

## 5<sup>th</sup> grade Lesson Plan

### Weather and Oceans: Uneven Heating of the Earth

#### Standards

- 4.a. *Students know* uneven heating of the Earth causes air movements (convection currents).
- b. *Students know* the influence that the ocean has on weather and the role that the water cycle plays in weather patterns.

**Suggested time: 50 minutes**

**Pressed for Time: 30 minutes**

#### Anticipatory set (engage)

Have you ever been to the beach on a hot day? What does the sand feel like? What about the ocean? Does the water feel hot? Even on the hottest day, the ocean temperature stays about the same. What about when we get in the car on a hot day. What does the seatbelt feel like? What about the belt buckle?

Have a volunteer come up to the front of the room and place there hand a few inches from a light bulb. **Be sure the student doesn't place his hand on the bulb.** What do you feel? Heat is radiating from the bulb, through the air, onto the student's skin. Explain that the radiant energy is absorbed by different materials (like your hand, the chair) it heats at different rates. Different materials heat up or cool down differently. What kind of materials make up the earth? Do these heat up differently?

#### Objective:

Set up a simple experiment to answer questions about how different surfaces on earth retain heat. Practice taking measurements with a thermometer. Test the heat capacity of water versus soil.

#### Materials:

For each group of students:

2 cups

Water

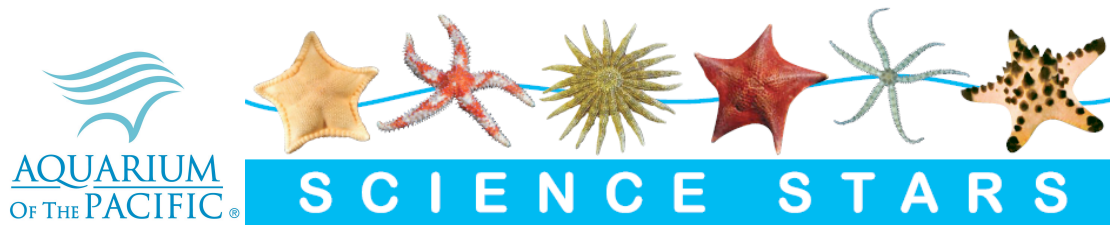
Soil

Heat Source (a desk lamp will work)

2 Thermometers

Weather and Oceans Data Sheet – *provided* (p. 29-30 of 5<sup>th</sup> grade journal)

Weather and Oceans Worksheet



### **Background:**

Large bodies of water can absorb (or release) a great deal of heat without changing temperature very much; their temperature stays relatively constant from day to night and from season to season. The specific heat capacity of water allows the Earth to be inhabitable by humans since it maintains our regular climate. Some materials have a low heat capacity such as metal sand, and even skin) which allow the temperature to increase and decrease very quickly.

The waves of radiant energy leave their source, the lamp (or the surface of the sun), and travel through space at 186,000 miles per second to the surface of the object. As radiant energy is absorbed by a material (like your hand or the sand at the beach), it forces the molecules in the material to move faster; thus creating heat energy and warming that material.

### **Vocab:**

- Energy
- Heat
- Temperature
- Heat Capacity
- Radiant energy

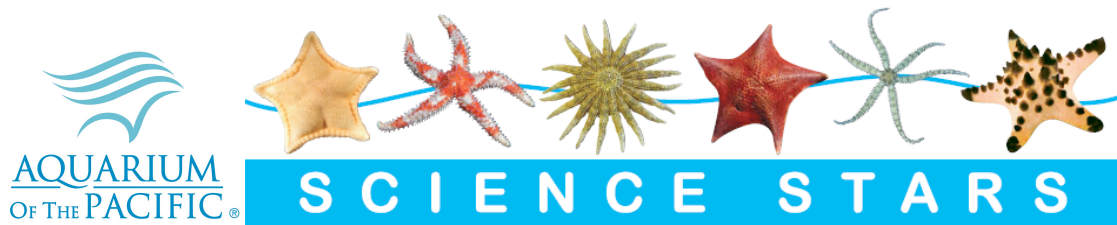
### **Modeling:**

1. Explain that using a thermometer is the best way to measure radiant heat
2. Model the proper way to use and read a thermometer.
3. Make sure students are comfortable with how to use the thermometers in the air, in water samples, and in soil samples.

### **Guided Practice:**

Once students are comfortable using thermometers, encourage them to design an experiment that will test the different heat retentions of soil and water. If needed, guide them towards the following experiment design:

1. Fill one cup with water.
2. Fill one cup with soil.
3. Stand one thermometer in the water and one in the soil.
4. Read and record the temperatures of each cup at room temperature.
5. Place both cups under the lamp. Wait several minutes for cups to absorb the lamp's heat.
6. Read and record the temperatures of each cup a second time.
7. Were there any changes in temperature? The temperature of the soil should rise (heat up) first, as the soil absorbs heat faster than water.
8. Remove the cans from under the lamp and leave at room temperature for several minutes.
9. Read and record the temperatures of each cup a final time.



