Lesson 21: CLIMATE *SOUL*UTIONS-A CALL TO ACTION!
Eco-Schools USA Climate Change and Energy Pathways

PURPOSE/QUESTION
Continuing to learn about the Eco-Schools program and how the work students have synthesized has prepared them to take action through the Eco-Schools framework. Students will have addressed 2 pathways, Climate Change and Energy, at the conclusion of the curriculum.

GRADE LEVEL
9-12

TIME TO COMPLETE
2-3 – 50 minute time periods

STANDARDS
See appendix below-page 4

LEARNING OUTCOMES
- Students will make connections between previous lessons and Eco-Schools USA via the climate change and energy pathways.
- Students will increase campus and community awareness through the Eco-Schools USA program.
- Students will reduce their school's carbon footprint through the implementation of the Eco-Schools USA program.

STUDENT OBJECTIVES
- Analyze the results of the energy audit from Lesson 1
- Look for potential connections to what you have studied and the 8 pathways.
- Based on the energy data you collected create, display, and share the schools strengths and weaknesses.
- Devise a plan to implement a new strategy that addresses the energy needs of your schools.

TEACHER BACKGROUND
The United States is home to just 5 percent of the world's population but consumes more than 20 percent of its energy. On average, a person in America uses 10 times more energy than a person in China and nearly 20 times more than a person in India. U.S. energy needs are met primarily by non-renewable sources including gas, oil, and coal. Access to abundant and inexpensive energy contributes to our high standard of living, but burning large quantities of fossil fuels also has serious environmental and health consequences. These range from smog and acid rain to, most critically, the release of greenhouse gases leading to global climate change.

Why Should Schools Reduce Their Energy Use?
The nation's school districts spend more than $7.5 billion a year on energy. Schools are the largest energy consumer in many municipalities. But up to 30 percent of that energy is used inefficiently or unnecessarily. By implementing energy-conservation measures and using energy-efficient technologies, schools can significantly cut their energy use. The result is financial savings as well as a reduced environmental impact.

PREREQUISITES
- Lesson 1: An Introduction to Eco-Schools USA
- Completion of the ***Energy Audit*** within the environmental audit from Lesson 1

MATERIALS & TOOLS
- Computer with Internet
- Color printer (optional)

LESSON LINKS
- Foldables®
- Thinking Maps

ESSENTIAL QUESTIONS PART 1
As you monitor student groups, ask:

1. Why did your group choose these particular 4 lessons?
2. Explain the connection between your module(s) and one pathway.
3. Could your module(s) connect to another pathway also? Explain.

Acton-Boxborough High School

PROCEDURE PART 1

1. Have students work in groups.
   a. Choose a total of 4 lessons for the purpose of reflection. Choose a combination of lessons from Modules 2-4.
   b. Students will reflect upon their learning sharing with their groups their hypotheses, conclusions, and aha's.
   c. Students will then review the 8 pathways to sustainability.
   d. Brainstorm connections and relationships between their lesson choices and the pathways and record them in their science notebook.
   e. The group will then design and create a way to visually represent the connections and relationships they made.
   f. Allow opportunity to share with class and put up for display (want students to get ideas from peers).

ESSENTIAL QUESTIONS- PART 2
As you monitor student groups, ask:

1. What similarities and or differences are you finding between your audits?
2. If differences, what are some possible reasons for the discrepancies?
3. How did you decide upon one strength/weakness over another to include in your plan?

PROCEDURE PART 2

1. Work in groups again, change groups so that students are working with a different peer group.
2. Students will compare data collected from their energy audits-a discussion, with a specific focus on the "Synopsis of Audit Results"
3. Everyone will need to read one Eco-Schools USA case study. Links on last page.
4. Students will then devise a plan to highlight the strengths and weaknesses found during the auditing process.
   a. This should include a minimum of 3 points and maximum of 5 points.
   b. Plan should be clear and concise-time to elaborate later.
5. The plan should be written and shared with the class.
6. As students share their plans make a class circle map so all ideas

PROCEDURE PART 3

Use the Monitor and Evaluate link to help guide you. At this point students will do one of two things:

Scenario 1

a. Compile a list of 8 most important recommendations based on class circle map and give to a member of the school's Eco-Action team.
b. Request progress report from team toward the end of the year.
c. As a class discuss the progress made on the recommendations to the Eco-Action team.
d. As a class decide the next plan of action.

