handout should be copied onto their own sheet of paper and answered as homework. (25 minutes)

SUNSHINE STATE STANDARDS:

SC.D.2.3.1 – understands that quality of life is relevant to personal experience

SC.D.2.3.2 – knows the positive and negative consequences of human action on the Earth's systems

SC.G.2.3.1 - knows that some resources are renewable and others are nonrenewable

SC.G.2.3.2 – knows that all biotic and abiotic factors are interrelated and that if one factor is changed or removed, it impacts the availability of other resources within the system

SC.G.2.3.4 - understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in the ecosystem

SC.H.3.3.1 - knows that scientists must not knowingly subject coworkers, students, the neighborhood, or the community to health or property risks

SC.H.3.3.4 – knows that technological design should require taking into account constraints such as natural laws, the properties of the materials used, and economic, political, social, ethical, and aesthetic values

Name: _____

As a group, discuss how the different parts of the town could be arranged. Make notes about your discussion below. Pay particular attention to design ideas that you do or do not wish to include in your city.

1) Will there be many small parks or one large one?

2) Should the industrial plant be near the edge of town or near the center of town?

3) Should the power plant be near the houses, near the industrial plant, or somewhere else?

4) Should the park(s) be in the center of town, near the edge of town, or will you have some of both?

5) Should the school be near the offices or near the houses?

6) What will you put the landfill next to? What should not go next to the landfill?

7) Will you have one large lake or several small ones?

City Planning 101

Your goal is to design a plan in which 120 units of land can be turned into a town. How should land resources be used? How will you meet the needs of your town people? Keep in mind people need shelter, jobs, and stores in order to survive. Children need to attend schools and have parks to play in. It may be helpful to consider what you like and what you do not like about the town where you live.

1) Make a rectangle graph **10 blocks across and 12 blocks down**. The graph represents a 120-unit piece of land. Each side of each block represents 100m in real life; therefore, each block represents 100m X 100m (or 10 000 m^2, which is also called one hectare). Write the name of your town in large letters across the top of your map.

2) This table shows the different parts of a town that need to be included in your plan. The left side names a particular use of land, and the right side says how much land is required and whether all the land must be together or not. For example, the **office buildings and industrial plant** are places where the people of the town will work. They are each **7 blocks** (or hectares) in size. These blocks must be located together on your map – **they cannot be divided**. The **schools** take **1 hectare apiece** and **may not be right next to each other**.

Parts of your Town	Number of Hectares Needed
Office buildings	7 hectares – must **not** be broken up
Industrial plant	7 hectares – must **not** be broken up
Coal-burning power plant	7 hectares – must **not** be broken up
Landfill for garbage	4 hectares – must **not** be broken up
Schools	2 hectares – **must be** broken up
Houses and apartments	45 hectares – **can be** broken up
Stores and businesses	20 hectares – **can be** broken up
Park(s)	20 hectares – **can be** broken up
Lake(s) and/or river(s)	8 hectares – **can be** broken up

3)   In your assigned groups, discuss how the different parts of the town might be put together. Should the park be in the center of town or on the outskirts? Should the school be near the offices or near the houses? Where should the landfill go? Will you have one large lake or several small ones?

4)   As a group, plan your town. Assign a particular color to each type of land use. Check over your plan to make sure that all town parts are being used. Use markers or crayons to color in each grid square as you decide what it will be used for. Be sure to include a legend (an explanation of the colors used on your map) so that it will be understandable.

Homework (Copy these questions on your own sheet of paper before you leave.)

a. Where did you place the office buildings and the industrial plant? Why were they placed there? *(Your answer should be at least 3 sentences long.)*

b. Where did you place the houses, schools, and businesses? Explain why you placed each one as you did. *(Your answer should be at least 3 sentences long.)*

c. Did you make one park or many parks? What are the advantages (positive or good points) of your parks plan? *(Think of at least three.)*

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Name: _____

Date: _____

Mod: _____

City Name

Land Use   Color

_____   [ ]
_____   [ ]
_____   [ ]
_____   [ ]
_____   [ ]
_____   [ ]
_____   [ ]
_____   [ ]
_____   [ ]

Lesson Three
You're Hired! (The Consultant's Letter)
Created for SPICE by Michael Cottam and May Steward

KEY QUESTION(S): What tradeoffs are involved in implementing an alternative energy resource in a city?