**Check for understanding:**

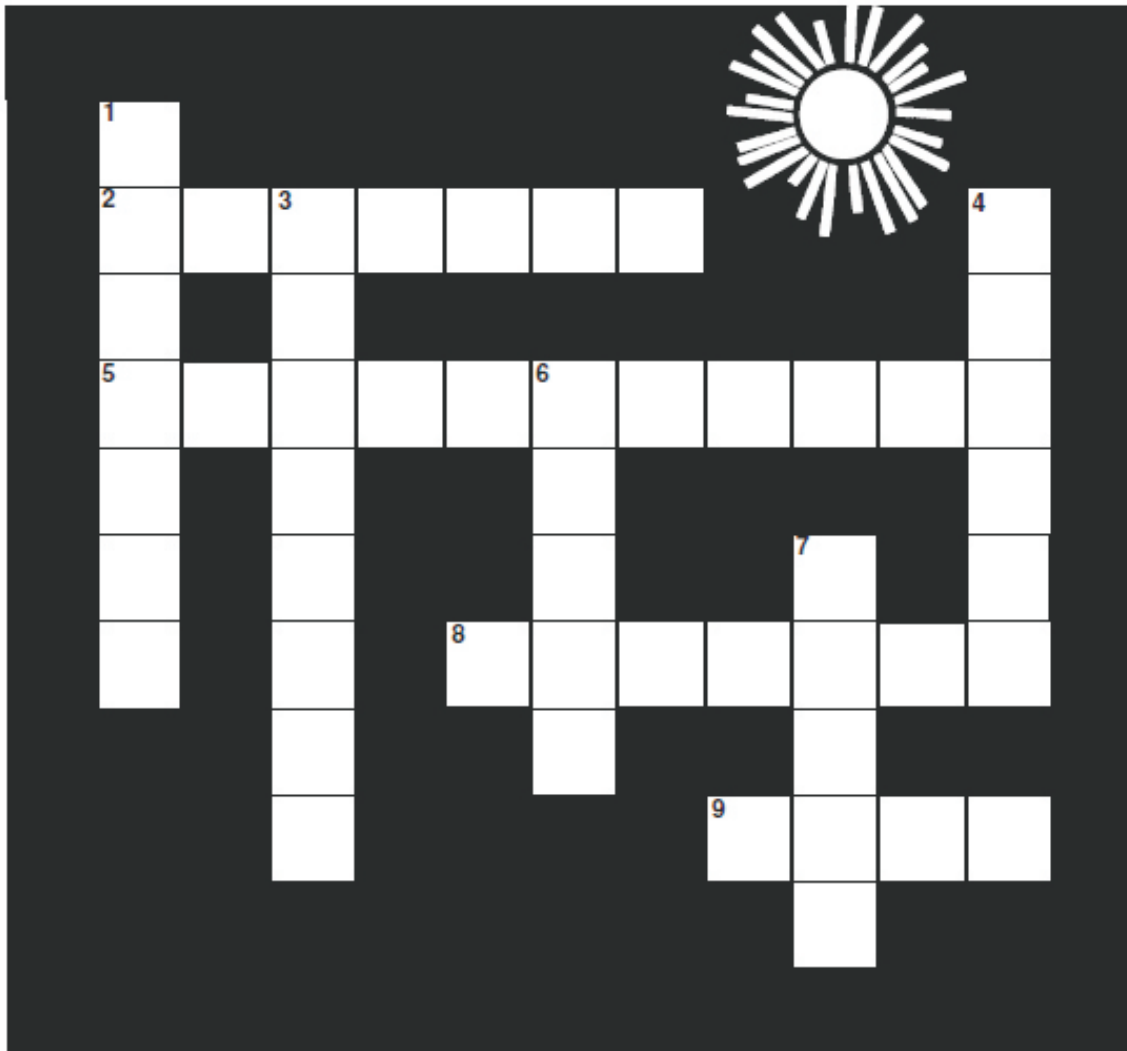
Where there any changes in temperature? (The temperature of the soil should fall (cool down) first, as the soil does not retain heat as long as (or can lose heat faster than) water.) What is radiant energy? Where is the source of radiant energy in this experiment?

If 70% of our earth is covered in water, what do we know about how fast or slow the planet can heat up or cool down? Does our planet heat up and cool down very quickly like the sand or does it retain heat and change temperatures very slowly like the water? (The oceans are what make our planet habitable. If earth was mostly land, we would reach high temperatures very quickly during the day and freezing temperatures as the sun went down at night – just like other planets in our solar system!)

