Lesson Plans: Microclimate

Objective

The objective of this activity is to identify, measure, and average microclimatic temperatures in a particular region.

Materials

Each student or group of students will need the following:

- Large white piece of paper or chalkboard
- Pencils and erasers or chalk
- Thermometer

Important Points to Understand

Have you ever noticed how much cooler it is in the shade than in direct sunlight? Of course! Or how much hotter it feels to stand on pavement as opposed to a grassy patch of land? Temperature differences within a small area are indications of microclimates: very small-scale climate conditions. The following are a few examples of microclimatic variation:

- Dense, cold air sinking into the bottom of a valley can make the valley floor 20 degrees Celsius colder than a slope only 100 meters higher
- Winter sunshine can heat the south facing side of a tree (and the habitable cracks and crevices within it) to as high as 30 degrees Celsius, while the temperature only a few centimeters away from the tree is below freezing in a high latitude case, i.e., not in the Pacific
- The air temperature in a corn or wheat field can vary by 10 degrees Celsius from the soil to the top of the canopy.

Frogs, beetles, and other small animals experience temperature changes on even small scales (e.g., pockets of coolness formed by crevices in tree bark, the shade of a leaf, or moist soil beneath a rock). Such small-scale temperature variations might seem unimportant, but they help set the distribution and abundance.

Air temperature varies from one location to another (spatially) and from one time to another (temporally). For example, there are large variations in temperature with latitude (it is warmer at the equator and cooler at the poles) and over the seasons (it is warmer in summer and cooler in winter). Given these variations, how do meteorologists know what the planet's temperature is? Average global temperature can be determined by dividing the globe into a grid and averaging temperatures collected from weather stations in each cell of the grid. Local temperatures reported on the evening news and in daily newspapers are determined much the same way, but on a regional scale. The same principle of averaging temperatures to calculate a single temperature for an area can be applied to the classroom and the school yard.

Preparation

Discuss the difference between the following pairs of terms: climate versus microclimate; spatial versus temporal variation; climate versus weather. Give examples of each.

Temperature is a good example of an important environmental condition that might vary on a microclimatic scale. List other environmental factors which might vary on a relatively small, or microclimatic, scale.

Procedure

1. Working individually or in small groups, identify and draw a small-scale map of an area to be sampled (e.g., the classroom, playground, park, backyard).
2. Divide the map into a grid and identify potential locations for microclimatic differences (e.g., under shaded rocks, on the sunny side of a building, on blacktop versus a grass field).
3. Take thermometers to different locations identified on the map. Record the air temperature in these locations, making sure enough time is allowed for thermometers to acclimatise to their surroundings (approximately 5-10 minutes).
4. Record the data on the appropriate grid of your map, and calculate an average of all that you have collected.

Exercises

1. Compare the different temperatures on the map. Were temperatures relatively similar at all locations, or were there large variations? Is the average temperature closer to the maximum or minimum temperature recorded?
2. Repeat the experiment on a day when the weather is quite different (perhaps due to cloud conditions), and compare the results.
3. Can you identify some locations which are characterized by warmer or cooler temperatures than others?