

SIEMENS STEM DAY ACTIVITY

WATCHING WEATHER

REAL-WORLD SCIENCE TOPICS

- An exploration of the different tools used to measure meteorological properties
- An exploration of the effect that meteorological variables can have on the comfort of people

ADDRESSES NGSS

LEVEL OF DIFFICULTY

3

GRADE RANGE:

K-2

OVERVIEW

Students will make their own weather station consisting of actual and simplified versions of real weather equipment. They will use that equipment to make observations about the local weather.

TOPIC

Weather

OBJECTIVE

Students will gain an understanding of how meteorologists observe and analyze the weather.

MATERIALS NEEDED FOR STUDENT ACTIVITY

Materials Needed for Each Group

- thermometer
- paper plate
- crepe paper
- tape

Additional materials

- compass

TEACHER NOTES

Use your discretion and your knowledge of the level of the class to guide you as you teach this lesson. For younger grades, it may be more appropriate to demonstrate the activity, and have them make observations and sketches. For older grades, students can take a more hands-on approach. Leveled methodologies for K–1 and 2–3 grade levels are provided, where appropriate, throughout the activity. Use your knowledge of each class to determine what the best option is for your particular group.

TEACHER PREPARATION

Before class you should scout the location where your students will be taking measurements. This location should be as far away from buildings as possible. Once you are there, use a compass to find north, and find a good reference students can use to identify north.

Make simple wind vanes for the students prior to teaching this lesson. Tape strips of crepe paper (about 15 cm in length) to each quadrant of a paper plate, as shown in the image in Step 5. Students will label the wind vane during the lesson.

NGSS THREE-DIMENSIONS

Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
<p>Analyzing and Interpreting Data</p> <p>Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.</p>	<p>ESS2.D: Weather and Climate</p> <p>Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.</p>	<p>Patterns</p> <p>Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.</p>

- 1. Warm-up Activity:** Begin by asking students if they have ever talked about the weather or heard others talk about the weather. Display [several photographs](#) illustrating different weather to spark engagement. Probe students with questions such as:

- Do you dress differently in different weather?
- What is the difference between good weather and bad weather?
- Where can you find out information about the weather?
- Why is it important to know about the weather?

Students will likely already be familiar with the concepts of temperature and precipitation, but review these concepts as needed. Depending on the level of your class, you may also want to introduce other weather-related concepts, such as humidity, air pressure, and wind. Before moving on, hold up a thermometer and ask students if they know what it is and how it is used. Make sure students know that it is a tool that helps

us know how hot or cold it is outside. Tell students that this activity will help them learn more about the weather and ways to measure the properties of the weather.

2. Divide students into groups of 4 and distribute the materials needed for this lab, as well as the Student Handout. Take your class outside, where they will do their weather monitoring.
3. Tell students to find the thermometer from their materials. Make sure students hold their thermometers from the top, not the bottom (to avoid skewing the results).

Have students hold up their thermometers and read you the temperature. Challenge them to read the temperature without your help. Ask them to explain why there are two different number scales, on either side of the thermometer. Allow students to brainstorm answers to these questions, and fill in any blanks as needed to make sure they comprehend how to read the temperature.

4. Next, tell students that they will make observations about the wind.

Tell students to observe the wind. They should then work with their group to decide which description on the Beaufort Wind Scale matches the current wind conditions. Instruct them to circle the row that matches the current conditions.

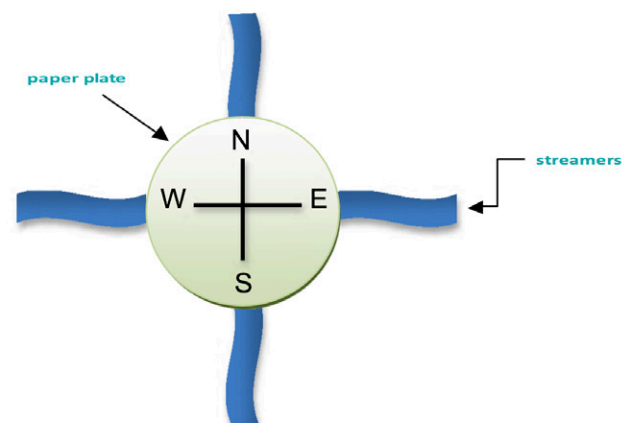
5. Now, tell students they will make a wind vane to measure the direction the wind is traveling.

Grade K–1 Provide students with a pre-made wind vane (see Teacher Preparation). Model writing the letters **N**, **S**, **E**, and **W** on the vane, and have students do the same on their own wind vanes. Point out which direction is north (and provide a reference point), and tell students to hold the place facing that way. They should then look at the streamers and see which way they are blowing. Model recording the wind direction, and have students do the same on the Student Handout.

Grades 2–3 Have students make a simple wind vane with a paper plate and streamers. Challenge them to correctly label the plate with the directions north, south, east, and west, providing direction if needed.

Instruct them to tape a piece of streamer at each label. Point out which direction is north (and provide a reference point), and tell students to hold the place facing that way. They should then look at the streamers and see which way they are blowing. Tell students to record wind direction on the Student Handout.

6. Now that students have made three measurements (temperature, wind speed, and wind direction), have them repeat these steps in order to gain a more comprehensive understanding of the weather. Allow them to work as independently as possible, providing instruction as needed. Instruct them to record their observations on the Student Handout.