**Independent practice:**

*Challenge students to design another experiment to test the same concept. What other materials could they test? What other energy sources could be used?*

*Complete the Weather and Oceans Worksheet to check for student understanding*



**DOWN**

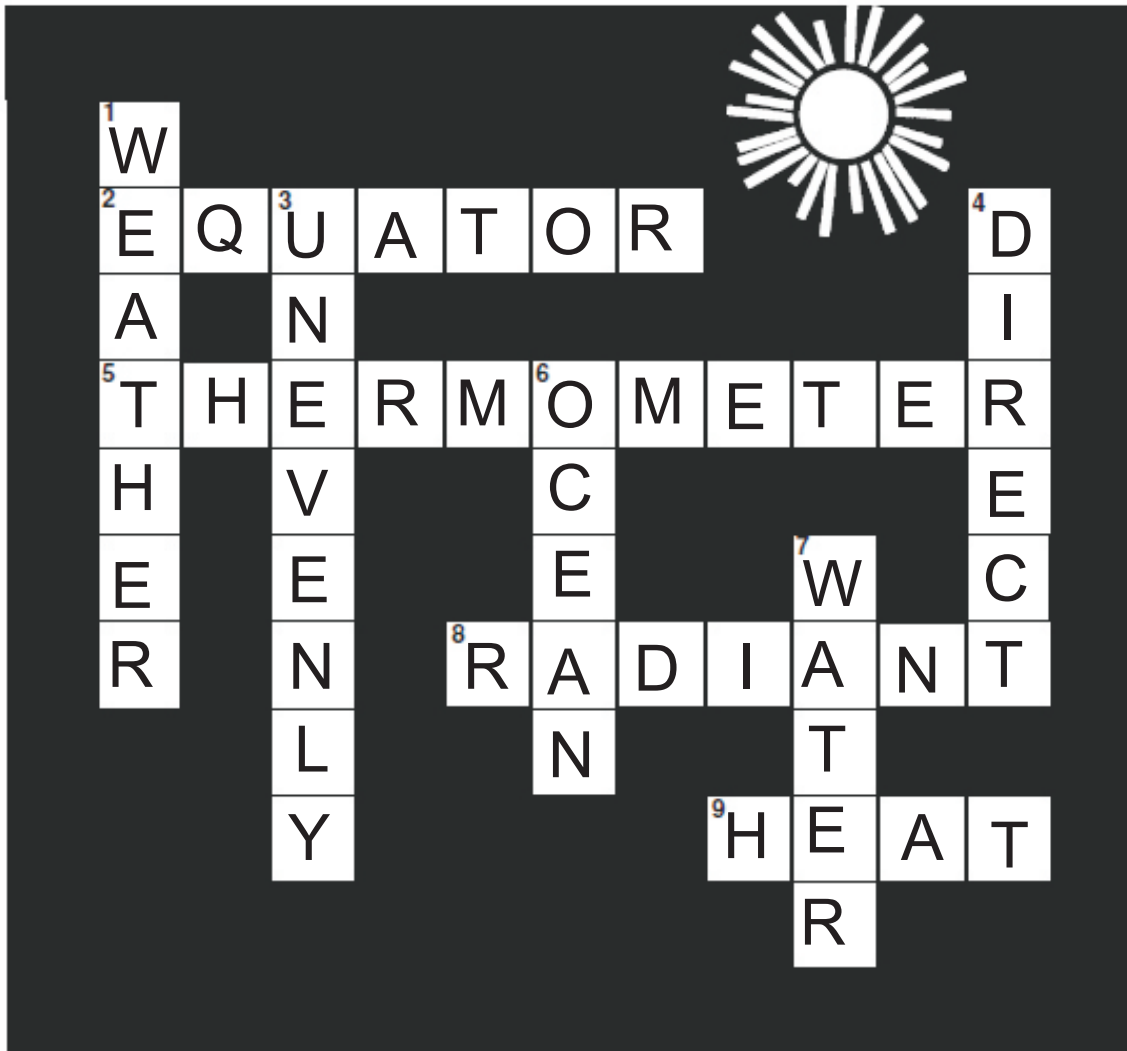
1. The ocean has an influence on our \_\_\_\_\_.
3. The Earth is heated \_\_\_\_\_.
4. When radiant heat is \_\_\_\_\_, the climate is hot.
6. The heat capacity of the \_\_\_\_\_ allows humans to live on Earth.
7. 70% of the Earth is covered with \_\_\_\_\_.

**ACROSS**

2. It is hotter at the \_\_\_\_\_ than at the poles.
5. We measure temperatures with a \_\_\_\_\_.
8. The sun's heat is called \_\_\_\_\_ heat.
9. Soil absorbs and loses \_\_\_\_\_ faster than water.

**Word Bank:**

- |         |          |             |
|---------|----------|-------------|
| Equator | Unevenly | Weather     |
| Ocean   | Heat     | Radiant     |
| Direct  | Water    | Thermometer |



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