Can You Measure the Wind?

Through a variety of experiments and the creation of their own wind gauge, students will learn how to measure the strength and direction of wind.

Grade Level: 2nd Grade

Phenomena:
Can we use tools to measure the wind?

Objectives:
- Students will describe and model how air moves to create wind.
- Students will model how air moves to create wind.
- Students will describe different wind conditions.
- Students will create a wind gauge.
- Students will measure wind speed and direction.

Materials:
- Plastic soda bottle
- Hot water
- Water
- Ice Cubes
- Balloon
- Wind Gauge (see pg. 5)

Appendixes:
- Wind Gauge Craft (page 5)

Time Considerations:
Preparations: 5 minutes
Lesson Time: 50-60 minutes
Introduction: 10 minutes
Activity 1: 10-15 minutes
Activity 2: 20-25 minutes
Conclusion: 10 minutes

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Next Generation Science Standards

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function
as needed to solve a given problem.

Science and Engineering Practices (SEP):
Developing and using models.
Planning and carrying out investigations.

Disciplinary Core Ideas:
2-LS2 Ecosystems: Interactions, Energy, and Dynamics

Cross Cutting Concepts:
Stability and change.
Systems and system models.

Excellence in Environmental Education Guidelines

Strand 1—Questioning, Analysis, and Interpretation Skills
F) Learners understand that relationships, patterns, and processes can be represented by models.

Background

Any horizontal movement of air is known as wind. Wind is the result of differences in air pressure; air will move from areas of high pressure to areas of low pressure. At a simple level, heating air causes air to expand and rise creating an area of low pressure. Air from surrounding areas moves in to fill this space. This movement is wind.

Differences in pressure are shown on maps by isobars. These are lines joining places of equal pressure which is measured in millibars. The closer together the isobars, the greater the difference in pressure and the stronger the wind.

The wind is always named by the direction from which it blows. When measuring the wind it is important to take the children to the most convenient open space so as to estimate the true direction and speed, since trees, hedges, and buildings can influence direction and speed.

Wind speed is accurately measured using an instrument called an anemometer. The Beaufort wind scale describes wind speeds based on how it affects the landscape.

Preparation

Create wind gauges:
Use directions on page 5 to create enough wind gauges necessary so each student has one in the class.

Introduction:
Begin by asking students to take a deep breath in and let it out. Ask the group what was it they just breathed in? Air!

Ask students what it is called when large amounts of air moves outside? Wind! Write "Moving air = wind" on the board. State that the class will investigate how exactly air moves to become wind and how the wind can be measured.

Doing the Activity

Activity 1: Wind in a Bottle
Take a plastic bottle and secure a balloon around the mouth. Place the bottle in hot water and observe what happens. (The balloon inflates!)

Now take the bottle out of the hot water and ask students to predict what will happen if you place the bottle in a container of ice water. Place the bottle in ice water and observe what happens. (The once inflated balloon deflates!)

Have students turn to their neighbor to discuss why they think the balloon inflated and deflated.

Allow students to share their ideas about this, but tell them the class will return to this experiment later in the lesson. By then students will know how this experiment is working.

Tell the students that they will be going outside to study the wind. As they walk outside, they should use their senses to make observations about the wind; what does it look like, taste like, smell like, feel like, and sound like?

Activity 2: Wind Walk
Once outside allow students to share what they have discovered thus far.

Ask the students what direction the wind is moving. Can the wind change directions?

Explain to students that wind direction is important and can easily be learned by using tools.

Have students stand in the center of the pre-made chalk compass. Ask students to point in the direction the wind is blowing. Ask them to describe the strength. Is the wind blowing hard or soft?

Explain to students that students will act as the wind and move in the direction it is blowing. For example, if the wind is blowing softly, students should then move slowly in that direction.

Designate an end point, to where the students will stop and begin.

Ask students to describe other types of wind speed and strength such as breezy, gusty, etc..

Do this activity again, but have students act out different wind speeds.

Summarize what students have learned thus far: moving air is called wind, wind moves in directions, and wind can move at different speeds and strengths.

Then remind students they are still trying to find out why exactly air moves.

Activity 3:
Expanding and Shrinking Air
Begin this activity by arranging students to stand in a circle (around the compass).

