Curriculum Connections

Exploring Schoolyard Microclimates

Cultivate Inquirers
Invite the class to brainstorm what the word "microclimate" might mean, then try to agree on a definition or description. (It refers to the climate of a small, local area that differs from the general climate because of differences in sun/shade, temperature, wind, or moisture.) Ask, *What factors might affect the climate in a given location?* Then have small groups investigate the school grounds, find places they think might have different microclimates, and describe each location. If they have measurement tools, encourage them to explore questions such as these: *Which is the warmest? Coolest? What might have caused the differences* (e.g., a building may provide shade and wind protection)*?* Other factors that can affect microclimates include manmade features (e.g., buildings or rock walls), geographic features (slopes), or living things (trees).

Take Soil Temperatures
Soil type and temperature is an important factor in plant growth. Invite students to explore soil in different spots in the schoolyard. *Is the soil temperature the same as the air temperature? Do some types of soil seem to warm up more quickly in the spring than others? What are their characteristics? How does soil temperature seem to affect plants?* After students use soil thermometers to compare temperatures of different types of soil, have them consider why variations occur. (Students may discover, for instance, that dark soil absorbs more heat than light-colored soil, or that wet soil remains colder than dry soil in the spring.)

Investigate Plant Preferences
Ask your class how they think different microclimates around the school might affect the growth of plants. Have them provide a rationale for their answers (for example, "Plants might grow more quickly in spot A because it gets more sun and moisture"). How might they test their hypotheses? A group of students could start several containers of one type of seedling using the same soil mix, container size, and so on, and then place each in a different location. They might track rainfall, soil and air temperature, and other factors, then chart the growth and development of plants in each site. *What can we infer about the effect of microclimate on plant growth? What other factors might have influenced the outcome?*

Did you know . . .?
The most important climatic and weather-related factors affecting plant growth are heat, sunshine, and water. The ideal amounts of these factors vary greatly from plant to plant.

Tracking Seasonal Changes (Phenology)

Springtime in temperate areas brings longer days (more sunshine), warmer temperatures, and rains. These factors, in turn, trigger sap to run, buds to swell and bloom, insects to hatch, and birds to migrate north. The term for observing and tracking these seasonal changes is **phenology.**

It all starts with the sun. As sunlight increases in the spring, plants break dormancy and start growing. Animals that eat plants soon appear. (In more arid areas, cooling temperatures actually trigger this greening.) Next, predators who feed on animals show up. (As plant begin to bloom, pollinating insects, birds, and other animals hatch, wake up, or return.) As light decreases and temperatures drop in the fall, the reverse happens. Plants adapt by re-seeding themselves or going dormant; some animals hibernate and others migrate.

As students attend to these changes in the schoolyard or larger environment, they become keen observers of the natural world, developing an understanding of natural relationships, recurring patterns, and the energy flow that fuels the cycles of life.

Observe Seasonal Signs

Whether it's weather or climate?
Weather is the stuff that happens outside the window, and changes on a daily basis. Climate, on the other hand, is the average weather conditions in a region over a long period of time. Your area might experience a week of dry weather, but a place that doesn't get much rain over many years has a dry climate.

Have students brainstorm signs that spring (or fall) is approaching, and then keep notes on related observations in the schoolyard, woods, or native plant garden. They might choose to focus on certain plants and set up a routine for collecting data on certain occurrences: buds opening, first leaves appearing, fall color changes, and so on. They should also be sure to note climatic factors, such as air and soil temperatures, precipitation, and day length, that coincide with changes in living things. Questions about animal "happenings" should also arise. For instance, *When do certain birds return or leave? When the Monarch butterflies return, how big are the leaves of its larval host plant, common milkweed? Does the appearance of bird and insect pollinators coincide with changes in plants?*

(Note: It's best to focus on how *native* plants respond to seasonal climatic changes. When gardeners water and fertilize garden plants, or use species that are not adapted to local conditions, they are less likely to see changes that are purely influenced by season and climate.)

Explore Planting Advice

Since different plants and animals tend to respond to seasonal changes in predictable ways, farmers traditionally took cues from nature to decide when to plant their crops. For example, some early settlers were told by native people in New England to plant corn "when the white oak leaves were the size of a mouse's ear or squirrel's footprint." Fact or fiction? These growers observed, rightly, that when oak leaves were about that size, the soil was warm enough for corn (and other warm-season plants) to germinate. In fact, farmers and gardeners today still use this kind of information.

Challenge students to keep track of seasonal and climatic conditions that coincide with each of the phenological events below (e.g., shadbush flowering), then determine ideal planting conditions (e.g., soil temperatures) for the corresponding garden crops. The class may also want to keep tabs on what's occurring with wild plants when they typically plant other garden crops, and create their own phenology-based planting tips.

- Plant potatoes when the shadbush flowers.
- When elm leaves are the size of a penny, plant kidney beans.
- Plant peas when daffodils begin to bloom.
- Plant corn when oak leaves are the size of a squirrels' ear.
- Plant morning glory seeds in the garden when the maple tree leaves are full size.

Testing Weather Lore

People have been observing and predicting the weather for centuries. Some of this weather wisdom, no doubt, has a scientific basis. Have students conduct Internet or library research, or interview parents and community members, to dig up some common weather-related sayings and/or generalizations used by weather forecasters. Ask the class how they might research or test the accuracy of these assertions.

Weather Sayings

- When the moon wears a halo around her head, she will cry before morning and the tears [rain] will reach you tomorrow.
- Expect rain when dogs chew on grass, sheep turn face first into the wind, and hogs are restless.
- Flowers close up as humidity rises so rain doesn't wash away pollen.
- You can tell the air temperature by counting a cricket's chirps. (If you count them for 14 seconds, then add 40, the total should be within 1 degree of air temperature.)
- When the leaves of trees turn over, it foretells windy conditions and perhaps severe weather.
- Dew on the grass, rain will never pass.
- If the woolly worm's head is more black than colored, the coldest part of the winter will come in the first months of winter.

Weather Generalizations

The weather will remain fair if . . .

- the wind blows gently from the west or northwest

- smoke rises and disappears
- the barometer rises or stays steady

A storm may be brewing if . . .

- the barometer drops quickly
- birds aren't as active as usual
- the wind shifts direction

(Students may want to create their *own* weather and gardening sayings based on their unique weather observations.)