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Amalia Delgado
FLA 518
Dr. Verplaetse
7/23/09

Title: The Environment – Global Warming

Grade level: 7th & 8th grade

Target group: Mainstream class with integrated ELL students

Sources of written reading materials:

Lesson 1
http://www.weirdomatic.com/global-warming-then-now.html SHOW 7 PICS ONLY
http://www.climatechoices.org/ne/impacts_ne/temperatures.html
http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ImpactsStateImpacts.html

Lesson 2

Lesson 3
http://www.ted.com/talks/al_gore_on_averting_climate_crisis.html (video)
http://www.pbs.org/wgbh/nova/warnings/waterworld/

Source of lessons: http://www.lessonplanspage.com/LAJH.htm

Learning goals: I want my students to know-

1. How temperature affects our environment
2. The impact of human kind on global warming
3. How to conserve energy and prevent further damage to our environment
4. How to help others “go green”
Lesson 1
Amalia Delgado  
7th & 8th grade-Environment (global warming)

Lesson 1 Objectives

**Content Objective:**

1. Students will identify environmental problems.
2. Students will recognize rises of temperatures in the world, particularly our state.
3. Students will identify ways to “take action” to prevent further damage to our environment.

**Language Objectives:**

1. Discuss environmental problems.
2. Prediction of weather trend using data
3. List ways to “take action.”

<table>
<thead>
<tr>
<th>Domain/topic</th>
<th>Fluent Bridging Level 5</th>
<th>Expanding Fluency Level 4</th>
<th>Speech Emerging Level 3</th>
<th>Early Production Level 2</th>
<th>Preproduction Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Global Warming</td>
<td>Students will present and explain, using scientific terms, the danger of global warming to the earth and human kind.</td>
<td>Students will present and explain weather changes over the years.</td>
<td>Students will compare and contrast climates using the “Before and Now” pictures or other relevant sources.</td>
<td>Students will describe the weather trend, using the “Before and Now” pictures and/or any other relevant sources.</td>
<td>Students will repeat descriptors or key terms using the “Before and Now” pictures or any other relevant sources from the teacher.</td>
</tr>
<tr>
<td>Reading</td>
<td></td>
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</tr>
<tr>
<td>Graph of climate</td>
<td>Students will make predictions about global warming (from pictures and different readings).</td>
<td>Students will interpret and record changes of weather supported by different readings.</td>
<td>Students will interpret and formulate weather predictions supported by the “Before and Now” pictures discussed as a class.</td>
<td>Students will describe in a few sentences climate changes using graphs visuals.</td>
<td>Students will describe weather changes using key words.</td>
</tr>
<tr>
<td>Zones-weather</td>
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</tr>
<tr>
<td>Writing/speaking</td>
<td>Students will present ways to take action supported by their research.</td>
<td>Students will write, as a group, a short paragraph of ways to take action supported by their research.</td>
<td>Students will read, write a list, and organize their thoughts about ways to take action.</td>
<td>Students will write a list of ways to take action.</td>
<td>Students will create visuals of ways to take action.</td>
</tr>
</tbody>
</table>
## Functional and Notional Chart

### Lesson 1

<table>
<thead>
<tr>
<th>Function</th>
<th>Situation</th>
<th>Expression</th>
<th>Words</th>
<th>Grammar</th>
</tr>
</thead>
<tbody>
<tr>
<td>List &amp; discuss</td>
<td>-global warming</td>
<td>What is ____?</td>
<td>-Little Ice Age</td>
<td>-articles</td>
</tr>
<tr>
<td></td>
<td>-rises in temperature</td>
<td></td>
<td>-ecological disruption</td>
<td>-nouns</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Celsius</td>
<td>-verbs: past tense</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Fahrenheit</td>
<td>-verbs: present tense</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-global warming</td>
<td>-verbs: future tense</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-greenhouse effect</td>
<td>-wh-questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Why worry about ____?</td>
<td>-go green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>How can I (we) help/prevent ____?</td>
<td>-intense heat wave</td>
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<td></td>
<td></td>
<td></td>
<td>-glaciers</td>
<td></td>
</tr>
<tr>
<td>Explain</td>
<td>Possible solutions to prevent further rises in temperature and global warming</td>
<td>First, I will learn about ____ by researching and discussing with the class.</td>
<td>-Little Ice Age</td>
<td>-Use of transitions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second, I will educate myself about _____.</td>
<td>-ecological disruption</td>
<td>-verbs: first person, future tense</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Third, I will teach/help others to understand what ____ means and how they can help to preserve our environment.</td>
<td>-glaciers</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>-greenhouse effect</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>-“Go Green”</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>-global warming</td>
<td></td>
</tr>
</tbody>
</table>
Modifications to lesson 1

*Global warming key vocabulary and definitions will be provided to preproduction, early production, and speech emerging students prior to our first class (see page # 7).
*Global warming key vocabulary words without definitions will be given to expanding fluency students prior to our first class (See page # 8).

Warm-up Activity 5 minutes
Semantic mapping of new vocabulary will include icons, synonyms, opposites, sentences, and native words if/when applicable. See page 8 for vocabulary words.
*Preproduction, early production, and speech emerging students will work in pairs to draw the icon and to write the native words for each vocabulary word (see page #9).
*Expanding fluent students will work in pairs to draw the icons, write the synonyms, and native words of each vocabulary word (see page #10).
*Fluent bridging students will complete the semantic map for each vocabulary word (see page 11).

Activity 1 (7 minutes) Class discussion about global warming from warm-up activity
(No need to fill in a K-W-L chart from activity 2 (from original lesson) since we will have a class discussion).

Activity 2 (7 minutes) Provide background (Activity 3 from original lesson)-
*Teacher -- show the first 7 “Before and Now” pictures from http://www.weirdomatic.com/global-warming-then-now.html (see pages 12-18).
*Then, students will receive modified readings (see page 19) to answer the questions from original lesson
  1. What do you notice about the changes in the glaciers over time?
  2. What do you think caused these changes?
-All students will work in groups of three. Each member will take one role of writer, reader, and presenter. We will have a class discussion.

Activity 3a (5 minutes) Have students go to the climate choice website
http://www.climatechoices.org/nc/impacts_ne/temperatures.html
A) Preproduction and Early production students will get a copy of the Rising Temperature chart handout. They will compare the weather trend for the next 90 years. (See page # 20)
B) Speech Emerging students will work with a partner to search and read the website (see copy on page 21).
C) Expanding Fluency and Fluent Bridging students will work individually to find the information on the above website (see copy on page 21).

Activity 3b (10 minutes) (Paraphrase from original lesson) Students will look and print the projections of temperature for this century and the potential impact on our region/state (see pages 22-26) http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ImpactsStateImpacts.html
Students will discuss the following questions

a. What area would our state be most like in both the higher and lower emissions scenario?
b. What industries in our area would be affected by this change?
c. How might day to day life be different for you?

Modifications
A) The teacher will ask preproduction and early production students to print the Global Temperature Changes chart on page 24. Then, the teacher will conduct a Q&A activity to answer the above questions.
B) Speech emerging students will work in pairs to interpret and formulate their hypothesis in regard to the Global Temperature Changes chart on page 24.
D) Expanding Fluency students will work with a partner to record, on a four-column chart, the answers to the above questions. An example will be provided (see page 27).
E) Fluent Bridging students will answer, individually, the questions on a blank four-column chart. An example will be provided (see page 27).

Activity 4 Take action 16 minutes
Students will brainstorm and present ways to conserve energy. They will work in groups. Each group will include one student of each level. Each member will take one of the following roles: presenter, reader, writer, time keeper, and creator of visuals. Students will choose the role which they feel more comfortable with.

Some ideas might include (taken from original lesson):

a. Carpooling group
b. Recycling efforts
c. Campaigning for the use of renewable energy sources
d. Creating a documentary/website about energy conservation

Provide magazines, scissors, construction paper, color pencils, glue, etc.
Narrative for Lesson 1

I modified readings for each level to increase comprehension. For some of them, I cut and pasted; for my fluent students I will let them try to read the original readings. I will also have many of the charts ready for preproduction level students. Through Q&A, I will help students read and understand a weather graph. This lesson is crucial for preproduction level students, since they are going to be learning key vocabulary in a contextualized form. I will be repeating myself in different ways to help them understand the lesson. My speech will be slower than when I am speaking to my fluent bridging students.

My unit is about environmental-global warming. I want to make sure my students share the same background information, even if it is in their L1. Preproduction level students will be able to learn new contextualized vocabulary. Fluent bridging students will be reinforcing and sharing their previous knowledge, while learning new information. The ultimate goal is to help students take action to prevent further damage and to preserve our environment. This lesson will help students learn facts about global warming and ways to conserve energy use. Students will internalize, share and/or educate others to do the same to help the earth.
APPENDIX

Global warming vocabulary and its definitions

| 1. Celsius | 1. Temperature scale ice=0 steam=100 symbol C |
| 2. Ecological disruption | 2. Man-made factors - oil spills |
| 3. Fahrenheit | 3. Temperature scale - ice=32 steam=212 symbol F |
| 4. Glaciers | 4. A mass of ice moving over some land or down a valley |
| 5. Global warming | 5. Average temperature caused by changes in climate from the greenhouse effects |
| 6. Go green | 6. Social movement to protect natural resources |
| 7. Greenhouse effect | 7. Solar radiation to the earth, absorbing gases such as CO2, water vapor, and methane as it reflected out the earth |
| 8. Intense heat wave | 8. Very hot temperature |
| 9. Little Ice Age | 9. Period from 1400 to 1800 |
Global warming vocabulary

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>1. Celsius</td>
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</tr>
<tr>
<td>2. Ecological disruption</td>
<td></td>
</tr>
<tr>
<td>3. Fahrenheit</td>
<td></td>
</tr>
<tr>
<td>4. Glaciers</td>
<td></td>
</tr>
<tr>
<td>5. Global warming</td>
<td></td>
</tr>
<tr>
<td>6. Go green</td>
<td></td>
</tr>
<tr>
<td>7. Greenhouse effect</td>
<td></td>
</tr>
<tr>
<td>8. Intense heat wave</td>
<td></td>
</tr>
<tr>
<td>9. Little Ice Age</td>
<td></td>
</tr>
</tbody>
</table>
Warm-up activity
Preproduction, early production, speech emerging levels