SCIENCE SUBJECT: Energy

GRADE LEVEL: 6th-8th

SCIENCE CONCEPTS:
Alternative energy resources
Land use
City Planning
Mathematics/Logic

OVERALL TIME ESTIMATE: This lesson takes 3 class periods.
One 50 minute class – selecting resource and planning the letter
Two 50 minute classes – writing and proof-reading the letter

LEARNING STYLES: Visual and kinesthetic.

VOCABULARY: See vocabulary in the "Life Without Fossil Fuels" lesson plan

LESSON SUMMARY: Using the city plans developed in a previous lesson, the students take the role of a consultant charged with recommending an alternative energy source for the city. Students select a new energy source and write a letter to the fictitious City Council detailing their reasoning and discussing possible reactions from the citizens.

STUDENT LEARNING OBJECTIVES:
        The student will be able to...
1. articulate advantages and disadvantages of several types of energy resources
2. anticipate and discuss citizen's attitudes to a given change in city policy
3. compose a letter describing a particular point of view and the reasons behind it

MATERIALS:

Essential:

Each student needs:

Hiring Packet

        -letter from City Council

        -Tips for Alternative Energy Experts

        -Guidelines for a Letter to the City Council (There are two different versions of this in the module, one for younger students and one for older students. Use the one appropriate for your students.)

        -Example Letter

Access to Student Energy Posters (created in the "Life Without Fossil Fuels" lesson)

Supplemental:

Computers with internet access

Access to a library and/or specific books about alternative energy resources

BACKGROUND INFORMATION: See background info in the "You're the Builder" lesson plan.

ADVANCE PREPARATION:

Make copies of the hiring packet. Each student should have their own copy of this packet. We made a class set of packets, which we collected each day at the end of class.
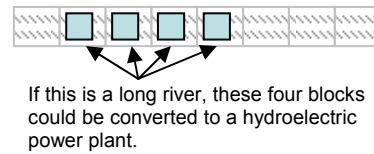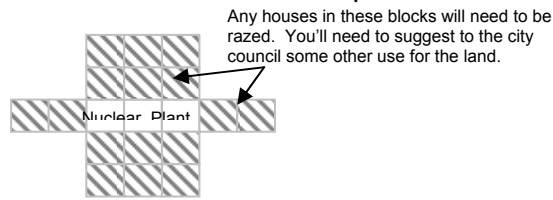
Each student needs to have access to at least one complete, accurate poster for each of the potential types of alternative energy. Teachers should review the energy posters that students made earlier and remove those that are incomplete or inaccurate.

Posters may be hung on the classroom walls, allowing students to view any poster they choose, analogous to a poster session at a scientific meeting. Posters may be grouped by energy resource, or they may be hung in smaller groups, each group containing one poster for each resource studied. To lessen confusion in our 6th grade classroom, we grouped posters by the latter method and distributed to each student (or small group of students) a complete set of posters.

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES:

1)   Congratulate students on being hired as energy consultants and distribute the Hiring Packets.

2)   Read the Letter from the City Council as a class. (3 minutes)

3)   Read the Tips for Alternative Energy Experts as a class. (3 minutes)

4)   Be sure the class understands the differences among the requirements for each resource. Ideas for doing this follow. (5 minutes)

a. Draw the required block patterns and any associated restrictions on the board. Two examples:

Any houses in these blocks will need to be razed. You'll need to suggest to the city council some other use for the land.

Nuclear Plant

If this is a long river, these four blocks could be converted to a hydroelectric power plant.

