This month . . .

Making Weather-Tracking Tools

Measuring Changes, Sleuthing Seasons, Testing Lore

Weather: sometimes we don't like it, but we certainly can't live without it. The general climate and more immediate weather affect how we live and what we eat. But that's not the half of it. These factors also influence the livelihoods of all the players, plant and animal, in the web of life.

Since weather is ever-present in schoolyards and gardens, why not learn to observe and make sense of it? School gardeners have good reason to be in tune with the weather. They need to know when conditions are right for seeds and transplants, when to protect tender transplants from frost, and when to provide "rain" when Mother Nature doesn't. What's more, by observing, measuring, and describing weather, they can think and act like scientists, looking for patterns, making sense of data, and predicting what the future will bring, meteorologically speaking!

Your weather sleuths might test some conventional (and more far-out) weather wisdom: that dandelion blossoms close before a rain, for instance. Or they might explore seasonal changes that are influenced by climate and weather. When do different birds migrate? Do tulips open at the same time in Arizona as in Kansas?

If you want to cultivate keen observers who use data to forecast weather changes and apply what they learn to better understand gardening and natural cycles, consider having them create some of the measurement tools described below. Also review the Curriculum Connections for more suggestions on how to integrate weather and seasonal investigations into your classroom and curriculum.

Materials

- **Rain gauge:** container (coffee can, clear glass jar, or clear plastic bottle); homemade or standard ruler or straw.
- **Barometer:** coffee can or large glass jar, balloon material or plastic wrap, rubberband; 1 or 2 clear straws, glue or tape, piece of paper or index card.
- **Hair hygrometer:** 9” x 12” piece of heavy cardboard, one piece of human hair about 9 inches long, 2 thumbtacks, 1 piece of oaktag or thin plastic, scissors, ruler.

Making Weather-Tracking Tools

Consider creating a schoolyard weather station that houses a variety of weather measurement tools. You can protect them with a wooden or plastic weatherproof box. Here are a few suggestions for simple devices your students can make. Visit the Resources section for links to more tool-making instructions and commercial products.

Gauge the Rain

Since water is vital to plant growth (the rule of thumb is an inch a week for garden plants), your young growers should be able to keep tabs on rainfall. Here's how:

1. Challenge your students to come up with suggestions for building a rain gauge to track the amount of precipitation in a given time period. First, they'll need a container for collecting rainwater, such as a coffee can, clear glass jar, or flat-bottomed clear plastic bottle. (On the latter, they should cut the top off and invert in to form a funnel.)

2. Container in hand, your young scientists will need way to measure collected rain. One method is to mark a clear plastic straw with inches or centimeters (and fractions), and insert it to the bottom of the container once a week. By putting a finger on top of the straw and withdrawing it, students will be able to read the rainfall depth. Students might also make a tagboard ruler, cover it with clear cellophane, and tape it upright inside your glass jar, or simply attach a plastic ruler. Attach your rain gauge to a post or outside or your weather station. (It is, after all, the one tool you *don't* want to keep under cover!)

Explore!
Although a set amount of rain may fall in your garden or schoolyard in a given period, not all plant roots will have the same access to it. For instance, water drains more quickly through sandier soils than through loamy or clay soils. Also, in a heavy downpour, much of the water that falls can run off the soil surface before soaking in. Rain that falls on planting beds that receive full sun may evaporate more quickly than water that falls on a shady spot. Encourage your investigators to observe the relationships among plants, water, and other environmental factors, and conduct tests or research to answer questions that arise.

Create a Barometer (feel the pressure)

If your classroom scientists want to predict when their gardens and habitats might see some rain, they should tune in to air pressure. In general, high pressure means that clearing or fair weather is in store. Decreasing air pressure often indicates that clouds and precipitation are looming. Here's how to make a simple barometer:

1. Stretch a layer of balloon material or plastic wrap over the top of your jar or coffee can to form a membrane. Secure it with a rubber band, ensuring that there is a good seal so the can is airtight.

2. Place a straw horizontally across the top of the container with about two-thirds of it on the container. Glue or tape the straw to the stretched membrane. (To observe more exaggerated movement of the straw as air pressure changes, tape another straw to the end of the first one.)

3. Next, challenge students to figure out how to record the straw's movement. They might tape an index card to the can and record the location of the straw daily, place the barometer near a sheet of paper on a wall and record the straw's movement on the paper, or create a setup like the one pictured above, which was designed by elementary students in California.