Tan

vocabulary Ward

Native Ward

L1
Lesson 1
Name __________________________ Date ____________________

Warm-up activity
Expanding fluent level

Synonym

Icon

Vocabulary word

Vocabulary word

Nature word

L1
Lesson 1
Name_________________________Date_________________________

Warm-up activity
Fluent bridging level

- Synonym
- Team
- Vocabulary word
- Sentence
- Opposite

---
Source: South Bay Mobilization, Reuters

Moscow, Russia

Then (January 2006)
Now (January 2007)

Source: English Russia

http://www.weirdomatic.com/global-warming-then-now.html
Rong Bu Glacier, Himalayan glaciers

Then (1968)

Now (2007)

Source: Time Blog

Some other place

Then (1928)

Now (2004)

http://www.weirdomatic.com/global-warming-then-now.html
Source: St. Maarten Private Eye

Larsen Ice Shelf, Antarctic Peninsula

Then

Now
Source: Nasa

Update:

Pictures © Gary Braasch

Mount Hood in Oregon, in late summer in 1985 and 2002
Pictures © Gary Braasch

And because I was talking about some funny pictures:
### Modified reading for activity 2

<table>
<thead>
<tr>
<th>A) Preproduction</th>
<th>B) Early production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Causes of global warming</strong></td>
<td><strong>Causes of global warming</strong></td>
</tr>
<tr>
<td><em>Temperature has risen 0.3 to 0.6 °C (Last 100 years).</em></td>
<td><em>Last 100 years—temperature has risen 0.3 to 0.6 °C.</em></td>
</tr>
<tr>
<td><em>We need to change our ways of living to avoid a temperature increase of 1 to 3.5 °C.</em></td>
<td><em>We need to change our way of living to avoid a temperature increase of 1 to 3.5 °C.</em></td>
</tr>
<tr>
<td><em>History—The Little Ice Age (1500-1800) was 0.5 °C cooler then in 1900.</em></td>
<td><em>History—The Little Ice Age (1500-1800) was 0.5 °C cooler then in 1900.</em></td>
</tr>
<tr>
<td><em>Extensive glacial in almost all alpine regions (before) vs. difficulties with agricultural production and the rising of sea level (now).</em></td>
<td><em>Extensive glacial in almost all alpine regions (before) vs. difficulties with agricultural production and the rising of sea level (now).</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C) Speech Emerging</th>
<th>D) Expanding Fluency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air temperature has risen 0.3 to 0.6 °C over the last 100 years.</strong></td>
<td><strong>Air temperature has risen 0.3 to 0.6 °C over the last 100 years.</strong></td>
</tr>
<tr>
<td>If we do not take drastic steps to curb greenhouse gas emissions, global temperature will increase 1 to 3.5 °C in the next century. It might be a small increase, but significant. For example, the Little Ice Age (1500-1800) was about 0.5 °C cooler than it was in 1900, there were extensive glacial in almost all alpine regions. Scientists predict intense heat waves in the next century, and difficulties with agricultural production, and rising sea level.</td>
<td>If we do not take drastic steps to curb greenhouse gas emissions, global temperature will increase 1 to 3.5 °C in the next century. It might be a small increase, but significant. For example, the Little Ice Age (1500-1800) was about 0.5 °C cooler than it was in 1900, there were extensive glacial in almost all alpine regions. Scientists predict intense heat waves in the next century, and difficulties with agricultural production, and rising sea level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E) Fluent Bridging (students will read the entire paragraph from original lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Although there is great debate about what causes global warming, climate experts agree that the global air temperature has risen 0.3 to 0.6 °C over the last 100 years. Factors such as rising sea levels and coral bleaching are indicative of increases in air temperatures. Most specialists predict that if we do not take drastic steps to curb greenhouse gas emissions, global temperature will increase 1 to 3.5 °C in the next century. Although the number may sound small, even a 1 °C increase can cause significant worldwide change. For example, during a period called the Little Ice Age (1500-1800) where the temperature was only about 0.5 °C cooler than it was in 1900, there were extensive glacial advances in almost all alpine regions. Most scientists argue that global warming in the next century will cause more frequent and intense heat waves, significant ecological disruptions, difficulties with agricultural production in the tropics and subtropics, and rising sea level. All of these will impact life on earth. Look back at the pictures of the glaciers again.</strong></td>
</tr>
</tbody>
</table>
Activity 3a

CHANGES IN AVERAGE ANNUAL TEMPERATURE

2010-2039

13°F
12
11
10
9
8
7
6
5
4
3
2
1
0

Higher Emissions Scenario

Lower Emissions Scenario

2040-2069

13°F
12
11
10
9
8
7
6
5
4
3
2
1
0

Higher Emissions Scenario

Lower Emissions Scenario

2070-2099

13°F
12
11
10
9
8
7
6
5
4
3
2
1
0

Higher Emissions Scenario

Lower Emissions Scenario
Activity 3a

Climate Choices in the Northeast: Rising Temperatures

California, Northeast

Climate Choices

IMPACTS
Rising Temperatures
Health & Safety
Change in Rainfall
Erosion of Coastal Habitats

SOLUTIONS
Adapting to rising temperatures
Incorporating Greenhouse Gas
Reduction

ACTION
Take Action
Visit for more
My Climate Choices

RESOURCES
Northeast Report
News & Updates
Links

IMPACTS Rising Temperatures

The Northeast is already experiencing rising temperatures consistent with global warming, and dramatic warming is expected later this century. Just how high temperatures rise depends on our heat-trapping emissions.

The thermometers below show projected increases in regional average annual temperatures for three time periods: early, mid-, and late twenty-first century. Temperature ranges for each emission scenario represent results from three different climate models.

Changes in Average Annual Temperature

2010-2039

2040-2069

2070-2099

Global Warming 101 Scenarios and Models About This Site

Union of Concerned Scientists
Climate Change and Environmental Issues

convio

http://www.climatechoices.org/ne/impacts_ne/temperatures.html

7/7/2009
Global Warming - Impacts

Please see EPA's Climate Change site for current information on climate change and global warming. EPA no longer updates EPA's Global Warming Site, but is maintaining this archive for historical purposes. Thank you for visiting the archive of EPA's Global Warming Site.

State Impacts

Here are links to the State Climate Change Impacts information sheets in pdf format (~70k to 100k each); these files can be viewed, downloaded, and reproduced using the Acrobat Reader, available at no charge from Adobe Systems.

Associated Pages

Data Sources

Alabama Hawaii Massachusetts New Mexico South Dakota Oregon
Arkansas Idaho Michigan North Dakota Utah Oregon
Arkansas Indiana Mississippi Ohio Vermont
Arkansas Indiana Mississippi Ohio Vermont
Arkansas Indiana Mississippi Utah Ohio Vermont
Arkansas Indiana Mississippi Utah Ohio Vermont
Arkansas Indiana Mississippi Utah Oregon Washington
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Data Sources for State Climate Change Impacts are available. Selected Chapters from the IPCC publication, The Regional Impacts of Climate Change - An Assessment of Vulnerability (1998), including the North America Chapter, are available on the EPA Global Warming Site.
The earth’s climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases — primarily carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. The heat-trapping property of these greenhouse gases is undisputed. Although there is uncertainty about exactly how and when the earth’s climate will respond to enhanced concentrations of greenhouse gases, observations indicate that detectable changes are under way. There most likely will be increases in temperature and changes in precipitation, soil moisture, and sea level, which could have adverse effects on many ecological systems, as well as on human health and the economy.

The Climate System

Energy from the sun drives the earth’s weather and climate. Atmospheric greenhouse gases (water vapor, carbon dioxide, and other gases) trap some of the energy from the sun, creating a natural “greenhouse effect.” Without this effect, temperatures would be much lower than they are now, and life as known today would not be possible. Instead, thanks to greenhouse gases, the earth’s average temperature is a more hospitable 60°F. However, problems arise when the greenhouse effect is enhanced by human-generated emissions of greenhouse gases.

Global warming would do more than add a few degrees to today’s average temperatures. Cold spells would occur in winter, but heat waves would be more common. Some places would be drier, others wetter. Perhaps more important, more precipitation may come in short, intense bursts (e.g., more than 2 inches of rain in a day), which could lead to more flooding. Sea levels would be higher than they would have been without global warming, although the actual changes may vary from place to place because coastal lands are themselves sinking or rising.

The Greenhouse Effect

Source: U.S. Department of State (1992)

Emissions Of Greenhouse Gases

Since the beginning of the industrial revolution, human activities have been adding measurably to natural background levels of greenhouse gases. The burning of fossil fuels — coal, oil, and natural gas — for energy is the primary source of emissions. Energy burned to run cars and trucks, heat homes and businesses, and power factories is responsible for about 80% of global carbon dioxide emissions, about 25% of U.S. methane emissions, and about 20% of global nitrous oxide emissions. Increased agriculture and deforestation, landfills, and industrial production and mining also contribute a significant share of emissions. In 1994, the United States emitted about one-fifth of total global greenhouse gases.

Concentrations Of Greenhouse Gases

Since the pre-industrial era, atmospheric concentrations of carbon dioxide have increased nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15%. These increases have enhanced the heat-trapping capability of the earth’s atmosphere. Sulfate aerosols, a common air pollutant, cool the atmosphere by reflecting incoming solar radiation. However, sulfates are short-lived and vary regionally, so they do not offset greenhouse gas warming.

Although many greenhouse gases already are present in the atmosphere, oceans, and vegetation, their concentrations in the future will depend in part on present and future emissions. Estimating future emissions is difficult, because they will depend on demographic, economic, technological, policy, and institutional developments. Several emission scenarios have been developed based on differing projections of these underlying factors. For example, by 2100, in the absence of emissions control policies, carbon dioxide concentrations are projected to be 30-150% higher than today’s levels.

Current Climatic Changes

Global mean surface temperatures have increased 0.6-1.2°F since the late 19th century. The 9 warmest years in this century all have occurred in the last 14 years. Of these, 1995 was the warmest year on record, suggesting the atmosphere has rebounded from the temporary cooling caused by the eruption of Mt. Pinatubo in the Philippines.

Several pieces of additional evidence consistent with warming, such as a decrease in Northern Hemisphere snow cover, a decrease in Arctic Sea ice, and continued melting of alpine glaciers, have been corroborated. Globally, sea levels have risen
4-10 inches over the past century, and precipitation over land has increased slightly. The frequency of extreme rainfall events also has increased throughout much of the United States.