5) Read the Guidelines for a Letter as a class. Read the Example Letter as a class and explicitly note where the letter addresses each of the Guideline questions. (10 minutes)
   a. Older classes can formulate their own letters, and should be instructed to address each of the Guideline questions in the letter.
   b. Younger students may need some additional help organizing a letter, in which case we suggest using the following outline.
      Paragraph 1: Keep this the same as the example letter, but change the name of the resource you use.
      Paragraph 2: Explain why you selected the type of energy that you selected.
      Paragraph 3: List the advantages and disadvantages for the type of energy you picked.
      Paragraph 4: Describe where in your city you will put your energy source and any changes that will need to happen to other buildings.
      Paragraph 5: Explain some concerns that the townspeople might have about this new source of energy or its effects on the town.
6) Allow students to look at the energy posters to select a new source of energy for their cities. (10 minutes)
7) After choosing a new energy resource, students may begin to answer the Guideline questions. If available, students may look up supplementary information on the internet or in library books. (20 minutes)
8) Have students put the answers to the questions into a letter format. Students should proof-read their own letters. (30 minutes)
9) Have students proof-read another student's letter. Proof-readers should look for spelling, punctuation, and grammatical errors. (5-10 minutes)
10) Instruct students to make a final (nice-looking) copy of the letter and to fix any errors found by the proof-readers. (10-15 minutes)

ASSESSMENT SUGGESTIONS: Describe specific assessments for EACH objective:

For objective 1…

For objective 2… etc.

Don't just say "Collect student worksheet or "Give an oral quiz." Need to clearly indicate the exact question or task that will be used to assess each objective.

EXTENSIONS:

ACTIVITIES: Are there other activities you know of from other resources that relate to this lesson?

LITERATURE: Are there trade books, novels, journal articles, or other print materials that focus on the same topic(s) as this lesson?

RESOURCES/REFERENCES:

Check your school media center for books on alternative energy resources.

SUNSHINE STATE STANDARDS:

SC.B.1.3.2 -   knows that energy can not be created or destroyed, but only changed from one form to another

SC.B.1.3.4 –   knows that energy conversions are never 100% efficient

SC.G.2.3.1 -   knows that some resources are renewable and others are nonrenewable

SC.D.2.3.1 –   understands that quality of life is relevant to personal experience

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SC.G.2.3.4 -   understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in the ecosystem.

SC.H.3.3.1 -   knows that scientists must not knowingly subject coworkers, students, the neighborhood, or the community to health or property risks

SC.H.3.3.4 –   knows that technological design should require taking into account constraints such as natural laws, the properties of the materials used, and economic, political, social, ethical, and aesthetic values

LA.B.1.3.1 –   organizes information before writing according to the type and purpose of writing.

LA.B.1.3.2 –   drafts and revises writing that has focus, organization, support and conventions.

LA.B.1.3.3 –   produces final documents that have been edited.

Hiring Packet

Independent Consultant on Energy
to the
City Council

Wednesday, March 2, 2005

Dear Lincoln Bulldog,

Congratulations! You're hired!

    We, the City Council of the city you designed, have decided to hire you as an energy consultant. We would like to explore the option of using an alternative energy source to provide energy to the city. Please examine the different options for alternative energy and write us a letter explaining which one you think is best for our city.

    Each alternative energy source requires a different amount of space and will have different effects on the buildings and people in the city. Use the Tips for Alternative Energy Experts, which we have included in your hiring packet, to determine which types of alternative energy could be considered for our city and what effects they could have on the buildings and population.

    Each type of alternative energy also has other advantages and disadvantages. Examine your the posters prepared by other Energy Experts (your classmates!) to learn about the advantages and disadvantages of each energy source.

    Once you have decided on the best source of energy for your city, use the Guidelines for a Letter to the City Council, which are in your hiring packet, to help you write your letter.

        Sincerely yours,

        The City Council

Tips for Alternative Energy Experts

Each type of energy requires a certain amount of space. In order to use some of the energy sources, the land in your city must already be arranged a certain way. Use the following tips to decide which energy sources could potentially be used in your city. If any Additional Considerations are listed for a resource, you will also need to inform the City Council of these if you decided to recommend that resource.

Nuclear
      Number of blocks needed: 3 blocks in one group
      Other Requirements: None
      Additional considerations: People will refuse to live within 2 squares of a nuclear power plant. Any houses within 2 squares of your nuclear power plant will need to be knocked down and you will need to suggest a different use for the land.

 Hydroelectric
      Number of blocks needed: 4 blocks in one group
      Other Requirements: This power plant must be built over an existing water source. Your city must have a river or lake that is 8 squares large to build a hydroelectric plant.
      Additional considerations: None

Geothermal
      Number of blocks needed: 3 blocks in one group
      Other Requirements: None
      Additional considerations: City engineers can dig a very deep hole to find a geothermal power source anywhere in the city. However, this source may only be used to heat water and homes. You will need another source of energy for electricity. The land required for that other source is half of what it would be without the geothermal power plant.

