

Measure the Distance from the sun with Vernier light sensor

Setting: Whole group in the classroom. Classroom teacher and ITRT

Materials: Student report, Computer, Logger lite software, Light sensor, table lamp with 60 watt bulb with the bulb exposed.

VA SOL's:

Science: 4.1 Scientific Investigation, 4.3 Force, motion, and Energy, 4.7 Earth patterns

Math: 4.7 Measurement, 4.14 Interpret data

Major understanding:

In this investigation students will explore how the amount of light from the sun differs on the planets as the distance away from the sun increases. Using a scale model of the solar system, conclusions can be made about how light travels and a planets ability to support life.

Assessment: student report

Extracted lesson plan from Vernier:

"Distance from the Sun"exp. #32

Have you ever thought about what it would be like if you were on another planet looking back at the sun? In this activity, you will use the Light Probe to get an idea of how much light the planets would receive.

OBJECTIVES

In this activity, you will

- Make a simulation of the planets of our solar system to scale.

- Measure the amount of light from a light source at different distances.
- Draw conclusions about conditions on other planets.

MATERIALS

computer with Logger Lite software installed
Go!Link interface
TI Light Probe
meter stick
Table lamp with 60 watt bulb
tape and marking pen

PROCEDURE

Part I Marking the Distances of the Planets

1. Make sure the Light Probe is connected to the Go!Link and that the Go!Link is connected to the computer.
2. Start Logger Lite on your computer.
3. Now you will use the meter stick and tape to make a scale model that shows the relative distances of the planets from the sun by following the steps below:
 - a. Put 0 cm end of the meter stick at the light.
 - b. Measure 10 cm from the light and mark the place with a piece of tape labeled "Mercury". In this model, 25 cm is one Astronomical Unit, or AU. One AU is the distance from the Sun to the Earth. All of the other planet distances are compared to this distance between Earth and the Sun.
 - c. Measure 18 cm from the light. Mark this place with a piece of tape labeled "Venus."
 - d. Continue marking the distances from the sun to the planets, using the Table of Distances, below.

Table of Distances		
Planet	Distance in meters	Distance in AU
Mercury	0.10 m (10 cm)	0.4 AU
Venus	0.18 m (18 cm)	0.7 AU
Earth	0.25 m (25 cm)	1 AU

Mars	0.38 m (38 cm)	1.5 AU
Jupiter	1.25 m (125 cm)	5 AU

Part II How Much Light Would Each Planet Get From the Sun?

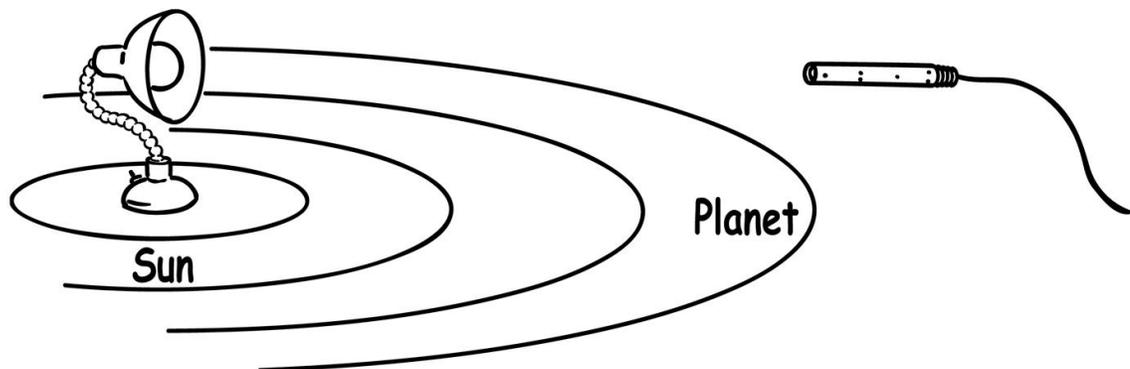
Key Question

How does the light level change when you get farther away from the sun?

Prediction

Click the Prediction button, , and draw how you think the light level will change as you increase the distance between the Light Probe and the light bulb.

4. Turn the lamp on, and then darken the room as much as possible.
5. Collect data by following the steps below:
 - a. Decide who will hold the Light Probe and who will enter the data into the computer.
 - b. Click to begin data collection.
 - c. Put the probe at the position where Mercury is located in the model so the probe is pointing towards the lamp.
 - d. Look at the live meter on the computer screen, showing what light level is reaching the probe. Move the tip around a bit to get the highest reading you can.
Careful: Make sure you are still pointing towards the lamp!
 - e. Click to save this data point.
 - f. In the box that appears on the screen, enter in the value for the planet location in AU based on the table above (for Mercury this value is 0.4) and then click .



6. Repeat Step 6 for each of the planets in the model.

7. When you have collected all your data, click to end data collection.
8. Write your observations on the Observations Sheet below.

Observations Sheet
Write observations about how the light level changes as you move away from the sun.

ANALYZE YOUR DATA

1. Use the data from your graph to describe the light levels of the first five planets.

2. Write about two ways that we on Earth depend on the sun.

3. Imagine you have traveled to one of the outermost planets. Write a sentence that describes what the sunlight on the planet might be like and how the sun would look from that planet.

4. Imagine that we are going to try to begin a colony on another planet. Using what you know about how we on Earth depend on the Sun, and your data from this activity, describe what you would need to make the colony a place where humans could survive.

Good job!!