**Weather**

**Lesson #3:** **Wind Direction**

**Time Frame:** 60 minutes or two lessons of 45 minutes

**Learning Standards:**

*Science*

Earth and Space Science: Weather

1. Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.

Skills of Inquiry

* Ask questions and make predictions that can be tested.
* Recognize simple patterns in data and use data to create a reasonable explanation for the results of an investigation or experiment.
* Record data and communicate findings to others using graphs, charts, maps, models, and oral and written reports.

*Technology/Engineering*

Materials and Tools

* 1. Identify materials used to accomplish a design task based on a specific property, i.e., weight, strength, hardness, and flexibility.
	2. Identify and explain the appropriate materials and tools (e.g., hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) to construct a given prototype safely.

Engineering Design

* 1. Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.

**Student will be able to:**

1. Explain how air pressure differences causes wind and how wind influences weather.
2. Make predictions, construct, test, and analyze a device to measure wind direction.

**Resources and Materials:**

|  |  |
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| **Item** | **Amount** |
| Science notebooks |  |
| 2-liter bottles with a taped hole, filled with Styrofoam packing peanuts | 7 (in bin) |
| Extra Styrofoam packing peanuts | 1 bag (in bin) |
| Fizz keeper pumps | 6-8 (in bin) |
| Masking tape | 1 (in bin) |
| Fan | 1 (in bin) |
| Compass | 6 (in bin) |
| Making a wind vane instructions student handout | 30 (in bin) |
| Wind vane cutouts | 30 (in bin) |
| Heavy foam | 6 pieces (in bin) |
| Unsharpened pencils | 3 boxes (in bin) |
| Pen caps | 1 bag (in bin) |
| Scissors (not provided) | (in classroom) |
| Glue (not provided) | (in classroom) |
| Metal cans | 6-8 (in bin) |
| Sand | 1 bag (in bin) |
| Modeling clay | 1 box (in bin) |

**Focus Activity:** Write the following question on the board: What would happen if warm air (low air pressure) and cold air (high air pressure) bumped into each other? Have students write a response in their science journals. Then ask leading questions relating to air pressure from the previous class.

**Introduction:** Explain that **wind** is air moving in the atmosphere and exists because of differences in air pressure caused by temperature differences. Cold air molecules are closer together, so cold air has higher air pressure. Warm air molecules move faster and are farther apart, so warm air has lower air pressure. As the sun warms the Earth's surface, the atmosphere warms too. Some parts of the Earth receive direct rays from the sun all year and are always warm. Other places receive indirect rays, so the climate is colder. Warm air weighs less than cool air and rises. Then cool air moves in and replaces the rising warm air. This movement of air is what makes the wind blow.

**Activity:**

1. Tell students that they will perform an experiment to investigate air pressure and wind using a soda bottle and a fizz keeper pump. Break the students up into groups of 3-4. Give each group the necessary materials. Explain that they will make an area with high air pressure and observe the results. Explain that Styrofoam peanuts are made of plastic and air and that the fizz keeper will pump more air into the bottle, increasing the air pressure.
2. Then, ask students to shake the bottle and describe how it sounds and feels. Ask them to make predictions about what will happen when they increase the air pressure in the bottle by pumping in more air.
3. Have one student hold his finger over the taped hole and have another student pump up the bottle as much as possible using the fizz keeper. Ask students to squeeze the bottle again and describe how it feels. What happens to the peanuts? What sound does the bottle make when you shake it?
4. Have students predict what will happen when they remove their finger from the hole on the bottle. Before removing the tape, tip the bottle horizontally and shake the peanuts evenly over the surface.
5. Ask students to remove the tape and ask them to discuss and explain what they observed. (Note: When they take the tape off the hole the high pressure moves horizontally to an area of low pressure, creating wind. The air pressure in the bottle and outside the bottle equalizes and the packing peanuts return to their original position.)
6. Discuss the relationship between wind and air pressure with the class. Explain that when wind blows, air is moving away from areas of high pressure and towards areas of low pressure. Knowing the direction and speed of wind is important in making weather forecasts. Refer to the experiment above. What direction did the wind blow? Did it blow from an area of high pressure to an area of low pressure?
7. Explain that **wind vanes** are tools used to measure the direction that the wind blows. Go over the procedure for making a wind vane. If the weather permits, tell students that they will test their wind vanes outside when they are complete. Otherwise, use the fan provided to test the wind vanes. Explain that the wind vane will point in the direction that wind is coming from. Discuss directions and compasses as necessary.
8. Break the students up into small groups and provide them with the necessary handouts and materials. Assist student groups as necessary to construct and test the wind vane.
9. When student groups are done making the wind vane go outside (or use the fan) to test the wind vanes. Use the compass to set the north point on the direction disk toward north.

**Closure:** Discuss the following questions as a class. What is wind? Where does wind come from? How is temperature related to air pressure? How can we measure wind direction? Why is it important for weather forecasters to know about wind direction?

**Assessment:** Science notebook responses, participation in class activities and discussions, completed wind vanes

**Making a Wind Vane**

A wind vane shows the direction the wind is blowing. Wind blows away from areas of high pressure and toward areas of low pressure.

**Materials:**

Heavy foam

Unsharpened pencil

Pen cap

Scissors

Tape

Glue

Metal can

Sand

Modeling clay

**Directions:**

1. Cut out the two patterns from the page provided.
2. Cut out a pointer using the heavy foam and the pointer pattern.
3. Glue the direction circle on the heavy foam and cut it out. Poke a hole in the dot in the center of the circle. Make the hole big enough for the pencil to fit through.
4. Push the pencil through the hole (eraser-side down). Stick the eraser in a small ball of clay on the bottom of the metal can.
5. Fill the can with enough sand so that it will not fall over.
6. Tape the pen can in the middle of one side of the wind pointer. Set the wind pointer on top of the pencil and make sure it is level. Also, make sure the pointer can spin around easily.
7. Test your wind vane.