Solar
      Number of blocks needed: 12 blocks in one group
      Additional considerations: None

Wind
      Number of blocks needed: 12 blocks in one group
      Additional considerations: None

**Guidelines for a Letter to the City Council
(for seasoned letter-writers)**

These guidelines tell you what information the City Council needs you to include in your letter. They will also help you format your letter.

1. Put today's date at the top of your letter.

2. Open your letter like this: Dear City Council Members of <name of city>:

3. Begin by telling the council which type(s) of alternative energy you have selected.

4. Explain the advantages of the type of energy you selected.

5. Explain the disadvantages of the type of energy you selected.

6. Where in the city will you put the new energy station? (What current parts of your city would need to be destroyed in order for the new power plant to be built?)

7. What are some possible complaints or concerns of the people in the city that the city council should be ready to respond to?

8. Close your letter by stating why you think the advantages to this power source outweigh the disadvantages.

9. Sign your letter.

Guidelines for a Letter to the City Council
(for beginning letter-writers)

These guidelines tell you what information the City Council needs you to include in your letter. They will also help you format your letter.

1)   Put today's date at the top of your letter.

2)   Open your letter like this: Dear City Council Members of ‹name of city›:

3)   Your letter will be five paragraphs long:

Paragraph 1: Keep this the same as the example letter, but change the name of the resource you use.

Paragraph 2: Explain why you selected the type of energy that you selected.

Paragraph 3: List the advantages and disadvantages for the type of energy you picked.

Paragraph 4: Describe where in your city you will put your energy source and any changes that will need to happen to other buildings.

Paragraph 5: Explain some concerns that the townspeople might have about this new source of energy or its effects on the town.

4)   Sign your letter.

Example Letter
This is an example of a good letter to the City Council. It recommends the use of biomass energy, another type of renewable energy that we did not discuss this year. You may use it to help you write your letter.

Friday, March 4, 2005

Dear City Council Members of Lincolnville:

You recently asked me to recommend an alternative energy resource for Lincolnville. After investigating several alternative sources of power, I recommend that you use biomass power in your city.

Biomass power is good because it is a renewable energy source. It can generate energy from the garbage your city throws out. This will decrease the size of your current dump. It will not pollute any more than the coal-burning plant you use now. The technology for making electricity this way is still fairly new. You will show how forward-thinking your city is by using this kind of energy.

You will need to spend quite a bit of money to change your existing dump and power plant to be able to generate biomass power. Not all garbage can be used to generate electricity, so you will also need to design a system of sorting the garbage in your city. Also, because this technology is still being developed, it will probably be expensive for a long time.

The biomass power plant will be built over part of the current landfill and part of the current power plant. This will mean that the current power plant will need to be closed for a while and you will need to purchase energy from another city while the new power plant is constructed. Because of this, energy costs in your city may go up. Your residents may complain about this. You will need to convince them that changing to a renewable resource is the best decision for the future of your city.

I think that the advantages you will gain from using biomass power outweigh the disadvantages. I think the potential for your city to attract many new jobs, especially for people who conduct research on biomass power, is very good. I think this is worth the money you will spend to get it set up. I also think your city is running out of room to store its garbage. Using it to generate electricity will help you deal with that problem.

Sincerely,

<your name here>

Lesson 4

Welcome to the Web
Created for SPICE by Michael Cottam and May Steward

KEY QUESTION(S): How can I use the World Wide Web to find the information I need?

SCIENCE SUBJECT: Computers and Internet

GRADE LEVEL: Anyone who is not comfortable searching and using information from the internet. Students should be able to read at a 4th grade level.

SCIENCE CONCEPTS: This lesson covers skills used to find information in the internet about a topic of interest.

OVERALL TIME ESTIMATE: 2-5 50 minute class periods. (The lesson is very easily segmented to provide as much or as little practice as the teacher deems necessary.)

LEARNING STYLES: Visual and kinesthetic.

VOCABULARY: Vocabulary words presented in each section of the website are defined here. The section names are underlined.

