

Teacher(s): Brad Boyle	Unit Title: Energy Audit in Schools
Subject: 9 Earth Science to 11-12 Physics, AP Environmental Science	Lesson Title: Exploration of Electrical Use in the Classroom
Grade Level(s):	Lesson Length: 3-4 50 minute Class Periods
Date(s): 07/17/2014	

- **Learning Goal(s)** [What should students know, understand, or be able to do as a result of this lab or activity.]

What are some ways that we can collectively reduce energy loss in schools? (An extension activity would be to do a personal energy audit or an energy audit of all the occupants of the home)

- **Energy Connection** [How is this lesson connected to energy or renewable energy concepts.]

Students will find data around five different main groups Building Orientation, HVAC, Lighting, Appliances, and personal behaviors and changes. Since we cannot as easily have access to or have experiments with building use, HVAC and behavior we will focus on lighting and appliances.

- **Connection to Standards** [List local, state, and/or national standards addressed by this lab or activity.]

Colorado State Standards-High School-Physical Science

3. Matter can change form through chemical and nuclear reactions abiding by the laws of conservation of mass and energy..

5. Energy exists in many forms such as mechanical, chemical, electrical, radiant, thermal, nuclear, that can be quantified and experimentally determined.

6. When energy changes forms, it is neither created nor destroyed; however because some is necessarily lost as heat, the amount of energy available to do work decreases.

- **Materials and Resources** [List materials, handouts, and any other resources needed to complete this lab or activity.]

See my Power-Point in Drop-box

See NEED Resources,

<http://www.need.org/files/curriculum/guides/EnergySurveyStudent.pdf>

See CSU Energy Audit Lesson Plan www.ext.colostate.edu/energy/k12/audit-lesson.pdf

See Colorado Green Schools <http://www.greenschools.net/article.php?id=461>

- **Procedure** [List all necessary steps for the lab or activity.]
 - (1) Have students brainstorm the ways that energy can be conserved within schools
 - (2) Have students brainstorm factors that apply to each main category of energy use within schools: building orientation, HVAC, lighting, appliances, and personal behaviors and changes.
 - (3) Lead students through average costs regarding HVAC and the factors involved with building orientation.
 - (4) Perform labs with the meters regarding appliances and computers using the Kill-a-Watt meter
 - (5) Use the lab about comparison of lighting bulbs (incandescent, CFL, LED) that was performed in the class earlier.
 - (6) Estimate the energy and cost of lighting one classroom, and the school. What would happen if these lights were left on when the room was unoccupied?
 - (7) (**Extension**) Have students conduct their personal energy audit.

- **Technology Integration** [List and/or describe the technology that will be used and how it will be integrated into the lesson.]
 - Kill-A- Watt Meter
 - Lux Meter to Look at irradiance (as we did in class)
 - Flicker Meter (to look at old vs new fluorescent light bulbs) (We have new bulbs, so I wouldn't buy)
 - Computers for Microsoft Excel plots

- **Modeling & Guided Practice** [List and/or describe any modeling or guided practice]
 - (1). Show how to use the basic units of energy work (kWh, BTU's etc.)
 - (2). Perform audits of the HVAC system as practice to determine costs of energy conservation
 - (3). Show how to set up the lighting activity done in class.
 - (4). Model how to use Excel if necessary

- **Checks for Understanding** [Identify when and how checks for understanding will be done.]

Checks for understanding will be done during each phase of the project: building orientation, HVAC, lighting, appliances, and personal behaviors and changes.

- **Independent Practice** [List and/or describe any work students will be asked to do independently to reinforce the learnings associated with this lesson.]

Students may be asked to perform their own personal audit.

- **Assessment & Closure** [Describe how this lesson will be brought to a close and how student understanding will be assessed.]



Students will perform calculations of energy (either in kWh or Btu's) on an assessment.

Students could write how they would personally change their energy consumption habits at home.

Students could persuasively argue about making meaningful change within their schools to address energy conservation.