7. **Wrap-up Activity:** Return to the classroom and have groups share their results. As they share their observations, write the results on the board. Discuss any differences in results, and explain why it's important to have multiple readings (helps reduce errors). Ask students to explain why it is important to know things about the weather.

WATCHING WEATHER EXTENSION ACTIVITY

Have students continue to measure the weather each day for a week. Additionally, give students a copy of the weather report from the local newspaper each day and have them compare their results with the results from their own measurements, and discuss any differences in the results. At the end of the week, have students create a short skit (perhaps in the form of a weather report on the news) to summarize their results.

WATCHING WEATHER | BACKGROUND INFORMATION

WHAT IS TEMPERATURE?

Temperature is a measure of the thermal, or heat, energy of the air around us. When air molecules heat up, they move faster. We use a thermometer to measure this heat energy. As the air heats up, so does the red liquid inside of a thermometer. When it heats up, it expands because the molecules take up more space as they move. A thermometer helps us know the temperature of the air around us.

WHAT CAUSES WIND?

Put simply, wind is caused by uneven temperatures on Earth. The sun does not warm all parts of the Earth evenly; some parts are warmer and some parts are cooler. This causes the air to be different temperatures in different places. Warm air weighs less than cold air, and it also rises. When warm air rises, cool air rushes in to take its place. It can then warm up, and rise, and more cool air rushes in. This air rushing in is felt as wind.

WHAT IS PRECIPITATION?

Precipitation is water, in one form, falling to the Earth. Precipitation is part of the water cycle. Water in the oceans, rivers, lakes, and streams of Earth is warmed by the sun. Some of it evaporates and turns into a gas. It then rises and enters the atmosphere. When it cools down, it falls back to Earth. Water can fall in many different forms of precipitation. Some forms include rain, snow, hail, and sleet.

KEY VOCABULARY

air pressure: the pressure exerted by the air molecules around you

barometer: a device that measures changes in air pressure

precipitation: liquid or solid water that falls from clouds

temperature: the measure of heat energy in a substance

- How is the weather right now? Describe the weather with at least two words.
The weather is calm and cold
- What is the temperature? Write down your reading from the thermometer.
The temperature is 45 degrees F.
- What is the approximate wind speed in knots according to the Beaufort Scale shown below? Circle the row that matches the weather conditions.
[Answers will vary.]

Force	Wind (Knots)	WMO Classification	Appearance of wind effects
0	Less than 1	Calm	Calm, smoke rises vertically
1	1–3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4–6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7–10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11–16	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	17–21	Fresh Breeze	Small trees in leaf begin to sway
6	22–27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28–33	Near Gale	Whole trees moving, resistance felt walking against wind
8	34–40	Gale	Whole trees in motion, resistance felt walking against wind
9	41–47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	48–55	Storm	Seldom experienced on land, trees broken or uprooted, “considerable structural damage”
11	56–63	Violent Storm	High waves and significantly reduced visibility, considerable damage to vegetation and roofing surfaces
12	64+	Hurricane	Huge waves, practically no visibility on water, widespread damage to vegetation and poorly constructed buildings. Debris may become airborne and dangerous

- Which direction is the wind blowing right now? Write down N, S, E, or W.
The wind is blowing to the south.
- Repeat your measurements of the weather. Write down your new measurements.
The temperature is now 47 degrees. The wind calmed down to light air, and it is still blowing to the south.
- Why do you think it is important to learn about the weather?
Knowing about the weather helps me decide what clothes to wear.

WATCHING WEATHER

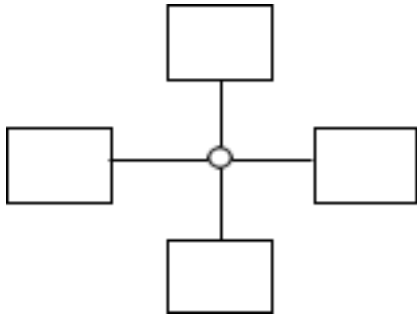
1. How is the weather right now? Describe the weather with at least two words.

2. What is the temperature? Write down your reading from the thermometer.

3. What is the approximate wind speed in knots according to the Beaufort Scale shown below? Circle the row that matches the weather conditions.

Force	Wind (Knots)	WMO Classification	Appearance of wind effects
0	Less than 1	Calm	Calm, smoke rises vertically
1	1–3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4–6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7–10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11–16	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	17–21	Fresh Breeze	Small trees in leaf begin to sway
6	22–27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28–33	Near Gale	Whole trees moving, resistance felt walking against wind
8	34–40	Gale	Whole trees in motion, resistance felt walking against wind
9	41–47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	48–55	Storm	Seldom experienced on land, trees broken or uprooted, “considerable structural damage”
11	56–63	Violent Storm	High waves and significantly reduced visibility, considerable damage to vegetation and roofing surfaces
12	64+	Hurricane	Huge waves, practically no visibility on water, widespread damage to vegetation and poorly constructed buildings. Debris may become airborne and dangerous

4. Which direction is the wind blowing right now? Write down N, S, E, or W.



5. Repeat your measurements of the weather. Write down your new measurements.

6. Why do you think it is important to learn about the weather?