The Internet
Internet – a huge collection of computers around the world
World Wide Web – a collection of millions of pages of information
Hyperlink – a place on a page that you can click to go to another page
Image map – a special kind of picture the can link to many different web pages

Guestbooks
Guestbook – a place on a web site where visitors can comment about the site
Text box – a place on a web page where you can type in text
Tick box – allows you to select (often from a list) by clicking the mouse button. Tick boxes will allow you to make more than one selection from a list.
Button – allows you to select (often from a list) by clicking the mouse button. Buttons will allow you to make only one selection from a list.

Drop-down menu – contains several choice in scrolling list. You access the list by clicking on the menu, then choose an option by clicking in it in the menu.

Web Browsers

Web browser – the software you use to look at web pages

Address bar – the place in the web browser where you type in the address of the page you want to visit

Favorites – saved names and addresses of web sites that you can visit again by selecting the name from a list

Definitions of common web browser buttons (The tutorial covers more buttons than I have listed here. These are the ones that are common to almost all browsers.)

Back button – takes you back to the last page you were looking at

Forward button – if you went BACK to a page, the FORWARD button returns you to the page you came from

Stop button – stops a web page from loading

Refresh button – tells the web browser to download the latest version of a page

Home button – takes you to the page that loads when your browser first starts

Search button – takes you to a page that will allow you to search for information on the web

Searching the Net

Search engine – a web site that makes it much easier to find web pages that relate to a particular topic

Frame – divides your web browser into separate segments that can scroll and load web pages independently of one another

Speech marks – British English for "quotation marks". (This is a British site, so they use British English. Teachers are aware they may need to explain this to students.)

Yahooligans (www.yahooligans.com) and Ask Jeeves for Kids (www.ajkids.com) – two search engines that are designed for use by children

<u>Researching on the Net</u>

Find tool – a tool built in to your web browser that quickly searches a web page for text that you tell it to look for

Clipboard – part of your computer's memory that stores text and pictures that you want to move from one document to another or from one place to another within the same document

Copy – copies any text or picture you have selected to the clipboard. Hold down the Ctrl button and the C button at the same time.

Paste – puts whatever is on the clipboard wherever the typing cursor is. Hold down the Ctrl button and the V button at the same time.

LESSON SUMMARY: This lesson teaches students how to use the internet to find information. Students learn skill sets via hands-on practice, then put the skills to use by aiding a fictitious police department in identifying and capturing the programmer of a malicious computer virus.

STUDENT LEARNING OBJECTIVES:

The student will be able to...

1. find content specific information on the internet.
2. browse large sites to locate specific information.
3. save information and pictures from a web page to a document to be accessed later
4. organize information in tables

MATERIALS:

Essential:

1 computer with internet access for each student or pair of students.

Some of the sections have additional requirements:

For the section entitled "Researching on the Net":

students will need to print a 1-page puzzle

1 pair of scissors per student (for cutting out the puzzle)

-older students may find it an interesting challenge to solve the puzzle *without* printing it

Supplementary:

It is helpful, but not essential, to have an internet-connected computer that can be projected and viewed by the entire class.

The Welcome to the Web Challenge has some nifty graphics and scrolling text that can only be seen if you have the Macromedia Flash plug-in

installed. The challenge can be completed without it. See advance preparation for instructions on how to check your browser for the plug-in.

BACKGROUND INFORMATION:

This table shows the estimated amount of time it would take a 6th grade class to complete each section. Keep in mind that these are averages; some students will complete a given section much more quickly and some much more slowly than indicated. Get a feel for how long it will take your students by going through it yourself.

The Internet – 50 minutes
Guestbooks – 40 minutes
Web Browsers – 35 minutes
Searching the Net – 35 minutes
Researching on the Net – 40 minutes
The Welcome to the Web Challenge – 60 minutes

Secret Codes

At the end of each exercise, students will take a short, on-line quiz. Students will receive a Secret Code when they achieve 100% on each quiz. These codes are needed to complete the Welcome to the Web Challenge. Here is a list of the correct codes:

Code 1 (from the Quiz Instructions): PQ47T
Code 2 (from the Internet Quiz): F972A
Code 3 (from the Guestbook Quiz): M21S8
Code 4 (from the Browsers Quiz): X594B
Code 5 (from the Searching Quiz): A12FP
Code 6 (from the Researching on the Internet Quiz): QRPX5

There are two additional secret codes. One is used in the Researching the Internet section and one is used in the Web Challenge. These codes will be given to students during the sections in which they are used.
Researching Code (given after students put together a puzzle): A1P5W
Challenge Code (given after students correctly identify two suspects): FTMW4

ADVANCE PREPARATION:

Well before class:

It is essential that you go through each section of the web site yourself that you plan to have the students complete. The directions are on the site are quite clear, but, especially for students who are still learning to read and follow directions, you should be prepared to refocus their attention on the specific parts of the directions they have missed.