A new international scientific assessment by the Intergovernmental Panel on Climate Change recently concluded that “the balance of evidence suggests a discernible human influence on global climate.”

Future Climatic Changes

For a given concentration of greenhouse gases, the resulting increase in the atmosphere’s heat-trapping ability can be predicted with precision, but the resulting impact on climate is more uncertain. The climate system is complex and dynamic, with constant interaction between the atmosphere, land, ice, and oceans. Further, humans have never experienced such a rapid rise in greenhouse gases. In effect, a large and uncontrolled planet-wide experiment is being conducted.

General circulation models are complex computer simulations that describe the circulation of air and ocean currents and how energy is transported within the climate system. While uncertainties remain, these models are a powerful tool for studying climate. As a result of continuous model improvements over the last few decades, scientists are reasonably confident about the link between global greenhouse gas concentrations and temperature and about the ability of models to characterize future climate at continental scales.

Recent model calculations suggest that the global surface temperature could increase an average of 1.6-6.3°F by 2100, with significant regional variation. These temperature changes would be far greater than recent natural fluctuations, and they would occur significantly faster than any known changes in the last 10,000 years. The United States is projected to warm more than the global average, especially as fewer sulfate aerosols are produced.

The models suggest that the rate of evaporation will increase as the climate warms, which will increase average global precipitation. They also suggest increased frequency of intense rainfall as well as a marked decrease in soil moisture over some mid-continental regions during the summer. Sea level is projected to increase by 6-38 inches by 2100.

Calculations of regional climate change are much less reliable than global ones, and it is unclear whether regional climate will become more variable. The frequency and intensity of some extreme weather of critical importance to ecological systems (droughts, floods, frosts, cloudiness, the frequency of hot or cold spells, and the intensity of associated fire and pest outbreaks) could increase.

Local Climate Changes

Over the last century, average temperatures in Storrs, Connecticut, have increased from 45.8°F (1892-1921 average) to 48.2°F (1966-1995 average), and precipitation in some locations has increased by 20%.

Over the next century, Connecticut’s climate may change even more. Based on projections given by the Intergovernmental Panel on Climate Change and results from the United Kingdom Hadley Centre’s climate model (HadCM2), a model that accounts for both greenhouse gases and aerosols, by 2100 temperatures in Connecticut could increase about 4°F (with a range of 2-8°F) in all seasons. Precipitation is projected to increase by 10-20% (with a range of 0-40%), with slightly less change in spring and summer and slightly more in winter.

The amount of precipitation on extreme wet (or snowy) days most likely would increase, but changes in the lengths of wet or dry spells are not clear. The frequency of extreme hot days in summer is expected to increase along with the general warming trend. It is not clear how severe storms such as hurricanes would change, although an increase in the frequency and/or intensity of winter storms is possible.

Precipitation Trends From 1900 To Present

Source: Karl et al. (1996)
Climate Change Impacts

Global climate change poses risks to human health and to terrestrial and aquatic ecosystems. Important economic resources such as agriculture, forestry, fisheries, and water resources also may be affected. Warmer temperatures, more severe droughts and floods, and sea level rise could have a wide range of impacts. All these stresses can add to existing stresses on resources caused by other influences such as population growth, land-use changes, and pollution.

Similar temperature changes have occurred in the past, but the previous changes took place over centuries or millennia instead of decades. The ability of some plants and animals to migrate and adapt appears to be much slower than the predicted rate of climate change.

Human Health

Higher temperatures and increased frequency of heat waves may increase the number of heat-related deaths and the incidence of heat-related illnesses. Connecticut, with its irregular, intense heat waves, may be especially susceptible.

In Hartford, one study projects that a 2°F warming could increase heat-related deaths during a typical summer by about 20%, from close to 40 heat-related deaths per summer to near 50 (although increased air conditioning use may not have been fully accounted for). Winter-related deaths are expected to change very little if the temperature warms by 2°F. The elderly, particularly those living alone, are at greatest risk.

There is concern that climate change could increase concentrations of ground-level ozone. For example, high temperatures, strong sunlight, and stable air masses tend to increase urban ozone levels. Air pollution also is made worse by increases in natural hydrocarbons emissions during hot weather. If a warmed climate causes increased use of air conditioners, air pollutant emissions from power plants also will increase.

A 4°F warming in New York City, with no other change in weather or emissions, could increase concentrations of ozone, a major component of smog, by 4%. Similar increases could be expected in Connecticut. Currently, ground-level ozone concentrations exceed national ozone health standards throughout the state. All of Connecticut is classified as a “serious” nonattainment area for ozone. Ground-level ozone has been shown to aggravate respiratory illnesses such as asthma, reduce existing lung function, and induce respiratory inflammation. In addition, ambient ozone reduces crop yields and impairs ecosystem health.

Warming and other climate changes could expand the habitat and infectivity of disease-carrying insects, thus increasing the potential for transmission of diseases such as malaria and dengue (“break bone”) fever. Mosquitoes flourish in some areas around Connecticut. Some can carry malaria, while others can carry Eastern equine encephalitis, which can be lethal or cause neuro-

Logical damage. Lyme disease, which is carried by ticks, has increased in Connecticut. If conditions become warmer and wetter and thus support larger populations of mosquitoes and ticks, these diseases may be transmitted more widely.

In addition, warmer seas could contribute to the increased intensity, duration, and extent of harmful algal blooms. These blooms damage habitat and shellfish nurseries, can be toxic to humans, and can carry bacteria like those causing cholera. Brown algal tides and toxic algal blooms already are prevalent in the Atlantic. Warmer ocean waters could increase their occurrence and persistence.

Coastal Areas

Sea level rise could lead to flooding of low-lying property, loss of coastal wetlands, erosion of beaches, saltwater contamination of drinking water, and decreased longevity of low-lying roads, causeways, and bridges. In addition, sea level rise could increase the vulnerability of coastal areas to storms and associated flooding.

Along much of Connecticut’s coast, sea level already is rising 8 inches per century, and it is likely to rise another 22 inches by 2100. Connecticut’s coastline contains valuable residential development and important wetlands ecosystems that would be vulnerable to flooding from sea level rise. In particular, Connecticut has extensive tidal flats and diverse nontidal freshwater marshes. Because Long Island Sound may reduce wave action, some of these wetlands may be protected with a temporary buffer from erosion. Connecticut’s freshwater marshes, however, are likely to be harmed by saltwater intrusion.

Cumulative costs through 2100 to protect Connecticut’s coastline from a 20-inch sea level rise could be $0.5-$3 billion.
Water Resources

Water resources are affected by changes in precipitation as well as by temperature, humidity, wind, and sunshine. Changes in streamflow tend to magnify changes in precipitation. Water resources in drier climates tend to be more sensitive to climate changes. Because evaporation is likely to increase with warmer climates, it could result in lower river flow and lower lake levels, particularly in the summer. In addition, more intense precipitation could increase flooding. If streamflow and lake levels drop, groundwater also could be reduced.

The Connecticut River is susceptible to changes in winter snow accumulation, which would be reduced in a warmer climate. Peak spring streamflows in the Connecticut River could occur several weeks earlier if the climate were to warm about 4°F. The Housatonic and Thames rivers could see similar but smaller changes. Without increased precipitation, groundwater would decrease in a warmer climate, which would reduce Connecticut’s aquifers.

Agriculture

The mix of crop and livestock production in a state is influenced by climatic conditions and water availability. As climate warms, production patterns will shift northward. Increases in climate variability could make adaptation by farmers more difficult. Warmer climates and less soil moisture due to increased evaporation may increase the need for irrigation. However, these same conditions could decrease water supplies, which also may be needed by natural ecosystems, urban populations, and other economic sectors.

Understandably, most studies have not fully accounted for changes in climate variability, water availability, and imperfect responses by farmers to changing climate. Including these factors could substantially change modeling results. Analyses based on changes in average climate and which assume farmers effectively adapt suggest that aggregate U.S. food production will not be harmed, although there may be significant regional changes.

In Connecticut, agriculture is a $500 million annual industry. About one-twentieth of 1% of total U.S. farm acres is in the state. The principal crops are silage and hay, and very little of the agricultural land is irrigated. Projections of changes in Connecticut yields are mixed; they could range from little change to decreases of almost 40%. Total acres farmed would remain about the same, but farm income could decrease by about 50%.

Forests

Trees and forests are adapted to specific climate conditions, and as climate warms, forests will change. These changes could include changes in species, geographic extent, and health and productivity. If conditions also become drier, the current range and density of forests could be reduced and replaced by grasslands and pasture. Even a warmer and wetter climate would lead to changes: trees that are better adapted to these conditions, such as oaks and redwoods, would thrive. Under these conditions, forests could become more dense. These changes could occur during the lifetimes of today’s children, particularly if they are accelerated by other stresses such as fire, pests, and diseases. Some of these stresses would themselves be worsened by a warmer and drier climate.

With changes in climate, the extent of forested areas in Connecticut could change little. However, a warmer climate could change the character of Connecticut’s forests. Maple-dominated hardwood forests could give way to forests dominated by oaks and conifers, species more tolerant of higher temperatures. This change would diminish the brilliant autumn foliage as the contribution of maples declines. Across the state, as much as 30-60% of the hardwood forests could be replaced by warmer climate forests with a mix of pines and hardwoods.

For further information about the potential impacts of climate change, contact the Climate and Policy Assessment Division (2174), U.S. EPA, 401 M Street SW, Washington, DC 20460.
Four-Column Chart

Write headings for each column. Add details to each column.

<table>
<thead>
<tr>
<th>Topic</th>
<th>1801 - 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global temperature Changes, CI</strong></td>
<td></td>
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<tr>
<td><strong>Year</strong></td>
<td><strong>°F</strong></td>
</tr>
<tr>
<td>1801</td>
<td>-0.8</td>
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<tr>
<td>1871</td>
<td>-0.6</td>
</tr>
</tbody>
</table>
Lesson 2
Amalia Delgado
7th & 8th grade-Environment (global warming)

Lesson 2 Objectives

**Content Objective:**
1. Students will be able to present ideas and facts about global warming using visuals and their cultural background (prior knowledge).

