How does the ocean affect weather?

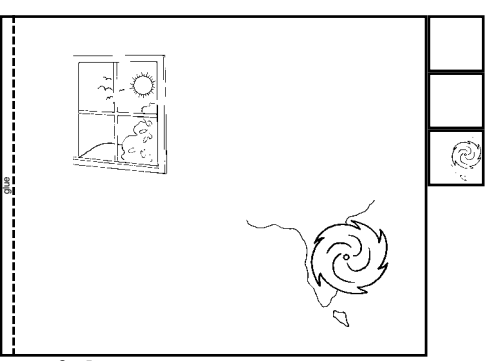
Ocean Concepts:

- Oceans play a key role in Earth's atmosphere and weather.
- Ocean temperature changes more slowly than land temperature.
- Tropical oceans hold in heat, while polar waters remain cold all year.
- The consistent temperatures of the oceans help moderate land temperatures.
- Water evaporates, condenses, and returns to land as rain or snow.
- Storms and hurricanes begin in warm, tropical seas.
- Earthquakes under the ocean can cause tsunamis.
- Storm surges occur when waters rise underneath hurricanes.

Vocabulary: weather hot cold hurricane tsunamis storm surges

Construct and Read: *Lots of Science Library Book #12.*

Activities:



Oceans Affect Weather - Graphic Organizer

Focus Skill: explaining a relationship
Paper Handouts: *Discovering the Ocean* Graphic Organizer
a copy of Graphic 12A
Graphic Organizer: Glue Graphic 12A under the previous page of *Discovering the Ocean* at the glue line. On the top of that page:

✎ Draw a picture of a hurricane over the ocean.

✎✎ Write clue words about the interaction between oceans and weather: *ocean temperatures change slowly; land masses may be very hot or very cold; tropical oceans hold in heat while polar waters remain cold all year; land quickly warms up or cools with seasons; consistent ocean temperatures help moderate the temperatures on land by warming and cooling air masses that move over the ocean surface; ocean's effect is more obvious in coastal areas but influences all areas of land; Earth maintains very consistent temperature due to oceans; heat from Sun evaporates water; water vapor meets cooler air and condenses; when cool air cannot hold any more water, rain falls; trade winds are more regular over oceans than land, and as they move over tropical waters, they pick up moisture and bring heavy rain to mountainous areas; storms and hurricanes begin in warm, tropical seas and weaken as they move over land.*

✎✎✎ Explain the interaction between oceans and weather. Compare and contrast tsunamis with storm surges.

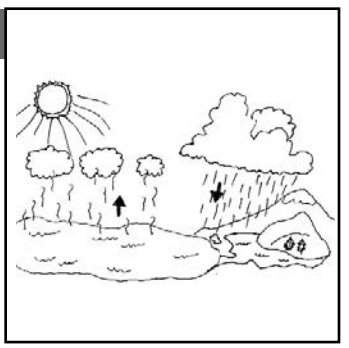
Holding Heat - Activity

Teacher's Note: The purpose of this activity is to introduce the student to the concept of water's high specific heat. A true scientific experiment would include more precise variables.

Activity Materials: 2 small styrofoam cups clean sand (Purchase the sand rather than using sand from outside so it will not contain moisture.) 2 thermometers lamp

Activity: Pour sand in one cup and water in another cup. Leave them overnight to achieve room temperature. Insert a thermometer into the middle of each cup and take a reading after a few minutes. Re-insert the thermometers and place the lamp over the cups. Place the lamp carefully so both cups receive the same amount of heat. Take a reading four times at 15-minute intervals. What can you conclude?

Rain - Investigative Loop



Focus Skill: predicting an outcome

Lab Materials: kettle of water stove pot oven mitts ice cubes

Paper Handouts: Lab Book Lab Record Card a copy of Graphic 12-1

Graphic Organizer: Glue Graphic 12-1 on the right pocket of the Lab Book.

Question: How does rain form?

Research: Read *Lots of Science Library Book #12.*

Predictions: Predict how rain forms. Write your prediction on a Lab Record Card.

Procedure: Boil a kettle of water. Place several ice cubes in a pot. Using oven mitts, hold the pot over the kettle.

Observations: Observe the bottom of the pot. What do you observe? **Water droplets form on the bottom of the pot and eventually fall as "rain."**

Record the Data: Label a Lab Record Card "Lab12-1." Draw a picture of the lab.

Conclusions: Explain how oceans affect weather. **Heat from the Sun causes water in the oceans, lakes, rivers, and ground to evaporate and become water vapor. Water vapor rises into the atmosphere. As water vapor meets cooler air, condensation occurs. The cool air cannot hold the water vapor, and water vapor turns back into water droplets as precipitation.**

Communicate the Conclusions: On a Lab Record Card, compare your observations and conclusions with your predictions.

Spark Questions: Discuss questions sparked by this lab.

New Loop: Choose one question to investigate further.

Design Your Own Experiment: Select a topic based upon the experiences in the Investigative Loop. See page viii for more details.

Experiences, Investigations, and Research

Select one or more of the following activities for individual or group enrichment projects. Allow your students to determine the format in which they would like to report, share, or graphically present what they have discovered. This should be a creative investigation that utilizes your students' strengths.

1. Investigate El Niño and La Niña. Explain their impact on weather.