MOSH CONNECT EDUCATIONAL ACTIVITY

DIY ANEMOMETER

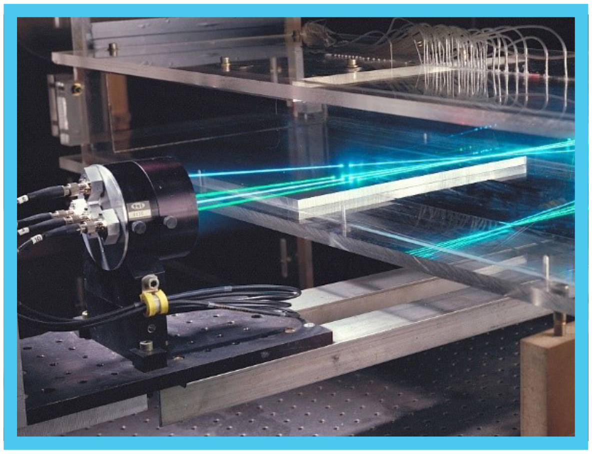
Learning Goal

Construct your own anemometer; then, observe and record approximate wind speed in your area over time, and assess how the time of day may or may not affect wind speed in your area.

The **Trade Winds** – and the speed at which they travel through Earth's Atmosphere – play an essential role in the El Niño Southern Oscillation (ENSO). When the Trade Winds speed up during La Niña, due to cooler water at the surface of the Pacific Ocean and higher air pressure in the upper atmosphere, they push warm, wet weather farther west. When the Pacific Ocean is warmer at the surface during an El Niño phase, Trade Winds weaken and slow down due to lower air pressure in the upper atmosphere.

While the ENSO cycle flips between fast and slow Trade Winds over the course of several months and years, smaller-scale changes in daily wind speeds can occur in your own backyard as the local weather changes. An **Anemometer** is a device that allows scientists to measure the speed of wind, and it turns out that these devices are quite easy to make and use on your own! There are many different types of anemometers, each specialized for different environments and weather conditions. This experiment will involve a **cup anemometer**. This is a basic measuring device, while newer, more accurate anemometers can make use of lasers and ultrasonic technology.

▼ Laser Anemometer used in a Doppler Radar.



◀ A cup anemometer is commonly called a **Robinson anemometer**. It uses cup-like shapes to catch the wind, causing the device to spin. How many times it spins in a given time interval can tell you how fast the wind is moving.

DIY ANEMOMETER, PART I: CONSTRUCTING YOUR ANEMOMETER

Materials:
5 Small Paper Cups, Hole Puncher, Scissors, Tape, 3 Thin Wooden Dowels, Skewers, or Sticks, Empty Water Bottle, Stopwatch or way to tell time

1. Use the hole punch to make a hole in the side of each of the 4 paper cups.
2. Use the hole punch to make 4 holes spaced evenly around the rim of the last cup. This will be the center of the anemometer.
3. Slide 2 of the wooden dowels through the holes in the center cup. They should cross in an "X."
4. Insert the ends of the dowels into the holes of the other cups and tape them into place. Make sure the cups are all facing the same direction.
5. Take the last wooden dowel and make a hole in the bottom of the center cup.
6. Push the dowel up until it meets the X and tape everything together. This will be your rotation axis.
7. Place the center dowel into an empty water bottle and voila!

DIY ANEMOMETER, PART II: CALIBRATING YOUR ANEMOMETER

1. On a windless day, have an adult drive you down the street at 10 miles per hour.
2. Hold the anemometer out the window and count the number of rotations in 30 seconds.
3. How many times your anemometer spins in 30 seconds will correspond roughly to wind blowing at 10 miles per hour

Calibrating your anemometer gives you a control speed for collecting wind data. If, for example, you recorded 15 spins in 30 seconds during your 10 mile-per-hour test run, then you will know in the future that fewer spins is slower than 10MPH, while more spins equal greater speeds than 10MPH.

To get a more accurate gauge, try repeating the process and recording controls for walking speed (roughly 4MPH) and 15MPH in the car with your adult.

DIY ANEMOMETER, PART III: WIND SPEED EXPERIMENT

1. Set your anemometer in an outdoor location that typically receives wind in your yard or area. It may help to weigh down your anemometer with rocks, sand, or tape so that it remains in place.

2. Over the course of 7 days, observe your anemometer for 30 seconds at a time, 3 times a day – once in the morning, once at midday, and once in the evening. Record how many spins you observe during each observation window of time.

3. Do your best to make your observations at the same 3 times of day each day (example: 10 a.m., 2 p.m., 6 p.m. every day for 7 days).

4. As you record the number of observed spins during the week, compare these observed speeds to your control speed and make your best guesses as to whether the observed speeds are greater or less than 10MPH.

5. At the end of the week, use your collected data to find the average approximate wind speed in the morning, midday, and in the evening. Do this by adding your speeds for the morning together and dividing by 7, and doing the same for your midday speeds and your evening speeds.

6. Compare your data – which time of day did you observe as having the highest wind speeds? Which had the lowest observed wind speeds? Why do you think your results turned out the way that they did? How do you think the time of day influenced your findings? Were there any other reasons you can think of that may have affected your results?

Don’t be shy – we’d love to see how your anemometer experiment turned out. Use #MOSHConnect so we can see your awesome work!