**Language Objectives:**
1. Discuss global warming and ways to educate others.

<table>
<thead>
<tr>
<th>Domain/topic</th>
<th>Fluent Bridging Level 5</th>
<th>Expanding Fluency Level 4</th>
<th>Speech Emerging Level 3</th>
<th>Early Production Level 2</th>
<th>Preproduction Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking/Writing</td>
<td>Students will present and explain, using scientific terms, their understanding about global warming through an experiment and visuals. At the same time, they will suggest ways to educate others about the topic.</td>
<td>Students will contribute to the presentation and explanation of global warming, and suggest ways to educate others.</td>
<td>Students will internalize and contribute their understanding of the topic through an experiment, visuals, and sharing/exposure to other students’ experiences.</td>
<td>Students will have the opportunity to make connections with their classmates using new vocabulary from the lesson. Students will get a chance to share their cultural background by using drawings or one/two words or sentences.</td>
<td>Students will contribute their understanding of global warming using key word or descriptors from previous activities. They will also be able to share their cultural backgrounds and their suggestions of ways to educate others.</td>
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</tbody>
</table>
## Functional and Notional Chart
### Lesson 2

<table>
<thead>
<tr>
<th>Function</th>
<th>Situation</th>
<th>Expression</th>
<th>Words</th>
<th>Grammar</th>
</tr>
</thead>
</table>
| List & discuss      | Reusable/recyclable items  
- how to save energy                                                       | What items are ____?            | - Recyclable items                           | - articles            |
|                     |                                                                          | How can I (we) help ______?     | - go green                                 | - nouns               |
|                     |                                                                          |                                 | - energy conservation                      | - verbs: present tense |
|                     |                                                                          |                                 | - environment                              | - verbs: future tense  |
|                     |                                                                          | I can learn more or educate other through____. | - EPA                                    | - wh-questions        |
| Predict and Explain | Similarities and differences between the greenhouse and experiment/hands-on activities. | I think cup A or B with OR without the cover is warmer because____________. | - The greenhouse effects is a blanket on our earth (metaphor) | - compliment phrases  |
Modifications to Lesson 2
(Students will place their cups outside the classroom at the beginning of the school day)

Activity 1 (10 minutes) Instructions for hands-on activity
All students will work with a partner and will receive the handout below to record their predictions, with modification for each level respectively (see pages 33-37).
   A) Preproduction level students will circle their predictions
   B) Early production level students will circle and explain in one or two sentences their predictions
   C) Speech emerging students will circle their predictions and explain in a short paragraph how they relate to global warming.
   D) Expanding fluency students will answer the questions from the original lesson.
   E) Fluent bridging students will answer the questions from the original lesson, using academic language.

<table>
<thead>
<tr>
<th>Cup A</th>
<th>Cup B (cover with plastic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*fill cups with tap water</td>
<td></td>
</tr>
<tr>
<td>*cover one cup with plastic</td>
<td></td>
</tr>
</tbody>
</table>

2 hours in the sun

Your predictions

Questions from original lesson:
1. Which cup will be warmer? Why?
2. How do you think the experiment relates to global warming?

Activity 2 (10 minutes) Back ground information

*Preproduction, early production level, speech emerging, and expanding fluency students will read modified readings about the scientific concepts behind global warming (see page 38).
*Fluent bridging students will read two paragraphs from the original lesson plan, with a partner (see page 38).

Activity 3a (10 minutes)
Students will work in groups to create a poster that explains their understanding about global warming. A good opportunity to talk about recycling at home and in school (items that can be reused).
   a) Groups will include one student from each level (preproduction level, early production level, speech emerging, expanding fluency, and fluent bridging).
   b) Each member will be assigned a role such as: presenter, reader, writer, organizer of visuals, and time keeper.
Material: construction paper, scissors, color pencils, tape, and magazines

Activity 3b (10 minutes) Students presentations
Each member is responsible for describing and/or explaining one item from their poster. Preproduction level students will use key words or one sentence statement. Expanding fluent and fluent bridging students will expand on or briefly summarize their understanding about global warming.

**Activity 4** (10 minutes)
Take action. Educate others about the importance of energy conservation.
1. Each group should include one student from each level. Students will complete a semantic map of the greenhouse effect-the blanket metaphor from activity 2. (see page 40).
2. Teacher will draw and complete the semantic map using the blanket metaphor on the board with students' answers.
Hints:
**ask students the following questions (taken from original lesson) to formulate ways, titles, or kind of language you can use to persuade others to take action about global warming. What other metaphors can we use?**
**Ask students to think of ways they can help their home countries improve the environment.**
Narrative for Lesson 2

Lesson 2 provides more opportunities to share previous knowledge and provides hands-on activities. It also incorporates a reading activity to enhance students' understandings of the topic, which will help them make a connection with lesson one. Exposure to different cultural backgrounds will promote respect and social interaction, while learning a new language through contextualized material. Students will be able to suggest ways to educate people to take action when they feel comfortable sharing their cultural backgrounds; without offending other cultural traditions.
Lesson 2  
Activity 2  Experiment handout  

Name________________________  Date______________

Preproduction Level

<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>cup A</td>
<td>Cup b (plastic)</td>
<td>Circle your answer</td>
</tr>
<tr>
<td>1. fill cups with tap water</td>
<td>2. cover one cup with plastic</td>
<td>?</td>
</tr>
</tbody>
</table>
| 2 hours in the sun | | Cup A= cooler or warm  
Cup B= cooler or warm |
<table>
<thead>
<tr>
<th>Early Production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cup A</strong></td>
</tr>
<tr>
<td><strong>Cup b (plastic)</strong></td>
</tr>
<tr>
<td>1. fill cups with tap water</td>
</tr>
<tr>
<td>2. cover one cup with plastic</td>
</tr>
<tr>
<td>2 hours in the sun</td>
</tr>
<tr>
<td>1. Circle your answer</td>
</tr>
<tr>
<td>?</td>
</tr>
<tr>
<td>Cup A = cooler or warm</td>
</tr>
<tr>
<td>Cup B = cooler or warm</td>
</tr>
<tr>
<td>2. Explain in one or two sentences</td>
</tr>
</tbody>
</table>
**Lesson 2**  
**Activity 2 Experiment handout**

Name_____________________________ Date________________

Speech emerging

<table>
<thead>
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<th>cup A</th>
<th>cup b (cover with plastic)</th>
<th>2 hours in the sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. fill cups with tap water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. cover one cup with plastic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Explain your answer in a short paragraph how it relates to global warming.
Lesson 2
Activity 2 Experiment handout

Name ___________________________ Date ___________________________

Expanding Fluency

<table>
<thead>
<tr>
<th>cup A</th>
<th>cup b (cover with plastic)</th>
</tr>
</thead>
</table>

1. Fill cups with tap water
2. Cover one cup with plastic

2 hours in the sun

Write your predictions

1. Which cup will be warmer? Why?

2. How do you think this experiment relates to global warming? Explain
Lesson 2  
Activity 2 Experiment handout

Name________________________________ Date____________________

Fluent Bridging

<table>
<thead>
<tr>
<th>cup A</th>
<th>cup b (cover with plastic)</th>
<th>2 hours in the sun</th>
</tr>
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<tbody>
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<td>1. Fill cups with tap water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Cover one cup with plastic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Write your predictions

1. Which cup will be warmer? Why?

2. How do you think this experiment relates to global warming? Explain
Preproduction Level
Teacher will help students, through Q&A, understand
The greenhouse effect diagram on next page from
http://yosemite.epa.gov/OAR/globalwarming.nsf/Unique
KeyLookup/SHSU5BPQB7/SFile/ct_impact.pdf, used in
lesson 1.
(From original reading): The constant need for energy
causes a reliance on fossil fuels, which, in turn, means
more and more CO2 being released into the atmosphere.
Metaphor - Students to think of The greenhouse as a
blanket around the earth.

Early production Level
Students will work in pairs to interpret and understand
The greenhouse effect diagram on next page from
http://yosemite.epa.gov/OAR/globalwarming.nsf/Unique
KeyLookup/SHSU5BPQB7/SFile/ct_impact.pdf, used in
lesson 1.
(From original reading): The constant need for energy
causes a reliance on fossil fuels, which, in turn, means
more and more CO2 being released into the atmosphere.
Metaphor - Students to think of The greenhouse as a
blanket around the earth.

Speech emerging students will read and
understand, individually, The
greenhouse effect diagram on next page from
http://yosemite.epa.gov/OAR/globalwarming.nsf/Unique
KeyLookup/SHSU5BPQB7/SFile/ct_impact.pdf, used in lesson
1.
(From original reading): The constant
need for energy causes a reliance on
fossil fuels, which, in turn, means more
and more CO2 being released into the atmosphere.
Metaphor - Students to think of The
greenhouse as a blanket around the earth.

Expanding Fluency (to work in pairs)
Solar radiation passes through atmosphere. Some solar radiation is
reflected by the earth and the atmosphere. Some of the infrared radiation
passes through the atmosphere, and some is absorbed and re-emitted in all
directions by greenhouse gas molecules. Some of the greenhouse gases
include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O),
and water vapor. The effect of this is to warm the earth's surface and the
lower atmosphere. Think of the greenhouse as a blanket covering the
earth, trapping most of the energy and gases, which increases the earth's
temperature causing global warming. The energy and/or gases needs to
have a balance, but human beings are contributing to releasing of carbon
dioxide as we destroy or burn forest transforming organic carbon into gas.
(From original reading): The constant need for energy causes a reliance on
fossil fuels, which, in turn, means more and more CO2 being released into
the atmosphere. Metaphor - Students to think of The greenhouse as a
blanket around the earth.

Fluent Bridging
Sunlight sends energy into the climate, most of which is absorbed by oceans and land. Heat is then radiated outward as
infrared energy. Some of this heat is absorbed by what are called greenhouse gases, which exist naturally in the atmosphere.
Greenhouse gases include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Water vapor is also an important
greenhouse gas, but human activity does not change it directly. When energy is absorbed, greenhouse gases transmit energy in all
directions. Some of the infrared energy is emitted towards space while some is reabsorbed, further warming the earth. The
greenhouse gases are often compared to a blanket around the earth which keeps the earth warm. Increased concentrations of
CO2 and other greenhouse gases cause more infrared energy, in essence creating a thick blanket around the earth that keeps
heat inside. This, in turn, causes increases in the temperature of the atmosphere and Earth's surface.