Explain how the sun heats the earth's surface unevenly. Therefore air can be at different temperatures too. As air cools, air shrinks and moves down towards Earth's surface. Instruct students to slowly huddle together and say "Cooling Down".

As air warms, it expands and rises up away from Earth's surface. Instruct students to raise their arms, move back to the perimeter of the circle, and say "Warming Up". Move through these actions until

students can demonstrate this concept as a group with little instruction.

Ask students to again think of the balloon and bottle experiment inside the classroom. Tell students to think of how the air was moving in the bottle as they move back in doors.

Activity 4:
Air Experiment Follow Up
Have students share their new thoughts as to how the air inside the bottle is moving into the balloon.

Conduct the experiment again and clearly explain how the air is moving.

Activity 5:
Measuring the Wind
Explain that scientist use tools to help them study the wind. These tools allow scientist to collect data and make observations about wind speed, strength, and direction. Using these observations, it is sometimes possible to predict weather patterns (like dust storms, rain, or snow).

Tell students that they will decorate a wind gauge that can be used to observe patterns of wind.
Show the class how to hold the wind gauge and simulate wind by blowing on the string. Allow students to experiment with the gauge at their desks.

Ask student to observe where the bead is at when they blow strongly? Where is the bead

Student testing wind gauge Photo By NOS

when they blow softly?

Have the students draw marks on their wind gauges that identifies different wind strengths.

Students may also write “Windy Words” on their wind gauges. Any word is acceptable that describes the wind.
Ask the students to tell you some characteristics of the wind that you can measure (direction, speed or strength).
Ask the students to explain to you how their wind gauge works.

Conclusion

Explain to students that the wind is constantly changing surprising scientists by it’s speed and strength.

Encourage students to take their wind gauge home and measure the wind.

Assessment

Assess students on their participation in lesson activities.

Assess student on how correctly they use their wind gauge and if they are able to explain what this tool measures.

Extensions

Anemometer Reading
Use an anemometer to measure wind speed from a fan on low, medium and high speeds.
Have students hold their wind gauges and mark where the bead hits from different fan speeds. Mark wind gauge and record the actual wind speed from anemometer reading.
Have students give estimated wind speeds from outside using their marked gauges.

Wind in a Bag
Give each student a plastic bag and have them “catch” the wind. After they have filled their bags up with wind they should twist the top to keep it inside the bag to bring it back inside the classroom.

Once back inside the classroom, ask: “Do you still have wind in your bags?” “Why or why not?” The answer is no, because the wind has become air.

Have students let the air out of their bags towards their face by

squeezing the bag together. Ask: “Did we just turn our air back into wind?” “Yes!”

Wind Gauge Report
After students have taken their wind gauges home, ask students to check them everyday and record the strength and direction of the wind.

Keep one gauge in class and compare the daily measurements to the weather. Is it similar?

Rain Gauge
Give students examples of other tools used to measure the weather.

Make a class rain gauge.

You will need a plastic ruler, scissors, clear waterproof tape, and a glass wide mouth jar with a wide bottom (a quart jar is suggested)

Cut the ruler in half so that only six inches of rain can be measured. The six-inch ruler will fit better in the quart jar.

Place the ruler inside the jar and tape it in place.

Watch the weather forecast and note when it is suppose to rain. Place the jar in an open area to collect rain.

After it rains, measure how much rain fell that day.

Vocabulary

Air Pressure: the force of air pressing against an object.

Anemometer: an instrument used to measure wind speed.

Beaufort Scale: used to describe wind strength.

Wind: the horizontal movement of air from high pressure to low pressure.

Wind Gauge: An instrument that can indicate the speed and direction of wind.

Wind Sock: An instrument used to measure wind direction.

Sources

- (2011). In *Wind Gage*. Retrieved Jan. 9, 2012, from http://www.thefreedictionary.com/wind+gage
- (2012). In *anemometer1.jpg*. Retrieved Jan. 9, 2012, from http://tlc.howstuffworks.com/family/weather-experiments-and-activities2.htm

Images:
- Photo by NOS in 2nd grade classroom

Wind Gauge Template and Directions

DIRECTIONS:

1. Trace wind gauge template (actual size) on card stock
2. Cut out template
3. Hole punch top right corner
4. Tie a piece of string through the hole and make it as long as the gauge
5. Attach a bead to the end of the string