How can you tell the speed of the wind?

Teaching and Learning Focus

To introduce students to ideas about wind and wind speed, they first need to understand that air can move from one place to another. It is easy to see this close up - just fanning the face, for example. Because air is invisible, getting some measure of wind speed is more complex. You can time a person running, or read the speedometer of a car moving along a highway, but measuring wind speed requires some methods that are less familiar. For the purposes of formal weather forecasting, wind speed is measured using an anemometer (see below). The wind pushes the cups in a circle, and the number of turns corresponds to the wind speed.
One way to measure wind speed is by observing its effects on objects. In 1805, a British naval officer named Sir Francis Beaufort developed a wind speed scale that refers to the movement of objects. The Beaufort Scale is a good way to introduce your students to the concept of wind speed. You may want to show students pictures of the instruments used by professional meteorologists as they collect weather data.
Ask your students to recall how they found that air is a material that fills the spaces around us. Remind them that they saw how the air supported objects like small paper planes and how air filled a soft balloon, making it expand and grow harder to the touch.

Materials Needed

For each group of students:

- Clipboards and pencils
- Copies of the Beaufort Wind Scale (use downloadable blackline master)

Safety

This investigation question is considered generally safe to do with students. Please review the investigation for your specific setting, materials, students, and conventional safety precautions.

Presenting the Investigation Question

Introduce your students to the investigation question: "*How can you tell the speed of the wind?*"
Have your students discuss the question in pairs, then in groups, and then as a whole class. Record their answers on the flipchart.
Have your students brainstorm ideas about how this investigation question could be investigated.

1. Design an experiment that could be used to test the investigation question.
2. What materials would be needed?
3. What would you have to do?
4. What would be measured?
5. How long would the experiment take?

Assessing What Your Students Already Know

Have your students discuss the investigation question, first in pairs, then groups and then as a whole class:

- How much do they already seem to understand about wind speed?
- What ideas do they have about how the speed of wind could be measured?
- Which of these ideas can be tested?

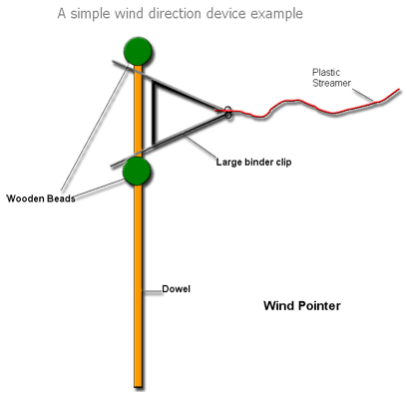
Now ask them:

- What are some of the ways you can make air move?
- How can you show that air moves? (*Students might suggest things like blowing a feather or fanning with a piece of cardboard.*)
- If they can't see the air, how can we tell if it is moving quickly or slowly? (*After all, if you are running, I can see how quickly you are going.*)
- Provide a variable speed electric fan. Turn it on low, then medium, then high. Have your students close their eyes and tell you how it feels on their faces at each setting.
- Next, ask students to open their eyes while you repeat the settings. What did they see? (*Hair blowing, clothes billowing, papers flying off desks, etc.*)
- Finally, ask your students to imagine that they cannot hear or see the fan. What clues tell them where the fan is in the room? (*The direction in which objects were blowing.*)

Tell the students that in this investigation they are going to learn to describe the way air moves outside. Tell them they will be making observations of wind speed and direction, and that these are important when we describe the weather conditions. They will record both of these observations on the daily weather charts.

Exploring the Concept

1. Take the class outside to make observations about wind speed. (*You may have to wait for a windy day - or at least for a day with some air movement for this first field observation*). Have your students make their observations at some distance from the building to minimize the building's effect on the flow of air.
2. Encourage the students to use the type of environmental descriptors given on the Beaufort Scale, but without making direct reference to the scale. (*If no column of smoke is available and the air feels very still, ask the students to suggest other indicators of calm or light air movements. Suggest looking at the school's flag or the way their loose clothing or long hair reacts. If wind chimes are available in the area, what do the students hear from the chimes? Ask if they feel air moving on their faces. Let them drop dry grass or bits of leaves to see how they are moved by the wind as they fall--don't use whole leaves as they will tend to flutter regardless of the wind speed and may be confusing. Tell the students that you will add these suggestions to the Wind Scale when you return to the classroom*).



3. If there is a significant breeze, ask the students if it is constant or if it comes in spurts or gusts. Turn their attention to the behavior of the trees in particular. (*They will find that the wind often starts at a slow speed-making leaves rustle--and accelerates to moderate--making small branches move. Scientists reporting wind speeds generally note the highest speeds observed. For example, "Wind gusts up to 20 miles per hour"*).

   Ask the students about other things they observe when the wind is at the "moderate breeze" level. (*They might suggest how the flag flaps, how their clothing billows, how their faces feel cold, how the dust from the road blows, how small pieces of trash fly about and so on.*)
4. Ask the students to imagine a very windy day, maybe even one where winds could damage things. How might they describe the movement of objects in the environment on such a day?
5. Return to the classroom and write some of their observations on sentence strips or large paper. Have the students suggest how those observations can be sequenced to show wind of increasing speed.
6. Have your students study a copy of the Beaufort Wind Scale. They should quickly see that it provides an estimate of the

wind speed using indicators like smoke columns and tree movements. Be sure that the students understand the descriptors given on the table. Show the students that you have left extra room to write more descriptions in the last column. Have the students add their own observations in the third column where they think they match the speed given on the Beaufort Wind Scale.
Adobe PDF (16 KB) | Word Document (49 KB)

Applying Students' Understanding

To assess your students understanding of wind speed, ask them to think of different wind situations:

- How can high wind speed can be a problem for humans? (*Students may cite tornadoes, hurricanes or dust storms. Some may suggest situations where wind affects airplane flights, or sporting events--like golf or tennis--that are difficult in strong winds*).

lightning storm

Image not found or

Left to right: Lightning storm approaching; Windmills in Tehachapi, California
Left to right: Courtesy: NOAA; © Michael Collier

- Are there situations where too little or no wind is a problem for humans? If so, what examples can you give? (*Some students might suggest recreational activities that depend upon wind such as sailing, para-gliding or kite flying. Others may suggest that having little wind makes a hot summer day difficult to stand and is a sign that the weather will not be changing soon. Yet others may suggest that machines that depend upon wind, such as water windmills or wind energy generators, may not work*).

Revisiting Investigation Question 1

Complete this investigation question by asking your students to reflect on "How can you tell the speed of the wind" and how their answers may have changed as a result of what they have learned.

Weather Unit Sections