Normally, the Earth maintains a balance in the amount of carbon dioxide in the atmosphere. Ocean uptake (dissolving of
CO2 gas into the oceans) and sedimentation (burial of plant and animal matter, which over time becomes limestone, coal, gas,
and oil) are two processes whereby CO2 is absorbed from the atmosphere. This naturally occurring system readjusts to return
the balance to normal states. However, the system is slow-moving and cannot keep up with the pace at which humans are
burning fossil fuel, and thereby releasing carbon dioxide into the atmosphere. Furthermore, the clearing and burning of forests
transform organic carbon into gas, which contributes to an increase in carbon dioxide in the atmosphere. The constant need for
energy causes a reliance on fossil fuels, which, in turn, means more and more CO2 being released into the atmosphere.
The earth’s climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases — primarily carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. The heat-trapping property of these greenhouse gases is undisputed. Although there is uncertainty about exactly how and when the earth’s climate will respond to enhanced concentrations of greenhouse gases, observations indicate that detectable changes are under way. There most likely will be increases in temperature and changes in precipitation, soil moisture, and sea level, which could have adverse effects on many ecological systems, as well as on human health and the economy.

The Climate System

Energy from the sun drives the earth’s weather and climate. Atmospheric greenhouse gases (water vapor, carbon dioxide, and other gases) trap some of the energy from the sun, creating a natural “greenhouse effect.” Without this effect, temperatures would be much lower than they are now, and life as known today would not be possible. Instead, thanks to greenhouse gases, the earth’s average temperature is a more hospitable 60°F. However, problems arise when the greenhouse effect is enhanced by human-generated emissions of greenhouse gases.

Global warming would do more than add a few degrees to today’s average temperatures. Cold spells still would occur in winter, but heat waves would be more common. Some places would be drier, others wetter. Perhaps more important, more precipitation may come in short, intense bursts (e.g., more than 2 inches of rain in a day), which could lead to more flooding. Sea levels would be higher than they would have been without global warming, although the actual changes may vary from place to place because coastal lands are themselves sinking or rising.

Emissions Of Greenhouse Gases

Since the beginning of the industrial revolution, human activities have been adding measurably to natural background levels of greenhouse gases. The burning of fossil fuels — coal, oil, and natural gas — for energy is the primary source of emissions. Energy burned to run cars and trucks, heat homes and businesses, and power factories is responsible for about 80% of global carbon dioxide emissions, about 25% of U.S. methane emissions, and about 20% of global nitrous oxide emissions. Increased agriculture and deforestation, landfills, and industrial production and mining also contribute a significant share of emissions. In 1994, the United States emitted about one-fifth of total global greenhouse gases.

Concentrations Of Greenhouse Gases

Since the pre-industrial era, atmospheric concentrations of carbon dioxide have increased nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15%. These increases have enhanced the heat-trapping capability of the earth’s atmosphere. Sulfate aerosols, a common air pollutant, cool the atmosphere by reflecting incoming solar radiation. However, sulfates are short-lived and vary regionally, so they do not offset greenhouse gas warming.

Although many greenhouse gases already are present in the atmosphere, oceans, and vegetation, their concentrations in the future will depend in part on present and future emissions. Estimating future emissions is difficult, because they will depend on demographic, economic, technological, policy, and institutional developments. Several emissions scenarios have been developed based on differing projections of these underlying factors. For example, by 2100, in the absence of emissions control policies, carbon dioxide concentrations are projected to be 30-150% higher than today’s levels.

Current Climatic Changes

Global mean surface temperatures have increased 0.6-1.2°F since the late 19th century. The 9 warmest years in this century all have occurred in the last 14 years. Of these, 1995 was the warmest year on record, suggesting the atmosphere has rebounded from the temporary cooling caused by the eruption of Mt. Pinatubo in the Philippines.

Several pieces of additional evidence consistent with warming, such as a decrease in Northern Hemisphere snow cover, a decrease in Arctic ice, and continued melting of alpine glaciers, have been corroborated. Globally, sea levels have risen
Semantic Map
Activity 4

- Language
- The greenhouse effects
- Take action
- Other metaphors
- Notes
Lesson 3
Amalia Delgado  
7th & 8th grade-Environment (global warming)

Lesson 3 Objectives

Content Objective:
1. Students will be able to internalize and apply new knowledge into their own lives and will brainstorm techniques to persuade others to go green.

Language Objectives:
1. Read and discuss effects and consequences of global warming  
2. Write techniques to persuade others to “take action.”

<table>
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<tr>
<th>Domain/topic</th>
<th>Fluent Bridging Level 5</th>
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<th>Speech Emerging Level 3</th>
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<tr>
<td>Effects and consequences of Global Warming</td>
<td>Students will read and explain, using scientific terms, their understanding of the danger of global warming to the earth and human kind.</td>
<td>Students will read and explain in short paragraph effects and consequences of global warming with the assistance of fluent bridging students (peer tutoring).</td>
<td>Students will work with early production students to understand effects and consequences of global warming interpreting pictures and titles from websites in one or two sentences (peer tutoring).</td>
<td>Students will describe and discuss pictures and titles with speech emerging students.</td>
<td>Students will take a picture walk through websites. They will interpret and answer, with one or two words or short phrases, teacher’s Q&amp;A.</td>
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<td>Writing</td>
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</tr>
<tr>
<td>Techniques to persuade others to take action</td>
<td>Students will summarize techniques to persuade others (including elaboration of classmates’ comments and websites/clip).</td>
<td>Students will write/elaborate on other students techniques to persuade others go green.</td>
<td>Students will write a few sentences on how to persuade others go green.</td>
<td>Students will create visuals and will write a one or two phases on how to persuade others go green.</td>
<td>Students will contribute one or two words and visuals on how to persuade others go green.</td>
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### Functional and Notional Chart
#### Lesson 3

<table>
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<th>Situation</th>
<th>Expression</th>
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| **Sequence** | -effects and consequences of global warming | What was the sea level before ____?  
What is the current ____?  
Describe the _________ if we don’t take actions?  
How can I (we) help/persuade other to ____? | -ice melting  
-hotter temperature  
-wild weather  
-rising sea level  
-scenario  
-go green  
-to recycle | -articles  
-nouns  
-verbs: past tense  
-verbs: present tense  
-verbs: future tense  
-wh-questions |
| **Describe** | Techniques to persuade others go green to stop global warming effects and earth consequences. | First, I will show people what was the sea level 20,000 years ago by _______.  
Second, I will use a metaphor about ____  
Third, I will speak about_______ | -creating visuals  
-showing pictures  
-greenhouse effect  
-ice melting  
-hotter temperature  
-wild weather  
-rising sea levels (17-foot rise and 170-foot rise)  
-recycling | -Use of transitions  
-nouns  
-verbs: past tense  
-verbs: present tense  
-verbs: future tense |
Modifications for lesson 3

Activity 1a (16 minutes)
Show clip of Al Gore’s “An Inconvenient Truth.” It is available in Chinese, French, Hebrew, Indonesian, Portuguese (Brazil), Romanian, Russian, and Turkish. Have students watch the video in their native language if available. If not, see handout for preproduction, early production, and speech emerging students to take notes (see page 46).

1. How does Al Gore start his presentation?
2. What are the audience’s emotions?
3. What key vocabulary is highlighted on the projector?
4. How does he persuade or motivate people?
5. What did he share about how to persuade or motivate others “go green”?

Activity 2 (3 minutes students working in groups)
(5 minutes class discussion)
Students will answer the following questions posted on the board:

1. What was Al Gore’s purpose for his presentation?
2. What were Al Gore’s techniques?
3. How would you persuade others?

Teacher will work with preproduction and early production level students through Q&A to make sure they understand key points from the video, i.e. people laughing, key vocabulary that we covered, and global warming.

Activity 3 (10 minutes)
1. All students will analyze and interpret the following websites:
   http://www.time.com/time/2001/globalwarming/a.html (see pages 47-51)
   http://www.pbs.org/wgbh/nova/warnings/waterworld/
   (for fluent bridging and expanding fluency students see pages 52-54)
   (For speech emerging and early production students see pages 55-56)
   (For preproduction level students see pages 57-68).
2. Students will answer the questions: What are the effects and consequences of global warming?

   - Teacher will pair fluent Bridging and expanding fluency students (peer tutoring)
   - Teacher will pair speech emerging and early production Level Students will need to read and interpret the headings/titles and pictures from both websites. Teacher will spend the last 3 minutes with these groups to check for understanding.
   - Teacher will work with preproduction Level students to interpret titles and pictures.

Activity 4 (10 minutes) class discussion, interpretation, and understanding of both websites and video clip. All students will participate: preproduction level students with
one or two words or short phrases; progressing to one or two sentences and fluent
bridging students will give a more detail explanation or summary of their understanding.

**Activity 5 (6 minutes)**

Provide handouts of the following questions, so students can “think, pair, and share” in
groups (a member for each level), how to speak and/or write persuasively.
1. How does Al Gore try to convince the viewer about the dangers of global
   warming?
2. Cite examples of how he engages the emotions of the viewer?
3. What images make the most impact? Why?

Preproduction Level-can use visuals or one/two words.
Early production Level-can provide visuals and one or two phrases.
Speech Emerging-can provide a couple of sentences.
Expanding Fluency-can elaborate on other students’ comments.
Fluent Bridging-can expand on and summarize other students’ comments referencing the
websites or the clip.
Narrative

This lesson provides facts about global warming. Students’ interactions and discussions will create engaging activities; instead of hearing the teacher repeat the same information in different manners. It will also create the awareness and desire to share the new information with others to preserve the earth. Furthermore, preproduction level students will learn a little bit of politics in the United States. We will start the discussion about Al Gore’s video clip by asking the following questions: Who was he? What is he doing now? What was his message? Etc.
Lesson 3
Activity 1

1. How does Al Gore start his presentation?

2. What are the audience's emotions?

3. What key vocabulary is highlighted on the projector?

4. How does he persuade or motivate people?

5. What did he share about how to persuade or motivate others "go green"?
EXHIBIT A: Thinning Ice

Antarctica, home to these Adélie penguins, is heating up. The annual melt season has increased up to three weeks in 20 years.

Mount Kilimanjaro has lost 75% of its ice cap since 1912. The ice on Africa's tallest peak could vanish entirely within 15 years.

Lake Baikal in eastern Siberia now freezes for the winter 11 days later than it did a century ago.

Montana will lose all the glaciers in Glacier National Park by 2070 if their retreat continues at the current rate.

Venezuelan mountaintops had six glaciers in 1972. Today only two remain.
EXHIBIT B: Hotter Times

Temperatures sizzled from Kansas to New England last May, surprising residents like this Delaware boy with an unusually early heat wave.

