



WISCONSIN 4-H YOUTH DEVELOPMENT TECHNOLOGY DOTS Lux Meter

Activity Plan



Project Skills or Goals or Objectives: Understand how to use a Lux meter and be able to compare natural and artificial light sources.

Life Skills: Digital Literacy, STEM

Grade Levels or Audiences: 4th – 12th grade

Time or Length of Experience: 2-3 hours

Supplies Needed: Mastech MS6612 Digital Lux Meter
Worksheets for Light Investigation
Writing Utensil

Sources: Photo: DOTS participant
US Dept. of Energy

Developed by: Justin Hougham and research naturalists

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BACKGROUND

Technology has been integrated into education in a variety of ways to deepen learners' educational experiences. Through the Digital Observation Technology Skills (DOTS) program, learners use technology to experience the outdoors and identify elements and processes of the natural world. One of the tools used to make these connections with nature is the Lux Meter. The purpose of this tool is to record lumens: a measure of the total amount of light emitted from a source. The tool then converts this into a lux reading: the amount of light output in a given area. (1 Lux = 1 Lumen/meter squared).

USING THE LUX METER

1. Remove the cap from the opto-sensor at the top of the meter.
2. Turn on the Lux Meter by pressing the power button.
3. The opto-sensor of the meter should be exposed to light for 1-2 minutes before measurement.
4. After 1-2 minutes have passed, begin pointing the meter where you would like to measure the light output of the given area.
5. Be sure to keep the user's shadow out of the opto-sensor's detection.
6. The measurement will stabilize after holding the meter as still as possible with the top of the opto-sensor sphere directly under the light source.
7. Push the hold/zero button briefly to freeze the reading to be recorded. Holding the zero button for too long will cause the meter to calibrate, which should only be done with the opto-sensor cover on. If the meter is zeroed accidentally, turn off and turn back on.
8. The max/min key can assist the user reading the maximum and minimum values during inquiry. Press this key once to toggle between max/min. Press and hold max/min for one second and the max/min value inquiry mode will exit.
9. To turn off the Lux Meter, press and hold the power button.

LEARNING ACTIVITY

This activity is ideal for students in groups of 1-3.

- Use the Lux meter to find brightest spot around you. Record measurement.
- Use the Lux meter to find darkest spot around you. Record measurement.

Write down why the spots you found were bright or dark.

- Take one more measurement each of an area that could be brightest or darkest. Record measurements.

Looking at the chart on the worksheet, measure the lux of at least three of the places listed on the chart (e.g. office, hallway, classroom, auditorium). Record measurements in the "actual" column.

Give the students time to discuss the answers to the remaining 3 questions on the worksheet.

Facilitate a share-out to the whole class, using each of the 3 remaining questions as prompts (one question/answer shared per group), or pick the questions for the class to answer together.

REFLECT AND APPLY

Questions to ask include:

1. How could you use this tool in your life?
2. What questions could you answer by using this tool?
3. Can you think of any scientific studies that you could conduct by using the Lux Meter?
4. What jobs would benefit from having this tool?

MORE INFORMATION

Lumen is a measurement unit which tells what the total amount of light emitted from a flashlight or headlamp is. You can generalize that the more Lumens, the brighter the light. Lumens measure the total amount of light output. For example, the flashlight of a smartphone provides about 20 Lumens, while the headlight of a vehicle provides about 1500 Lumens.

Lux is a unit of light measurement where the area is also taken into account, and $1 \text{ Lux} = 1 \text{ Lumen/m}^2$. Measuring Lux enables us to measure the total amount of visible light present and the intensity of the illumination on a surface.

A Lux Meter can be used for many circumstances in which illumination needs to be measured. Imagine being a photographer and looking for the best conditions of photographing a person's portrait, or using a Lux Meter as you walk around a potential home or office space you plan to buy, making sure the amount of natural light in the space meets your expectations for use. The Lux Meter in the DOTS Kit can be used in many inquiry investigations including greenhouse growing conditions, stream and riparian ecosystem studies, and energy auditing of indoor space.

Light Investigation

1. Use the Lux Meter to find the brightest spot around you:

_____ Lux

Where? _____

2. What is causing this spot to be bright/illuminated?

3. Use the Lux Meter to find the darkest spot around you:

_____ Lux

Where? _____

4. What is causing this spot to be dim?

5. How do the Lux readings you measured differ from the recommended amounts?

6. Are any of the actual readings higher than the recommended readings? If so, describe the natural light in the area and the artificial light in the area.

Area: _____

Natural light sources:

Artificial light sources:

7. What else did you notice while using this tool?

8. If you were an energy auditor of your school, what would you investigate with the Lux meter tool?

Recommendations based on Illuminating Engineering Society of North America Handbook.

AREA	LUX (recommended)	LUX (actual)
Hallway	150 – 300	
Classroom	350 – 500	
Auditorium	50 – 100	
Office	400 - 500	

Source: Energy Audit Lesson Resources, National Renewable Energy Laboratory, U.S. Dept. of Energy, <https://www.nrel.gov>