**Weather**

**Lesson #2:** **Temperature**

**Time Frame:** 45-60 minutes

**Reminder:** Ice is not provided for this lesson.

**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. Make predictions, construct, test, and analyze a device to measure temperature.
2. Explain how a thermometer measures temperature and why temperatures are different in different locations.

**Resources and Materials:**

|  |  |
| --- | --- |
| **Item** | **Amount** |
| Science notebooks |  |
| Making a Thermometer instructions | 30 (in bin) |
| Clear plastic water bottles | 10 (in bin) |
| Water (not provided) | (in classroom) |
| Rubbing alcohol | 3 bottles (in bin) |
| Clear straws | 1 box (in bin) |
| Modeling clay | 1 box (in bin) |
| Food coloring | 1 box (in bin) |
| Bowls | 6 (in bin) |
| Ice (not provided) |  |
| Thermometers | 15 (in bin) |
| Indoor/outdoor thermometers | 4 (in bin) |

**Focus Activity:** In small groups or individually in their science notebooks, have students brainstorm differences in weather between seasons (fall, winter, spring, and summer). Then have students discuss their ideas with the class and discuss the importance of temperature in understanding weather.

**Introduction:** Review with students that weather occurs because of the interaction between the sun, atmosphere, and the earth. Explain that the sun provides the earth with light and heat. In the winter, the northern hemisphere of the earth is tilted away from the sun so it is colder and in the summer the northern hemisphere is tilted towards the sun so it is warmer. Demonstrate this idea with a globe or the plastic earth ball. The varying sunlight on different parts of the earth creates moving air and water currents of different temperatures. Relate this to the temperatures of the poles and the equator, which are always colder and warmer relative to each other.

**Activity:**

1. Ask students what temperature is. Explain that **temperature** is a degree of hotness or coldness the can be measured using a thermometer. It's also a measure of how fast the atoms and molecules of a substance are moving. Then, ask the students how they can measure air temperature. Show the students a thermometer and explain that today students will make a basic thermometer to understand how a thermometer works.
2. 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 thermometers.
3. When student groups are done making the thermometers and testing the thermometers provided, discuss their observations and drawings in their science notebooks. Ask them questions about their results. Why does this happen? What happens to the density of the liquid when it gets warm? When it gets cold?
4. Explain that just like any thermometer, the mixture expanded when it was warmed. This made the mixture no longer fit in the bottom of the bottle. As the alcohol expanded the colored mixture moved up through the straw. If the bottle were to get extremely hot, the mixture would have come up through the top of the straw. When the mixture became cold it contracted and the liquid moved back down the straw. This is how a thermometer works.

**Closure:** Discuss the following questions as a class. Why is temperature important to know about and understand? How does a thermometer measure temperature? How does temperature affect our daily lives?

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

**Making a Thermometer**

A thermometer measures temperature.

**Materials:**

Clear plastic water bottle

Water

Rubbing alcohol

Clear plastic drinking straw

Modeling clay

Food coloring

Thermometer

**Directions:**

1. Fill about 1/4 of the bottle full with equal parts of water and rubbing alcohol.
2. Add one drop of food coloring.
3. Put the straw in the bottle, but don't let it touch the bottom.
4. Use the modeling clay to seal the neck of the bottle, so the straw stays in place. Make sure the seal is tight.
5. Place the bottle in a container with hot water and watch the straw. Draw what happens in your lab notebook.
6. Place the bottle in a bowl with ice and watch the straw. Draw what happens in your lab notebook.
7. Hold a thermometer in your hand (or the hot water) and then the ice water and watch what happens. Draw what happens in your lab notebook.