Crops withered and Dallas temperatures topped 100 degrees F for 29 days straight in a Texas hot spell that struck during the summer of 1996.

India's worst heat shock in 50 years killed more than 2,500 people in May 1998.

Cherry blossoms in Washington bloom seven days earlier in the spring than they did in 1970.

NEXT >>
EXHIBIT C: Wild Weather

Heavy rains in England and Wales made last fall Britain’s wettest three-month period on record.

Fires due to dry conditions and record-breaking heat consumed 20% of Samos Island, Greece, last July.

Floods along the Ohio River in March 1997 caused 30 deaths and at least $500 million in property damage.

Hurricane Floyd brought flooding rains and 130-m.p.h. winds through the Atlantic seaboard in September 1999, killing 77 people and leaving thousands homeless.
EXHIBIT D: Nature's Pain

Pacific salmon populations fell sharply in 1997 and 1998, when local ocean temperatures rose 6 degrees F.

Polar bears in Hudson Bay are having fewer cubs, possibly as a result of earlier spring ice breakup.

Coral reefs suffer from the loss of algae that color and nourish them. The process, called bleaching, is caused by warmer oceans.

Diseases like dengue fever are expanding their reach northward in the U.S. butterflies are relocating to higher latitudes. The Edith's Checkerspot butterfly of western North America has moved almost 60 miles north in 100 years.

NEXT >>
EXHIBIT E: Rising Sea Levels

Cape Hatteras Lighthouse was 1,500 ft. from the North Carolina shoreline when it was built in 1870. By the late 1980s the ocean had crept to within 180 ft., and the lighthouse had to be moved to avoid collapse.

Japanese fortifications were built on Kosrae Island in the southwest Pacific Ocean during World War II to guard against U.S. Marines' invading the beach. Today the fortifications are awash at high tide.

Florida farmland up to 1,000 ft. inland from Biscayne Bay is being infiltrated by salt water, rendering the land too toxic for crops. Salt water is also nibbling at the edges of farms on Maryland's Eastern Shore.

Brazilian shoreline in the region of Recife receded more than 6 ft. a year from 1915 to 1950 and more than 5 ft. a year from 1955 to 1995.
Water World

What would happen to the world's coastlines if the West Antarctic Ice Sheet melted, raising global sea levels by as much as 20 feet? Some scientists say a collapse is inevitable, possibly even imminent. Click on the images below to get a look at selected coasts in the aftermath of such a melting. (Black lines represent current coastlines.)

While you're at it, check out the same stretch of coast 20,000 years ago. It was the height of the Ice Age, when sea levels were 400 feet lower than today, and there was a lot more land to go around.

Finally, if you dare, have a look at what would be lost if the East Antarctic Ice Sheet were to melt. No one believes this monstrous dome will disintegrate anytime soon. But if it did, it would raise seas around the world by as much as 200 feet. (To play it safe, these images depict a conservative rise of 170 feet.)

Click on any picture to see a larger image (60-130K in size).

U.S. East Coast
20,000 years ago
(400 feet below today)

U.S. East Coast if West sheet melted
(17-foot rise)

http://www.pbs.org/wgbh/nova/warnings/waterworld/

7/20/2009
U.S. East Coast if East sheet melted (170-foot rise)

Florida 20,000 years ago (400 feet below today)

Florida if West sheet melted (17-foot rise)

Florida if East sheet melted (170-foot rise)

Northern Europe 20,000 years ago (400 feet below today)

Northern Europe if West sheet melted (17-foot rise)

Northern Europe if East sheet melted (170-foot rise)
Southeast Asia
20,000 years ago
(400 feet below
today)

Southeast Asia if
West sheet melted
(17-foot rise)

Southeast Asia if
East sheet melted
(170-foot rise)

Special thanks to: William Haxby
Adjunct Research Scientist
Lamont-Doherty Earth Observatory

Images: William Haxby

Stories in the Ice | Antarctic Almanac | Water World |
Live and Breathe Antarctica
Teacher's Guide | Resources | Transcript

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http://www.pbs.org/wgbh/nova/warnings/waterworld/
Click on any picture to see a larger image (60-130K in size).

U.S. East Coast 20,000 years ago (400 feet below today)

U.S. East Coast if West sheet melted (17-foot rise)

U.S. East Coast if East sheet melted (170-foot rise)

Florida 20,000 years ago (400 feet below today)

Florida if West sheet melted (17-foot rise)

Florida if East sheet melted (170-foot rise)

Northern Europe 20,000 years ago (400 feet below today)

http://www.pbs.org/wgbh/nova/warnings/waterworld/

7/20/2009
Northern Europe if West sheet melted (17-foot rise)

Northern Europe if East sheet melted (170-foot rise)

Southeast Asia 20,000 years ago (400 feet below today)

Southeast Asia if West sheet melted (17-foot rise)

Southeast Asia if East sheet melted (170-foot rise)
U.S. East Coast 20,000 years ago.
(400 feet below today)
U.S. East Coast if West Coast Sheet melted (17-foot rise)
U.S. East Coast if East sheet melted (170-foot rise)
Florida 20,000 years ago
(400 feet below today)
Florida if West sheet melted (17-foot rise)
Florida is a vast sheet of ice

http://www.pbs.org/wgbh/nova/warnings/waterworld/fla50.html

7/20/2009
Northern Europe 90,000 years ago (400 feet below today)
Northern Europe if West sheet melted (170-foot rise)
Southeast Asia 20,000 feet below (today)
Southeast Asia if West sheet melted (17-foot rise)
Southeast Asia ice sheet melted 170-foot rise
Lesson 3
Activity 5

Name_________________________________________ Date________

How to speak and/or write persuasively (may need to answer the questions below to find some techniques).

A) How Al Gore tries to convince the audience about the dangers of global warming?

B) Cite examples of how he engages the emotions of the audience?

C) What images make the most impact? Why?
Checklists
Unit: The Environment

Grammar and Functions Checklist

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FLA 518: Sheltered ELL Strategies Checklist

Write the page numbers and any other identifying features to identify those parts of your lessons that employ the following strategies.

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Original Lessons
Unit Information:

The following lesson is the first lesson of a 10-day Environment Curricula from Do Something, Inc. Other lessons in this unit are as follows:

**Day 1: Introduction** *(See the lesson below)*
Introduction to global warming, energy conservation and how rising temperatures affect us locally

Day 2: Its Getting Hot In Here! - The Science of Global Warming
Students learn about greenhouse gases and the power of language

Day 3: The Consequences of Global Warming
Students learn about the potential consequences of global warming

Day 4: If the shoe fits... Learning about Ecological Footprints
Students examine their own energy consumption and conservation

Day 5: How Green Is Your School
Students learn how schools can participate in energy conservation

Day 6: Energy Hog - Who's using up all the energy?
Students compare U.S. energy use to that of other countries

Day 7: Renewable Energy Sources
Students explore different types of renewable energy sources

Day 8: Renewable Energy - How Do You See It?
Students discuss the pros/cons of renewable energy

Day 9: The Politics of Energy Conservation
Students debate the pros/cons of government involvement in energy conservation

Day 10: Presentation Day
Students present their energy conservation projects
Day 1: Introduction

Goals:

- To introduce students to the concept of global warming and energy conservation
- To begin to discover how rises in temperature might affect their area/state

Standards:

- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 7: Uses reading skills and strategies to understand and interpret a variety of informational texts

Materials:

- K-W-L

Vocabulary:

- **Global Warming**: a term used to describe the increase and projected increase in the average temperature of the Earth’s climate

Procedure:

1. **Heat it up:**
   
   Begin a discussion with your student about global warming by asking students to describe general trends in the weather over their lifetime. Do they notice changes in temperature since they were small children? Do their parents comment on how the weather has changed? What weather extremes can they remember in their lifetime?

2. **Have students fill out a K-W-L chart about global warming/energy conservation.**

3. **Provide Background:**

   Introduce students to the unit on global warming by showing students pictures from the following website: [http://www.koshlandscience.org/exhibitgce/intro01.jsp](http://www.koshlandscience.org/exhibitgce/intro01.jsp).

   What do students notice about the difference in the glaciers over time? Why do they think this is? Introduce students to general facts about global warming.

   Although there is great debate about what causes global warming, climate experts agree that the global air temperature has risen 0.3 to 0.6 Celsius over the last 100 years. Factors such as rising sea levels and coral bleaching are indicative of increases in air temperatures. Most specialists predict that if we do not take drastic steps to curb greenhouse gas emissions, global temperature will increase 1 to 3.5 Celsius in the next century. Although the number may sound small, even a 1 Celsius increase can cause significant worldwide change. For example, during a period called the Little Ice Age (1500-1800) where the temperature was only about .5 Celsius cooler than it was in 1900, there were extensive glacial advances in almost all alpine regions. Most
scientists argue that global warming in the next century will cause more frequent and intense heat waves, significant ecological disruptions, difficulties with agricultural production in the tropics and subtropics, and rising sea level. All of these will impact life on earth. Look back at the pictures of the glaciers again.

4. Have students go to the climate choice website (http://www.climatechoices.org/ne/impacts_ne/temperatures.html) and look at the projections of temperature for this century of their region. Students can also read about the potential impact in their state at http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ImpactsStateImpacts.html.

Discuss the following questions:
- a. What area would your state be most like in both the higher and lower emissions scenario?
- b. What industries in your area would be affected by this change?
- c. How might day to day life be different for you?

5. Take Action:

Tell students that for the next ten lessons that class will be studying about energy conservation and the impact of global warming on the world. Throughout this unit, they will be developing ways in which individuals and organizations can help conserve energy and protect the environment. During the unit, they will create a project that addresses how to decrease energy use and educate people about the importance of energy conservation. Each lesson will provide students with information and/or techniques to help educate the public about the importance of energy conservation. Have students brainstorm ways they could make a difference in conserving energy. They can add to and refine this list as they learn more throughout the unit.

