

ASSESSING THE SCHOOL'S LIGHTING LEVELS

*Taken from the Green Schools Tool Kit Manual to be used in conjunction with the tool kit

Objective: Students will use a light meter to determine whether the school is appropriately lit.

Suggested Grade Level: 5 – 8

Equipment:

- Light meter*
- Building code lighting specifications for the community in which the school is located

* From Green Schools Tool Kit

BACKGROUND INFORMATION

The level and quality of a school's lighting can have a direct impact on learning. When rooms have dull, gray light, it is difficult to see and to learn.

The amount of light needed for a task depends on a number of factors, including:

- The age of the person doing the task. The younger the person, the less light is needed.
- The speed with which the task is to be done. The slower the task can be done, the less light is needed.
- The size of the item or the task. The larger the item, the less light is needed.
- The amount of contrast between the item and the background. The greater the contrast, the less light is needed.

Experts have calculated what the lighting levels should be for each type of room in a school or business. These levels are specified in building codes that are followed by architects as they design a facility.

Typical light levels for various areas are:

Corridor and Stairways	10-20 foot-candles
Conference and Reception Areas	20-75 foot-candles
Classrooms	50-75 foot-candles
Restrooms	15-30 foot-candles

When using the light meter, put the meter at the surface level where the work takes place. For example, in the hallway, meter readings should be taken on the floor because that is where the work (walking) takes place. In the classroom, readings should be taken on the desk because that is where the work (reading) takes place.

LEADING THE INVESTIGATION

Follow the investigation as described on the student page, conducting it as a class demonstration or in small student groups.

FOLLOW UP

- Discuss the results of the investigation. If there is room for improvement in the lighting or energy use, what might the class recommend? For example, if students removed one light bulb or tube out of each fluorescent fixture and light levels remained within standards, the class may recommend leaving it like that.
- If students recommended removing light bulbs, they can calculate how much energy would be saved. For example, if they recommend removing 27 light bulbs rated at 34 watts each and these lights are normally operated 200 hours per month, they would multiply: $34 \text{ watts} \times 27 \times 200 \text{ hours} = 183600 \text{ watt hours}$, or 183.6 kWh (kilowatt hours).
- From their calculation of kWh savings, students could calculate the monthly dollar savings by multiplying that number by the local rate of electricity per kWh. They could also calculate the amount of savings in emissions. National average figures for emissions are:
 - 1.23 pounds carbon dioxide (CO₂) per kWh
 - 0.016 pounds sulfur dioxide (SO₂) per kWh
 - 0.007 pounds nitrous oxide (NO_x) per kWh
 - 0.043 milligrams mercury (Hg) per kWh

Your state office of energy or environmental services may be able to provide you with numbers specific to your state.

Assessing the School's Lighting Levels

Question

Does the current lighting in specific areas of the school meet or exceed what is considered adequate for these areas?

Your prediction:

Equipment

- Light meter
- Building code lighting specifications for the community in which the school is located

Procedure

1. Use the light meter to measure the light levels in a variety of rooms and hallways around the school, for example classrooms, bathrooms, foyers, and offices. Record your findings on the back of this page.
2. Compare the measured light levels to the levels required by your state codes. How do the light levels at the school differ from the code requirements?
3. If you have time, you may want to change the parameters and repeat the measurements. For example, you might measure the light under different conditions (a sunny day, a cloudy day, or at night). Or, you might ask your teacher to have the custodian remove one light bulb or fluorescent tube from each fixture in a classroom; then repeat the measurements.

Analyzing the Data

Take a look at the data you have collected and see if there are any trends or patterns. Consider the collected data and compose a list of recommendations.