

ENERGY SAVINGS ACTIVITIES - LIGHTING

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Overview:

1. In the first experiment, students use the light meter in the Green Schools tool kit to measure the amount of light in each classroom in the school.
2. In the second, students compare the energy use of a compact fluorescent bulb to an incandescent bulb

Objectives:

1. Students identify techniques and applications for light energy conservation.
2. Students use appropriate technology tools to conduct their experiments.
3. Students communicate orally and visually to explain their view.
4. Students gain experience in conducting and writing up experiments.

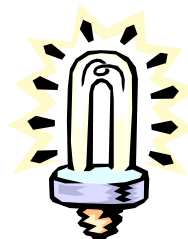
Subjects: Science, Art

Suggested Grade Level: 8

California Standards addressed: Science Grade 8 Investigation & Experimentation #9

Materials:

- Worksheets: Energy Savings Experiment Worksheet & Green Schools Classroom Lighting Survey
- Light meter (from Green Schools Tool Kit)
- Two-socket Meter (into which two types of bulbs can be screwed)
- Poster paper
- Markers, colored pencils and/or crayons
- Scotch tape
- One incandescent and 1 fluorescent light bulb
- Presentation software, laptop & projector
- Disposable camera, picture CD
- Thank you gifts (optional)
- Computer microphone (optional)



BACKGROUND

- Energy can easily be saved. For example, this lesson shows that using compact fluorescent bulbs instead of incandescent bulbs saves energy.
- Light meters can be used to both measure the amount of light in a room and also measure how much energy a light bulb uses.

PROCEDURE

1. Give the students an overview of the experiment process, from data collection, to experiment write-up, including data, variables, and conclusions in a 5-step scientific method.
2. Form two groups of students. Each group selects a method for demonstrating energy efficiency in lighting. Students may take photos to use for presentations at the end of the experiment.
3. Explain the use of the light meter from the Green Schools Tool Kit. Then, have the first group use the meter to measure the amount of light in each classroom in the school, both near the wall of windows, and away from the windows. Record findings and make a recommendation for energy savings based in the experimental write-up.
4. Have the first group create posters regarding energy savings by turning off lights, and explain the posters in each classroom. Then, place the posters by the lights in each classroom, the library, the lunchroom, on the stage, and every room in which students work or have activities in.
5. Next, explain the use of the two-socket meter into which two types of bulbs can be screwed. Have the second group screw in one incandescent and one fluorescent light bulb into the meter. The disc that turns at the bottom of this meter has white lines painted on it so that it is possible to compare how many "white lines" go past the middle of the disc in a 10-second time period. Have each student create a hypothesis as to which bulb will use the most energy, and what the ratio of energy usage between the two will be. Record findings and use observations to facilitate a discussion about whether the "load," or energy draw, of the community would affect how much energy is available at different times of the day.
6. After they have conducted and written up the experiment, have students share information with the school and encourage the school to replace all incandescent bulbs in the school building with fluorescent bulbs. Also, have the students share this information with their families and encourage their families to purchase compact fluorescent bulbs for their homes.
7. After completing these two experiments with lights, have students prepare a presentation for selected audiences. This may be the school board, a gathering of some other association, or a conference audience. Methods of presentation may include: a poster board show including pictures and explanations of the investigations that the students have done; a PowerPoint presentation; or, potentially, a PowerPoint plus audio narration (recorded using a computer microphone). The latter is more self-explanatory and will be of service to other schools that may want to borrow it to see what your school has done towards energy savings.

CASE STUDY

1. Eighth grade students at Fortuna Middle School incorporated energy savings activities into their science studies, (California 8th grade state science standard 9, Investigation and Experimentation.) This standard involves testing hypotheses, dealing with controlled and uncontrolled variables, and "developing statements about relationships between variables."
2. The first experiment involved using the light meter in the *Green Schools* tool kit to measure the amount of light in each classroom in the school, near the wall of windows in each classroom, and away from the windows in each classroom. It was found that there was enough light near the windows in each classroom, with one exception - due to bushes blocking the windows - to allow one of the rows of fluorescent lights to be turned off. This conclusion of the experiment with the recommendation to turn off one bank of lights was presented to 12 classrooms.
3. An art class then created posters regarding saving energy by turning off lights, and these posters were explained in each classroom, and then were placed by the lights in each classroom, the library, the lunchroom, on the stage.
4. The next experiment compared of energy use of a compact fluorescent bulb to an incandescent bulb. The *Green Schools* Project Coordinator acquired a meter for us to borrow that had two light sockets. The disc that turns at the bottom of this meter had white lines so it was possible to compare how many "white lines" went past the middle of the disc in a 10 second time period. Students created a hypothesis as to which bulb would use the most energy, and what the ratio of energy usage would be between the two. It turned out that the compact fluorescent bulb used approximately 25% of the energy of the incandescent bulb each period, with a small variation in the last period of the day. This observation led to a discussion as to whether the "load" or energy draw of the community would affect how much energy was available at different times of the day to run appliances. After conducting and writing up this experiment, students shared this information with their families.
5. Motion sensors were installed for lights in restrooms.
6. After completing these two experiments, Fortuna's *Green Team* presented their project and findings to the school board. The Board was extremely impressed.



ENERGY SAVINGS EXPERIMENT WORKSHEET

NAME:

PERIOD:

SCIENCE INVESTIGATION ASSESSMENT STANDARDS 1.0, 5.0

PURPOSE:

HYPOTHESIS:

EXPERIMENT:

a. MATERIALS LIST:

b. SKETCH:

c. PROCEDURE:

d. VARIABLES:

i. CONTROLLED:

ii. UNCONTROLLED:

DATA:

CONCLUSION:

a. What happened?

b. Does this agree with my hypothesis?

c. Real-world application:

GREEN SCHOOLS CLASSROOM LIGHTING SURVEY

[L.M. = Light Meter]

DATE & WEATHER	CLASS-ROOM # & TEACHER	L.M. READING, NO LIGHTS, AWAY FROM WINDOW	L.M. READING, NO LIGHTS, NEAR WINDOW	L.M. READING W/ LIGHTS, AWAY FROM WINDOW	L.M. READING W/ LIGHTS, NEAR WINDOW	SURVEY-ORS