Some ideas might include:
- a. Carpooling group
- b. Recycling efforts
- c. Campaigning for the use of renewable energy sources
- d. Creating a documentary/website about energy conservation

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Lesson 2: It's getting hot in here! -
The Science of Global Warming

Goal:
- To learn about greenhouse gases and how they keep the earth warm
- To discuss the power of language to make difficult concepts more understandable

Standards:
- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 4: Gathers and uses information for research purposes
- Language Arts Standard 2: Uses the stylistic and rhetorical aspects of writing
- Science Standard 1: Understands atmospheric processes and the water cycle

Materials:
- Plastic cups
- Plastic wrap
- Water

Procedure:

1. Heat it up:
   Give each student two cups and have them fill it with water that is the same temperature. Wrap one of the cups with plastic wrap. Leave both cups in a sunny place for a few hours. Have students take the temperature of the water in both cups. Have students predict which one will be warmer? Why? How do they think this experiment relates to global warming?

2. Provide Background: Introduce students to the science behind global warming.

   Sunlight sends energy into the climate, most of which is absorbed by oceans and land. Heat is then radiated outward as infrared energy. Some of this heat is absorbed by what are called greenhouse gases, which exist naturally in the atmosphere. Greenhouse gases include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Water vapor is also an important greenhouse gas, but human activity does not change it directly. When energy is absorbed, greenhouse gases transmit energy in all directions. Some of the infrared energy is emitted towards space while some is reabsorbed, further warming the earth. The greenhouse gases are often compared to a blanket around the earth which keeps the earth warm. Increased concentrations of CO2 and other greenhouse gases cause more infrared energy, in essence creating a thick blanket around the earth that keeps heat inside. This, in turn, causes increases in the temperature of the atmosphere and Earth's surface.

   Normally, the Earth maintains a balance in the amount of carbon dioxide in the atmosphere. Ocean uptake (dissolving of CO2 gas into the oceans) and sedimentation (burial of plant and animal matter, which overtime becomes limestone, coal, gas, and oil) are two processes whereby CO2 is absorbed from the atmosphere. This naturally occurring system readjusts to return the balance to normal states. However, the system is slow-moving and cannot keep up with the pace at which humans are burning fossil fuel, and thereby releasing carbon dioxide into the atmosphere. Furthermore, the clearing and burning of forests transform organic carbon into gas, which contributes to an increase in carbon dioxide in the atmosphere. The constant need for energy causes a reliance on fossil fuels, which, in turn, means more and more CO2 being released into the atmosphere.

3. Synthesize:
In pairs, have students develop a chart that explains their understanding of the science of global warming. Rather than just having students create a two dimensional drawing, encourage students to go through their daily non-food trash and use the items they find to make the poster three-dimensional. You can extend this lesson by inviting students to talk about garbage and recycling. You might discuss with students what items are wasted most often in a school environment. What might be reused?

4. Take Action:

One way to raise awareness about the importance of energy conservation is to educate others about global warming. Discuss how using the metaphor of a blanket is helpful to have people understand in a basic way what is occurring with global warming (metaphor is described in the "Provide Background" section). If they choose to educate others, what powerful ways can students use language to help others understand the urgency? What metaphors or symbols will make people take notice?

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Lesson 3: What are the Consequences of Global Warming?

Goal:
- To learn about the potential consequences of global warming

Standards:
- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 4: Uses the stylistic and rhetorical aspects of writing
- Arts and Communication Standard 4: Understands ways in which the human experience is transmitted and reflected in the arts and communication
- Science Standard 1: Understands atmospheric processes and the water cycle

Materials:
- Strategy Worksheet
- Video of an Inconvenient Truth

Vocabulary:
- **Ethos**: A mode of persuasion that relies on the speaker establishing expertise
- **Logos**: A mode of persuasion that relies on evidence and logical thought
- **Pathos**: A mode of persuasion that relies on appeals to the audience’s emotions

Procedure:

1. **Heat up:**
   Start by showing students a clip of Al Gore’s "An Inconvenient Truth" and discuss the consequences of global warming. Begin a discussion around techniques that you can use to persuade others. For example, how might a child get his parents to let him/her stay out late? Ask for a few examples.

2. **Provide Background:**
   Have students investigate the effects and consequences of global warming. Do a jigsaw read of the articles by having the students count off by three and then read one of the articles. Create groups of three students, so that each group has a member that has read either the first, second, or third article.

3. **Synthesize:**
   As a class, discuss how to speak and write persuasively. How does Gore try and convince the viewer about the dangers of global warming? Cite examples of how he engages the emotions of the viewer? What images make the most impact? Why?

4. **Discuss persuasive techniques** and have students look again at a clip and discuss what techniques are being used. How does the combination of all three of these strategies support Gore’s point of view? For MS students, you may want to give them the worksheet to help
organize the notes they take while viewing.
   a. Logos: use of evidence to support your points (facts, statistics, accounts)
   b. Pathos: use of emotions to engage the support of the audience
   c. Ethos: credibility or reliability of your argument (expert opinions, celebrity endorsement).

5. Take Action:
   As part of their project, encourage students to create something that they can share with others that builds awareness about the importance of energy conservation and the consequences of global warming. Some ideas might include a collage, poem, song, or poster that students can share with others. How can they use logos, pathos, and ethos to get their point across? Have students discuss their ideas in groups.

Additional Activities

- Multimedia: Have students develop a commercial promoting energy consciousness
- Social studies/Language Arts: Look at great speakers of our century and see the techniques that they use to get their point across.
As you watch the movie, note examples when any of these strategies are used. Describe the example and rate how effectiveness of this strategy.

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Lesson 4: If the shoe fits... Learning about Ecological Footprints

Goals:
- Students will examine their own energy consumption and think about ways they can conserve energy.

Standards:
- Geography Standard 18: Understands global development and environmental issues.

Vocabulary:
- Ecological Footprint: a way of measuring human demands on natural resources.

Procedure:

1. Heat it up:
   Begin a discussion by asking students to contemplate their own energy use. Have them think of their morning and list all the energy they used. For example, do they have an alarm clock? Which lights did they turn on? How long was their shower? Did they take food from the refrigerator? Did they drive to school?

2. Provide Background:
   Begin by describing the concept of an ecological footprint. Explain to students that ecological footprints have been done on a global, national, and individual level. A nation's footprint is calculated using its population, the amount consumed by the average resident, and the amount of resources used in providing goods and services required to meet people's consumption. Also included is the area required to absorb the CO2 that is released due to fossil fuel burning.

3. Have students go to [http://www.earthday.net/Footprint/Index.aspx](http://www.earthday.net/Footprint/Index.aspx) to find out their ecological footprint.
   Discuss with class:
   a. How did they compare to their national average?
   b. How many Earths would we need if everyone lived the same way they did?
   c. What are some things they could do to decrease their score? What are some things they could do that increased it?

4. Calculate the overall score of the class.
   Tell them that through the course of the year, they will work to decrease this score, so as to have less of a detrimental effect on the environment.

5. Synthesize:
   After students have determined their footprint, discuss what contributes to a “deeper” ecological footprint. Using the categories from the website (Food, Mobility, Transportation, Shelter, and Goods and Resources), have students think of ways they could conserve energy.
   Look at a list of recommended actions that individuals can take. For example, eat less meat, donate magazines to hospitals, avoid purchasing disposable items with lots of packaging, drive fuel efficient vehicles, plant vegetables or visit local green markets, use less trees by getting off of junk mail lists, write a letter about your concerns to members of congress.

6. After students have listed options for each category, have each student personally arrange what they would be most willing to do/change in their life to what they would be least willing to do.

7. Have students choose one action to try for the week and then report back on their outcome. Inform other students by creating “footprint” signs that show how other students can help conserve energy through simple actions.

8. Take Action:
   How can the class get others to be more aware of their energy use? Is there a way/venue to provide an ecological footprint reading for students?

E-Mail: DoSomething, Inc.
Lesson 5: How Green is your School

Goal:

- To learn about how schools can participate in energy conservation

Standards:

- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 2: Uses the stylistic and rhetorical aspects of writing
- Arts and Communication Standard 4: Understands ways in which the human experience is transmitted and reflected in the arts and communication

Vocabulary:

- **LEED rating system**: Benchmark used to design, construct and operate green buildings

Procedure:

1. **Heat-it up**:
   - Have students look around the classroom and list everything they see in the classroom that uses energy. How energy efficient do they think their school is? How much energy/resources are wasted daily? Discuss with students how higher heating costs have made some school districts think twice about school trips and the number of days class is in session. See [http://www.pbs.org/newshour/extra/features/july-dec05/gascosts_11-21.html](http://www.pbs.org/newshour/extra/features/july-dec05/gascosts_11-21.html) for further information.

2. **Provide Background**:
   - Read and discuss what this article says about green schools:

3. **Introduce students to the LEED rating system**.
   - Ask students if they were going to look at how green a building is, what factors would they investigate? Gather a list from the students and then introduce them to the rating system developed by LEED. Compare the student rating system against LEED. Did they include everything on this list? Did they mention components that were not included in LEED? "The Leadership in Energy and Environmental Design (LEED) Green Building Rating System" is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings." (US Green Building Council). LEED has developed a rating system for schools. This rating system looks at elements such as air quality, cleaning and chemical use, water efficiency, recycling, exterior maintenance and system maintenance to meet high energy performance standards (from US Green Building Council).


4. **Introduce students to one energy-saving concept called green roofs**.
   - "A **green roof** is a roof or building that is partially or completely covered with vegetation and soil, or a growing medium, planted over a waterproofing membrane. This does not refer to roofs which are merely colored green, as with green shingles. It may also include additional layers such as a root barrier and drainage and irrigation systems." (www.wickipedia.com)

5. Synthesize:
   Have students develop their own plan for a "Green School". They can draw out the plans and write a brief explanation of their ideas for their green school. Students should focus on the following questions:
   a. What innovations could they design in the architecture?
   b. How could the curriculum/student activities support an ecological design?
   c. Why should the city give public money to building a new school? How efficient are "Green Schools"?
   Students can read about other Green schools:
   ii. http://www.pbs.org/newshour/extra/features/july-dec06/green_12-26.html - Schools across the nation that are taking steps to being more green

6. Take Action:
   Have students continue working in their action groups.

Other Activities:

- Math/ Civics: Have students develop a survey to measure how green their school is? Share the results with the student body.

E-Mail Do Something, Inc.
Lesson 6: Energy Hog - Who's using up all the energy?

Goal:

- To learn about energy use across America compared to other countries

Standards:

- Geography Standard 14: Understands how human actions modify the physical environment
- Geography Standard 18: Understands global development and environmental issues

Procedure:

1. Heat up:
   Ask students the night before to count the number of SUV’s or large vehicles that they see on their way to school. How many people were in those vehicles? What do they notice?

