Lesson 6

Energy Walkabout

Hudson River Estuary
Sea Grant New York
New York State Water Resources Institute
Cornell University

Energy Walkabout

NYS Intermediate Level Science

Standard 1: Analysis, Inquiry and Design/Scientific Inquiry

- S2.3c Collect quantitative and qualitative data.
- S3.1 Design charts, tables, graphs, and other representations of observations in conventional and creative ways to help them address their research question or hypothesis.
- S3.2a Accurately describe the procedures used and the data gathered.
- S3.2c Evaluate the original hypothesis in light of the data.
- S3.2d Formulate and defend explanations and conclusions as they relate to scientific phenomena.
- S3.2h Use and interpret graphs and data tables.

Standard 1: Analysis, Inquiry and Design/Engineering Design

- T1.1a Identify a scientific or human need that is subject to a technological solution which applies scientific principles.
- T1.3a Generate ideas for alternative solutions.

Standard 6: Interconnectedness

- 5.2 Observe patterns of change in trends or cycles and make predictions on what might happen in the future.

Standard 7: Interdisciplinary Problem Solving

- 1.1 Analyze science/technology/society problems and issues at the local level and plan and carry out a remedial course of action.
- 1.3 Design solutions to real-world problems of general social interest related to home, school, or community using scientific experimentation to inform the solution and applying mathematical concepts and reasoning to assist in developing a solution.

Standard 4: The Living Environment

- 7.2d Since the Industrial Revolution, human activities have resulted in major pollution of air, water, and soil. Pollution has cumulative ecological effects such as acid rain, global warming, or ozone depletion. The survival of living things on our planet depends on the conservation and protection of Earth's resources.

Standand 4: The Physical Setting

- 4.1d Different forms of energy include heat, light, electrical, mechanical, sound, nuclear and chemical. Energy is transformed in many ways.
- 4.5b Energy can change from one form to another, although in the process some energy is always converted to heat. Some systems transform energy with less loss of heat than others.

Next Generation Science Standards

Science and Engineering Practices:

4. Analyzing and interpreting data
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Grade 6

ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Grade 7

ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Grade 8

ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Common Core State Standards

ELA in the Content Areas - Grades 6-8

CCSS.ELA-Literacy.RST.6-8.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-Literacy.RST.6-8.8
Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

CCSS.ELA-Literacy.RST.6-8.9
Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CCSS.ELA-Literacy.WHST.6-8.1a
Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

CCSS.ELA-Literacy.WHST.6-8.1b
Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

CCSS.ELA-Literacy.WHST.6-8.2b
Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

CCSS.ELA-Literacy.WHST.6-8.2d
Use precise language and domain-specific vocabulary to inform about or explain the topic.

CCSS.ELA-Literacy.WHST.6-8.8
Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Common Core State Standards - Mathematics

Standards for Mathematical Practice

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

CCSS.Math.Practice.MP4 Model with mathematics.

Energy Walkabout

This lesson is modified from educational materials produced by U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy: http://www1.eere.energy.gov/education/pdfs/efficiency_energyauditchecklist.pdf

Introduction

Learning about climate change can often be overwhelming and discouraging to students. One way to mitigate these feelings is to identify ways that they can personally make changes that relate to climate through energy use.

In this activity, students will apply the energy conservation measures to perform an energy audit of the school building using a data table that they create. Photos of energy behaviors—good, bad, and ugly— and survey results can be used in educational posters and presentations to students and faculty on why we need to work on energy conservation and how easy it can be to save energy by simply keeping doors and windows closed, shutting things off when they are not in use, etc. Discuss this activity with your colleagues and let them know that your students will be visiting their classrooms. Consider inviting the custodian into your class following the students' audit to discuss overall building energy use concerns, e.g., the boiler, timers on lights and heat, etc.

This lesson is best implemented following a lesson on types of energy (i.e., electrical, chemical), energy transfer, and efficiency. Additionally, it is recommended that students have some background in climate change and how fossil fuel use is contributing to the problem in order for them to understand how energy decisions are related to the issue.

Additional Resources:
http://www.eia.gov/kids/energy.cfm?page=3
http://www.energystar.gov/index.cfm?c=kids.kids_index
http://www.consumerenergycenter.org/tips/schools.html
http://www.fi.edu/PECO/saving-guide-family.pdf
http://usgovinfo.about.com/library/weekly/blearthday2002.htm

Time Estimate: Approximately three 45-minute class periods.

