Investigating Environmental Science through Inquiry

4th Edition

ESI

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(x) optional sensor

		Temperature	Relative Humidity	Soil Moisture	pH	Conductivity	UVA/UVB	Voltage	Current	Dissolved Oxygen	Turbidity	Light	CO_2 Gas
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(x) optional sensor

PRELIMINARY ACTIVITY FOR
A Local Weather Study

Weather is simply what is happening in the atmosphere at a particular place at a particular moment. *Climate*, on the other hand, is the average weather in an area over a long period of time. In this experiment, you will make weather measurements and investigate factors that influence weather and climate.

In the Preliminary Activity, you will gain experience measuring temperature, relative humidity, and UV radiation.

After completing the Preliminary Activity, you will first use reference sources to find out more about weather before you choose and investigate a researchable question. Some topics to consider in your reference search are:

- weather
- climate
- relative humidity
- rain shadows
- solar radiation
- hydrologic cycle

PROCEDURE

1. Go to a web site, suggested by your teacher, which gives the local weather for your school area. Note the displayed weather characteristics and their units.

2. Connect a Temperature Probe and a Relative Humidity Sensor to the data-collection interface.

3. Note and record the displayed values.

4. Disconnect the Temperature Probe and the Relative Humidity Sensor from the data-collection interface. Connect the UVB Sensor to the interface.

5. Use a ring stand and a utility clamp to suspend the UVB Sensor aiming directly at the sun. When it is aimed directly at the sun, its shadow is a small round circle. **CAUTION:** *Do not look directly at the sun*.

6. Note and record the displayed reading.

QUESTIONS

1. Describe the location where you recorded your measurements. Include observations such as:
   a. Is the spot open? Are there buildings, trees, or other objects that could have affected your measurements?
   b. What is the ground cover like—soil, vegetation, asphalt, concrete, or other?
   c. Are there any living organisms in the immediate area?
2. Did the measurements of other groups differ from yours? Why?
3. How did your weather observations of the local weather compare with those of the web site?
4. List at least one researchable question for this experiment.

Experiment 13

PRELIMINARY ACTIVITY FOR Managing Garden Soil Moisture

Compost, aerobically decomposed remnants of organic materials, is commonly mixed into soil to improve soil fertility and water holding capacity. Grass clippings, leaves, sawdust, kitchen refuse, wood ashes, garden refuse, and shredded newspapers are just some of the common materials that are composted.

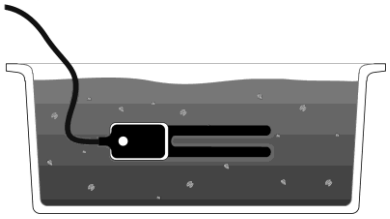
Mulch, in contrast, is placed on the soil surface. Mulch affects soil moisture by slowing evaporation, reducing weed transpiration, and reducing runoff. Grass clippings, leaves, sawdust, wood chips, straw, shredded newspapers, and compost are common materials used a mulch. Inorganic mulches, such as plastic sheeting, rocks, and gravel are also widely used.

Commercial *water absorbing polymers*, such as Soil Moist®, Stockosorb®, and Terra-Sorb®, are water management tools that purportedly reduce evaporation, water runoff, and soil erosion when mixed into soil.

In the Preliminary Activity, you will gain experience using a Soil Moisture Sensor and learn soil moisture measuring technique as you determine the soil moisture of a soil sample.

After completing the Preliminary Activity, you will first use reference sources to find out more about soil and managing soil moisture before you choose and investigate a researchable question dealing with the management of soil moisture. Some topics to consider in your reference search are:

- soil moisture
- compost
- mulch
- managing soil moisture
- soil
- water-absorbing polymers



PROCEDURE

1. Connect a Soil Moisture Sensor and the data-collection interface.

2. Obtain a soil sample.

3. Position the Soil Moisture Sensor. **Note:** The long axis of the sensor should be placed horizontally, with the short axis or "blade" oriented vertically as shown in the figure below.
   a. Use a thin implement such as a flat-bladed trowel to cut a slot in the soil.
   b. Place the sensor into the hole, making sure the entire length of the sensor is covered.
   c. Press down on the soil along either side of the sensor with your fingers. Continue to compact the soil around the sensor by pressing down on the soil with your fingers until you have made at least five passes along the sensor. This step is important, as the soil adjacent to the sensor surface has the strongest influence on the sensor reading.

4. Collect data.
   a. Start data collection.
   b. Stop data collection after the displayed readings have stabilized for 15 seconds.
   c. Determine the mean soil moisture value for the flat portion of your graph using the Statistics function. Record the value (in %).
5. When removing the sensor from the soil, **do not pull it out of the soil by the cable!** Doing so may break internal connections and make the sensor unusable.

QUESTIONS

1. What was the soil moisture value (in %) for the soil sample you tested in the Preliminary Activity?

2. Some material used for making compost, such as grass clippings, leaves, sawdust, and coffee grounds, are found nearly everywhere. Other desirable composting materials, such as grapevine waste and seaweed, are not available in all locations. List three materials used for making compost in your area that are not available in all locations.

3. Materials used as soil mulch vary from place to place. List three mulching materials commonly used in your area.

4. List at least one researchable question for this experiment.