Scenario 2

a. If your entire class is a part of the Eco-Action team, discuss as a class, the progress made since the initial audit.
b. Take results back to entire Eco-Action team and address accomplishments and areas to readdress.
c. Develop a method to let campus know the results of the Eco-Action team's accomplishments.
d. Collaborate with team to develop a new plan for the next school year.

ECO-SCHOOLS USA CASE STUDIES

- **Sleepy Hollow Middle School Goes Green on a Tight Budget** – October 2010
- **Lincoln Elementary School Goes Green with Eco-Schools USA and HSBC and Youth CAN at Boston Latin School**
- **Partnership is Powerful for Kent Meridian High School** – September 2010

LESSON 21-APPENDIX

WEB ADDRESSES FOR HYPER LINKS

Lesson Links

- **Foldables®**
  http://www.dinah.com/media/videotutorial/videotutorial.php
- **Thinking Maps**
  http://thinkingmaps.com/why_thinking_maps/

Procedure Part 3

- **Monitor and Evaluate**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Steps/Monitor-and-Evaluate.aspx

Eco-Schools USA Case Studies

- **Sleepy Hollow Middle School Goes Green on a Tight Budget**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Steps/Monitor-and-Evaluate.aspx
- **Lincoln Elementary School Goes Green with Eco-Schools USA and HSBC and Youth CAN at Boston Latin School**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Case-Studies/Case-Study-Archive/Climate-Change.aspx
- **Partnership is Powerful for Kent Meridian High School**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Case-Studies/Case-Study-Archive/School-Grounds.aspx

LESSON 21-STANDARDS

National Science Education Standards

Unifying Concepts and Processes

- Systems, Order, and Organization
- Evidence, Models, and Explanations
- Change, Constancy, and Measurement

Standard A – Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Standard B – Physical Science

- Interactions of energy and matter

Standard C – Life Science

- Matter, energy, and organization in living systems

Standard D – Earth and Space Science

- Energy in the earth system
- Geochemical cycles

Standard E – Science and Technology
- Abilities of technological design
- Understandings about science and technology

Standard F – Science in Personal and Social Perspectives
- Personal and community health
- Natural resources
- Environmental quality
- Science and technology in local, national, and global challenges

Standard G – History and Nature of Science
- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

National Education Technology Standards

Standard 1: Creativity and Innovation
- Use models and simulations to explore complex systems and issues
- Identify trends and forecast possibilities

Standard 3: Research and Information Fluency
- Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- Process data and report results

Standard 4: Critical Thinking, Problem Solving, and Decision Making
- Collect and analyze data to identify solutions and/or make informed decisions.

Standard 5: Digital Citizenship
- Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

Standard 6: Technology Operations and Concepts
- Understand and use technology concepts
- Select and use applications effectively and productively
- Troubleshoot systems and applications
- Transfer current knowledge to learning of new technologies

National Council of Teachers of Mathematics Education Standards

Measurement

- Understand measurable attributes

Data Analysis and Probability

- Develop and evaluate inferences and predictions that are based on data

Process

- Connections
  - Recognize and apply mathematics in contexts outside of mathematics
- Representation
  - Use representations to model and interpret physical, social, and mathematical phenomena

Climate Literacy Principles

Principle 1: The sun is the primary source of energy for Earth's climate system.
Principle 2: Climate is regulated by interactions among components of the Earth system.
Principle 3: Life on Earth depends on, is shaped by, and affects climate.
Principle 4: Climate varies over space and time through both natural and man-made processes.
Principle 5: Our understanding of the climate system is improved through observations, theoretical studies, and modeling.
Principle 6: Human activities are impacting the climate system.
Principle 7: Climate change will have consequences for the Earth system and human lives.

Energy Literacy Principles

Principle 1: Energy is a measurable quantity that follows physical laws.
Principle 2: Physical Earth processes are the result of energy flow through the earth system.
Principle 3: Biological Earth processes depend on energy flow through the earth system.
Principle 4: Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.
Principle 5: Individuals and communities make energy decisions every day.
Principle 6: The amount of energy human society uses depends on many factors and can be reduced in many ways.
Principle 7: The energy choices made by individuals and societies affect quality of life.

LESSON 21-ESSENTIAL QUESTIONS ANSWER KEY

[Based on the creative and organic nature of this lesson student's answers will vary. You will see evidence of their learning as their ideas are put on paper, voiced, shared, and put into action.]