2. Provide Background:
   Explain to students that although Americans make up only about 5 percent of the world’s population, they consume 26% of the world’s energy. Each day the average American uses approximately seven gallons of gasoline. Over a course of year this is about 2,500 gallons (The Need Project). Most energy savings in the last few years have come from improved efficiency for various technologies (U.S. Department of Energy).

3. Have students look at the predicted energy use for each country:
   http://timeforchange.org/prediction-of-energy-consumption
   http://www.worldwatch.org/node/808 - read about global energy trends
   - Which countries show the greatest increase in energy use?
   - How can students account for this increase?
   - Why is energy a global issue?
   - What should developing nations do to ensure that they maximize their energy use? How can we encourage this help?

4. Use the following website to have students look at energy use in their state:
   http://tonto.eia.doe.gov/state/

5. Synthesize:
   Have students create an energy brochure/or website for their state that details the state’s main energy use. The brochure should discuss the following:
   - How does their state’s energy use compare to the national average?
     - Why do they think this is?
   - What types of alternative fuels are used in their state?
   - What types of emissions are listed?
   - What percentage of the total national emissions does this make up? How does this compare with the population that lives in their state?

6. Take Action:
   Have students meet in their action groups and continue to develop their project.

Additional Activities:

- Social Studies/ Geography/Math: Have students create a map that illustrates both actual and predicted energy use over time for various areas.
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Lesson 7: Renewable Energy Sources

Goals:

- To learn the difference between renewable and nonrenewable energy
- To explore various types of renewable energy sources

Standards:

- Geography Standard 14: Understands how human actions modify the physical environment
- Geography Standard 18: Understands global development and environmental issues
- Science Standard 1: Understands atmospheric processes and the water cycle

Vocabulary:

- **Geothermal Energy**: Energy that is created by heat below the Earth’s surface
- **Hydropower**: Energy that is harnessed from moving water for some useful purpose
- **Landfill gas**: Energy produced by fermentation or anaerobic digestion of organic matter
- **Photovoltaic solar power**: Energy that is harnessed from the sun and converted directly into electricity
- **Renewable Energy**: Energy from sources that are not in danger of running out such as sunlight, wind, tides or geothermal heat
- **Wind power**: Energy harnessed from the conversion of wind energy

Procedure:

1. **Heat-it up**:
   Hide a bunch of M&M’s or pennies around the classroom. Ask for a few volunteers. Give the volunteers ten seconds to find them. Count the number of objects retrieved. Ask the volunteers to continue searching in ten second intervals, recording the number of candies that are found each time. As the supply of M&M’s or pennies drops, the number of objects found should get less and less. Connect this to your discussion about renewable energy.

2. **Begin a discussion on renewable and non-renewable energy**.
   Explain to students that the objects you hid were symbolic of non-renewable energies. As the students found them, the amount available throughout the classroom dropped. This is the case with fossil fuel. Discuss America’s reliance on fossil fuel. Fossil fuels - coal, oil and natural gas - provide more than 85% of all the energy consumed in the United States. According to the U.S. Department of energy, nearly two thirds of our electricity and almost all of US transportation fuels come from fossil fuel. It is likely that the need for fossil fuel will increase over the next decade.

3. Ask students to think of some other sources of energy. Once you have exhausted their list, review alternate sources of energy that they might not know about.

   - **Geothermal energy**: electricity generated by naturally occurring geological heat sources
   - **Hydropower**: energy obtained from flowing water
   - **Wind power**: using the kinetic energy of the wind or wind turbines to extract the wind’s energy
   - **Landfill gas**: utilizing emitted gases from landfills to produce electricity
Photovoltaic solar power: gaining energy from sunlight using solar panels

4. Synthesize:
   Put students into pairs and give them a type of energy source to research. They should describe each source and list the pros and cons of using this type of energy and provide examples of where this energy source is currently used. Have students create large charts that demonstrate the pros and cons of each of these sources to the class.

   For students in middle school, you may want to have them use a worksheet to take notes as other students present.
   - How expensive is each type of energy source?
   - Is it difficult to create?
   - Discuss and provide examples of these alternative forms of energy for preparation for the next day.

5. Take Action:
   Have students continue working on their action projects.

Additional Activities:

- Social Studies/Civics: Have students investigate how their town/city gets energy. On what type of energy plants does their area rely?

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Lesson 8: How do you see it?

Goal:

- To engage students in a discussion about the pros and cons of renewable energy

Standards:

- Geography Standard 1414: Understands how human actions modify the physical environment
- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 8: Uses listening and speaking strategies for different purpose
- Life Skills Thinking and Reasoning Standard 5: Applies basic trouble-shooting and problem-solving techniques
- Life Skills Thinking and Reasoning Standard 1: Understands and applies the basic principles of presenting an argument

Procedure:

1. Heat it up:

   Describe the following scenario to students:

   Imagine this scenario. The year is 2080 and the world’s fossil fuel supply has been nearly exhausted. Most people don’t have cars anymore because of high gas prices. Since the cost of heating and cooling homes is so expensive, most people live for long periods of times in extreme temperatures. Many businesses have shut down because of the high cost of transporting goods and electricity. What needs to be done now to prevent this from happening?

2. Provide Background:

   Have each student review their notes on alternative energy. Discuss questions before beginning the activity.

3. Synthesize:

   Create groups of 3-4 students. Students should work together to decide how much to rely on the various type of energies. They should think about the pros and cons of each that were discussed the day before and then assign a percentage to a certain type of energy source. At the end, they will be asked to explain their choices.

   Give each student a role in their group:
   a. Environmentalist (Mr. Brad Conserve)
     This person wants to use a 100% renewable energy. He believes in conservation and reducing fossil fuels. He does not worry about the cost of creating plants to harness alternative energies.
   b. Oil company (Ms. Olive Oil)
     Wants to satisfy stock holders and continue to provide revenue for her company. Cares about her company more now than in the future. Will never agree to abandoning use of oil.
   c. Family guy/gal (Joe Regular/Ms. Jane Plain)
Working person who cares about what this whole endeavor will cost him/her. This person’s main concern is providing for his/her family now, not what will happen some years in the future.

d. Moderator: This person will help moderate and lead the discussion. They can decide how the final distribution will be made.

4. Have students do a quick "write from the perspective of their character" about what to do about this problem. Then have the groups discuss the various alternative energies.

5. Take Action:
   Have students continue working on their take action projects.

http://www.lessonplanispage.com/printables/PScienceSSLAODoSOMethingAboutTheEnvir... 7/13/2009
Lesson 9: The Politics of Energy Conservation

Goals:

- To debate the pros/cons of governmental involvement in energy conservation

Standards:

- Geography Standard 14: Understands how human actions modify the physical environment
- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 8: Uses listening and speaking strategies for different purpose
- Life Skills Thinking and Reasoning Standard 5: Applies basic trouble-shooting and problem-solving techniques
- Life Skills Thinking and Reasoning Standard 1: Understands and applies the basic principles of presenting an argument
- Civics Standard 2: Understands the essential characteristics of limited and unlimited governments
- Civics Standard 23: Understands the impact of significant political and nonpolitical developments on the US and other nations

Procedure:

1. Heat-up:

   Begin your class by asking students if they believe that energy consumption is a problem and if the government should play a role in preventing it? Should the government limit people’s energy consumption? Or should this be up to individuals?

2. Ask students what techniques can governments use to influence global warming?

   (Policies, taxes, treaties, laws, trade, research)

   Discuss how these techniques can influence global policy and individual people’s actions?

3. Tell students that global warming has become a very political issue that is often decided through party lines. Explain to students that today students will be exploring both sides of global warming and then having a debate.

4. Provide Background:

   Split students into two groups: those who want the government to take an active role in preventing global warming and those who do not believe global warming to be a serious enough of a problem that merits government involvement. Have students read the following articles to determine arguments that are pro and con and make notes for their side.

   PBS provides a number of interviews of climatologists, politicians, and those in the business world presenting different perspectives:
   http://www.pbs.org/wgbh/warming/debate/

   You may want to have your high school student take a look at the following websites to find further information:

   Senate speeches on media global warming alarmism:

   http://www.lessonplanspage.com/printables/PScienceSSLAODoSomethingAboutTheEnvir...
Business organizations that call on strong government action to prevent global warming:
http://www.pbs.org/wgbh/warming/debate/palmer.html
http://www.us-cap.org/

5. Synthesize: Set up a debate in your classroom.

Line debate: Create groups of four students - two that are anti-government involvement and two that are pro-government involvement. The groups of four students should face each other. Have one of the sides begin the debate. Only one person may talk at a time. Then have the other side present their ideas. Finally each group can present a rebuttal. During the debate, call a spotlight on certain groups of four by having the rest of the class sit down and listen to the arguments being presented. They can then use those arguments in their own debates. At the very end, ask them quickly to switch positions and argue for the other point of view.

6. Take Action:
Continue working on your take action projects and develop a presentation of your work for Lesson 10.

Additional Activities:

- Social Studies/Language Arts: Research the Kyoto Protocol and discuss the issues around the U.S. signing the treaty.
- Social Studies/Language Arts: Choose your favorite politician and research their stance on energy conservation.

E-Mail Do Something, Inc.!
Lesson 10: Presentation

Goals:
- To have students present their energy conservation projects
- To discuss students' impressions of energy conservation efforts

Standards:
- Geography Standard 14: Understands how human actions modify the physical environment
- Geography Standard 18: Understands global development and environmental issues
- Language Arts Standard 7: Uses listening and speaking strategies for different purpose
- Life Skills Thinking and Reasoning Standard 5: Applies basic trouble-shooting and problem-solving techniques

Procedure:

1. Heat up:
   Have students go back to their K-W-L chart from Day One and add to the list of what they have learned. What questions have been answered? What still need to be addressed? Was anything they learned in this unit that was surprising? What do they feel is important to share with others?

2. Have students present their take action projects.

3. During the projects students should talk about the challenges they faced accomplishing this task and how they can continue the work beyond these ten days to address issues of energy conservation.

4. Reflection: Have students discuss the following topics:
   a. Do they feel that energy conservation is a topic worth teaching as part of a curriculum? What grade should you start teaching conservation?
   b. How responsive are young people of their generation to environmental issues?
   c. How willing are people to make changes to their lifestyle to save energy?
   d. How has this unit impacted their view of energy consumption?

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