

## How can you tell the direction of the wind?

### Teaching and Learning Focus

Understanding that air comes from different places at different times is quite difficult to appreciate. However, wind direction, like wind speed, is an important part of weather study and forecasting. In this investigation, your students will design and build their own wind vane to help make observations about wind direction.

### Materials Needed

For each student group:

**For wind vane shown in diagram:**

- Wooden dowel, about 1 meter (3 feet) long and 2.5 mm ( $\frac{1}{4}$  inch) diameter
- Wooden bead that slides onto the dowel, but stays in place\*
- Wooden bead that fits snugly on the end of the dowel\*
- Large binder clip
- 60 cm (2 feet) strip of lightweight plastic material cut from a plastic trash bag
- Wood glue to hold the beads in place
- A simple magnetic compass

\* tape, clay or glue can be used to adjust the fit of the beads if necessary

**For student designed wind vanes:**

a range of craft materials such as:

- String
- Safety scissors
- Masking tape
- Paper clips
- Construction paper
- Poster-board
- Aluminum foil
- Empty plastic bottles
- Cotton balls
- Small and medium plastic cups
- Thumb tacks
- Rubber bands

### 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: "*Where is the wind coming from, and how can you tell?*"

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, then as a whole class:

- How much do they already seem to understand about wind direction?
- Do they understand that wind they observe comes from somewhere and moves on to somewhere else? *(Some students may not have considered this possibility. They know there is wind, but not have thought about air traveling from place to place).*
- Are your students aware that the winds they experience can come from different directions at different times? *(You cannot assume that all students know this. To some wind will simply be wind and they may not have ever noticed that it comes from different directions).*
- Have any of your students seen wind direction indicators or devices? *(Students whose families own and use sail boats may have seen the wind indicator flags at the top of the sail mast. Similarly, students with experience of light aircraft airports may have seen a wind sock. Still others may connect this with flags or wind vanes, but most may never have noticed wind indicators).*
- Do your students have a working understanding of compass directions? Do they know that North and South are opposites as are East and West? Do they know what a compass is and how to use it to identify directions? *(It may be that many of your students have never seen or used a compass - those that are familiar have probably learned this through Boy and Girl Scouts and similar organizations. You may need to devote some time to ensure your students gain this understanding).*

## Exploring the Concept

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1. Give your students a copy of the compass drawing, which already shows where North is. Have them mark where they think South, East and West should be. *(This will show you how well, if at all, your students understand compass directions. If some do not, then spend time helping them see how it works. You can use a globe to show the main four compass directions. You can also help them see that in the mornings we always see the Sun in the East, and at dusk it is in the West. If necessary, have them complete the compass diagram a second time to reinforce the concepts.)*
2. Take your students outside and, using a compass, have them figure out which direction is North *(you may be able to pick a landmark as a general guide for later reference).*
3. Once North is agreed upon, have your students figure out which direction faces South, then East and West. *(You could mark this in the school playground or sidewalk using chalk).* Tell the students that wind direction is typically reported in terms of the direction it is blowing from rather than the direction it is blowing toward.
4. Back in the classroom, ask students to design a hand-held device that could be used to show the wind direction. They should sketch their idea, and then check it with you before making it. Ask them to be prepared to demonstrate their devices within a specified time period. *(You can let your students go on this. It might be good to have them work in teams--like a science fair approach--and they could use homework time to plan and experiment with their designs. Ask them to show you their designs before they actually build their devices. This will give you an opportunity to assist them and also assess their thinking. If you want to introduce a slightly more complex challenge, tell them the device should also show where North is).*
5. Allow students to test their devices. They should strive to improve their designs through this testing phase. *(Your students may need to explore with their designs, to see what works and what does not. This, of course, is what scientists and engineers do in the real world).*
6. Have your students prepare to demonstrate their devices. You can call it "The Wind Direction Device Challenge". Designers should prepare an explanation of how they developed their device (ideas, problems, solutions, etc.) to accompany their demonstration.

## Applying Students' Understanding

You can use "The Wind Direction Device Challenge" for this purpose. Have groups stand widely spaced on the schoolyard, well away from building, while holding their wind pointing devices above their heads.

For each device, have students observe it in operation and ask these questions:

- What part of the device shows the wind direction?
- What will happen if the wind blows from a different direction?
- Can the device tell how strong the wind is?
- Does the device tell from which compass direction the wind is coming?
- How could the device be improved?
- How could ideas from this device be combined with those of other groups?
- How does the wind pointer device help to describe the wind speed? (*Students should be able to notice variations in how the device behaves in different wind speeds. They can draw what their pointer looks like in still air, moderate breeze, strong breeze and so on. You can now have your students add another key observation to their Beaufort Wind Scale tables*).

### Using the Weather Station to Gather Data

Each day, your students can add wind speed observations and wind direction observations to their weather charts along with temperature. Later they can add precipitation (rain, snow, sleet and hail) , cloud cover and cloud type to their weather charts. Help your students understand the importance of collecting observations at the same time and in the same place each day.

## Revisiting Investigation Question 2

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

## Weather Unit Sections

Introduction

Air

Temperature

Wind

How can you tell the speed of the wind?

**How can you tell the direction of the wind?**

Revisit the concept of Wind

Clouds

Weather

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