The web site has worksheets that go along with each of the five sections. They can be viewed and printed at the beginning of each section. That said, the worksheets are quite extensive and will need to be previewed by the teacher. (For example, we made some sections of each worksheet optional and left others out completely.) Teachers will also need to decide which of the website sections are relevant to their class and which are not. (We used only "The Internet" and "Searching the Net" in class. We offered extra credit to students who completed the rest of the tutorials on their own time.)

Some of the text in the Welcome to the Web Challenge scrolls by very quickly if you are using the Flash plug-in. Students who miss something can press the RELOAD button to view the animation again, or may elect to complete the non-Flash version of the Challenge. Here are instructions for confirming that the Macromedia Flash Plug-in is installed on a particular computer.

1) Go to http://www.teachingideas.co.uk/welcome
2) Scroll to the bottom of the page
3) Click on the bold-faced link "The Welcome To The Web Challenge!"
4) Scroll to the bottom of the next page and click on the multicolored "Start"
5) If you can see the animation, the Flash Plug-in is already installed.
6) If you cannot see the animation, click on the picture of a broken puzzle piece and follow the on-screen instructions for downloading and installing the plug-in.

Immediately prior to class:

If you have a projector for you computer screen, set it up. Set the web browser to http://www.teachingideas.co.uk/welcome

If you can not project a computer screen to be viewed by the class, do this instead:
On the first page of the website, there is a 5X2 grid that shows each section of the website and tells what the student will learn in that section. Replicate the left column of this grid on the board.

Set the browser on each of the students' computers to http://www.teachingideas.co.uk/welcome (This is especially important for beginning students. They will get more practice typing in web addresses during the exercise, but may waste quite a bit of time doing it on their own at this point.)

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES:
1) Some students will not have had much exposure to the internet. Ask students to raise a hand if they have used the internet to search for information, so that you will be aware of those who may need a little extra help.
2) Ask for examples of the kinds of information that could be found on the internet. Answers may include projects from other classes or personal interests of the students.
3) Explain that this activity will help those who are new to internet searching learn to find particular, relevant information. Veteran internet searchers will learn some new techniques for finding exactly what they are looking for.
4) Introduce students to the first screen of the website. (Or to your chalkboard drawing of it.)
5) Tell them that the website is divided into 5 sections, each of which will teach different skills associated with locating information on the internet.
6) Point out the sections you would like them to complete.
7) Tell the students that they will need to carefully read and follow the directions on *each* page in order to discover how to get to the next page.
8) If you are using worksheets, point out that the answers are in order on the web page (i.e. the answer for question number 1 will be found before the answer for question number 2), but that there will not necessarily be an answer on *every* page they look at.
9) Tell them that a section can be started by clicking on the title to that section, scrolling to the bottom of the next page, and clicking

on the multi-colored "START!" (If you are using a computer that the whole class can see, demonstrate this now.)

10) Remind the students to carefully read and follow the directions on *each* page of the web site.

11) The explanation to this point should take 5-7 minutes.

12) Pass out the worksheets and allow the students to begin working.

13) As the students work, circulate through the class to provide encouragement and keep students on track. Students will be visiting some very interesting (and very large) websites; many students will want to surf further into these sites. Remind them that they are looking only for certain information on these websites right now (the answers to the worksheet questions), but encourage them to return to the websites later and explore on their own time.

RESOURCES/REFERENCES:
www.teachingideas.co.uk/welcome or www.welcometotheweb.org.uk

SUNSHINE STATE STANDARDS:
SC.H.3.3.7 – knows computer speed up and extend people's ability to collect, sort, and analyze data, prepare research reports, and share data and ideas with others

LA.B.2.3.4 – uses electronic technology to gather information and communicate new knowledge