Explore!
What's happening? High pressure makes the balloon or plastic wrap cave in so the end of the straw will go up. Low pressure causes the membrane to puff out so the end of the straw will lower. Challenge students to track changes in air pressure over time and look for related patterns of changes in weather or in living things (including themselves!) How accurately can they predict storms using their barometer?

Build a Hair Hygrometer

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Seasonal Sleuths: Investigating Weather

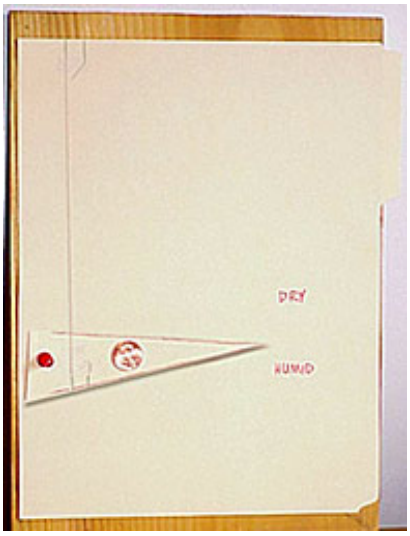
Seeking Climatic Clues

Transplant Countdown

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.

Did you ever notice that humidity and "bad hair days" sometimes go hand-in-hand? When humidity increases, the length of hair strands also increases. (Typically, straight hair goes limp and curly hair frizzes!) Scientists in 1783 used that concept to create a cool tool — a "hair hygrometer" — for measuring changes in humidity. Here's how your students can make one:



1. From the piece of oak tag or thin plastic, cut a triangular pointer about 6 inches long (see illustration). Cut two slits at the bottom of the pointer about 1 inch from the left edge. Tape or hot glue a dime onto the triangle about 2 inches from the pointer's left edge.

2. Cut two slits on the cardboard's top edge about 1/4 inch apart and 1 inch from the left side.

3. Attach the pointer to the cardboard with a pushpin. Place it about 1/2 inch from the left edge and about 3/4 of the way down the side.

4. Attach the hair strand by sliding it through the 2 slits at the top of the cardboard and those at the bottom of the triangle. Use tape or hot glue in both sets of slits to keep the hair in place.

5. Push the pin through the pointer hole so the hair is slightly stretched when the pointer is horizontal. Wiggle the pointer up and down to make sure it can move freely. (The hair should hang vertically and the pointer should be horizontal.)

6. The pointer on your hygrometer is now set to show changes in humidity. When there is a lot of moisture in the air (high humidity), the hair gets just a little bit longer. That makes the pointer droop lower. When the air gets drier (low humidity), the hair gets a little bit shorter and the pointer goes higher.

What does humidity have to dew with it?

Humidity is the amount of water vapor in the air. Warmer air can hold more water vapor than cold air. The more vapor, the higher the humidity. (The amount of water vapor in the air compared with the maximum amount of water vapor that the air *could* hold at a one temperature is called the **relative humidity**.)

Why should your school gardeners care? When humidity is low, plants tend to dry out faster. More important, low humidity and frost can go hand in hand. When night skies are clear (with no clouds to act as a blanket), the earth loses heat. When the air cools to the point where it can no longer hold water vapor, the vapor condenses and forms dew. If the air temperature is below this "dew point" and below freezing, frost occurs. (Invite students to find the dew point from the weather forecast, and then predict when frost is likely to bite their precious plants.)

Explore!

Consider having students check relative humidity on the computer or radio for several days. Each time, they can draw a line at the tip of the arrow on their hair tool and write down the actual humidity.

Here are some questions your weather sleuths might investigate: *Does the air feel different when the humidity changes? Do we notice any related changes in plants? Is there a relationship between shifts in*

humidity and the general weather? How do nighttime air temperatures, humidity, and the occurrence of dew or frost relate to one another? How do classmates' hairstyles vary with changes in the humidity?

More Weather-Related Tools

Compass - If students want to track wind direction or plant certain things on the south side of the garden, they may want to create their own compass.

Anemometer (wind speed indicator) - These wind speed tools are great fun to make and use. Your young wind watchers may also enjoy using the Beaufort wind scale to determine approximate wind speeds, or create their own schoolyard measure.

Sun Clock - It's not exactly a weather tool, but it can help students learn about compass directions, sun movements, and shadows as they prepare to design and plant a garden. (By learning compass directions, for instance, students will be able to plant tall crops on the north side of the garden so they won't shade shorter ones.)

Maximum/Minimum Thermometer - Your kids can use this tool to keep track of nighttime lows and daily highs. It's particularly useful for those who garden in greenhouses and other structures where temperatures can reach extremes. (Another device that every gardener should have is a soil thermometer.)

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