Objectives

Students will be able to

- create a template for assessing energy use in their school and home environments.
- perform an energy audit of their school and home environments.
- provide written recommendations for conserving energy based on findings from the energy audit.

Engage

Ask students to create a list of all the ways they have used energy already today. If necessary, give them a few ideas to get started, e.g., charging a cell phone, listening to music, cooking breakfast, lighting, heating or air conditioning, etc.

Discuss ways to conserve energy in everyday life. As a class, generate a list on the board. Examples might include:

- Unplugging chargers when not in use
- Turning off lights
- Closing windows when the heat is on
- Being sure windows and doors are sealed, not allowing a draft.
- Turning off computers at the end of the day

You may need to model some of the ideas, e.g., how to feel/assess whether a window or door is weather-sealed.

Explore

Part I: Creating the Instrument

Explain to students that they will be creating a data table that they will use to assess energy conservation at school and at home—an energy audit. If necessary, show them an example, such as the table below:

Room Number			
Lights off when unoccupied			
Unnecessary electronics Unplugged			
. . .			
Comments			

In small groups, have students create their own data table. Then, bring the whole class together to create a class table so that all groups are using the same instrument to assess energy conservation. There may be categories that require students to ask questions of faculty members, custodians, or other school personnel. For example: Are computers turned off at night?

Either create a table and make copies for the whole class, or have students copy it down.

Part II: Assessing Energy Conservation

Be sure that all students are clear on how to use the table. If possible, students can also use cell phone or other cameras to take pictures of energy wasting during their audit.

Divide the school into sections based on the number of groups of students in your class. Send small groups of students to each section to perform the audit and take pictures. Give a set amount of time to do this, e.g., 20 minutes.

Explain

Students should share their findings with the class. Groups should add other students' findings to their table. If possible, the building custodian should visit your class to discuss overall building energy concerns, e.g., whether timers are used, how the heat is set, etc.

Based on the findings, students should answer the following questions:

- What are the most common energy-wasting problems identified? How common are these problems?
- What are some recommendations for saving energy that you would make based on these findings?

Support your recommendations with evidence.

Have students share their recommendations with the class. Compile a list in which the class prioritizes these recommendations based on importance, feasibility, and how much energy they would save. Consider presenting the list to the principal.

Elaborate

Ask students how they would modify their data table for use at home. Invite each student to go home and complete the same assignment, including identifying the most common energy-wasting problems and making recommendations.

In addition, either in class or at home, students should conduct background research using outside websites, books, or their textbook to answer the following:

- Why is conserving energy important?
- Why are our findings about energy conservation in our homes and school important?
- What suggestions can you make for improvement? Why?

Evaluate

For homework, have students complete the following writing assignment:

- Pretend you are explaining to a third grader about energy conservation and some ways that they can better conserve energy. In an essay, poster, PowerPoint presentation, or other method, explain to these third graders:
  - Some things that they use energy for at home and at school.
  - Some ways that they can conserve energy and why this is important.

- Be sure to support your statements with:
  - Evidence from your energy audit (home, school, or both).
  - Facts from your background research.
  - Pictures or graphics that engage your readers.

Evaluate Rubric

Criterion/Score	3	2	1
Identification of Energy-using items	Clearly identifies five or more household (or school) items that require energy	Identifies three or more household (or school) items that require energy	Identifies one or more household or school) items that require energy
Identification of ways to conserve energy	Accurately identifies three or more ways to conserve energy	Accurately identifies two or more ways to conserve energy	Ways to conserve energy are inaccurate or only one way is identified.
Support from Energy Audit	Clearly supports ideas using specific findings from the energy audit.	Supports ideas by referring to the energy audit.	Does not support ideas with energy audit findings
Facts from background research	Clearly supports ideas using relevant facts from the background research	Supports ideas with background research	Background research ideas may include facts and opinions, or support is unclear.
Includes graphics	Well-selected graphics clearly communicate information about energy conservation	Graphics are relevant, but do not lead to clearer understanding of the topic	Graphics are irrelevant to the topic or inappropriate

Hudson River Estuary Climate Change Lesson Project

www.nyseagrant.org
http://www.dec.ny.gov/lands/

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