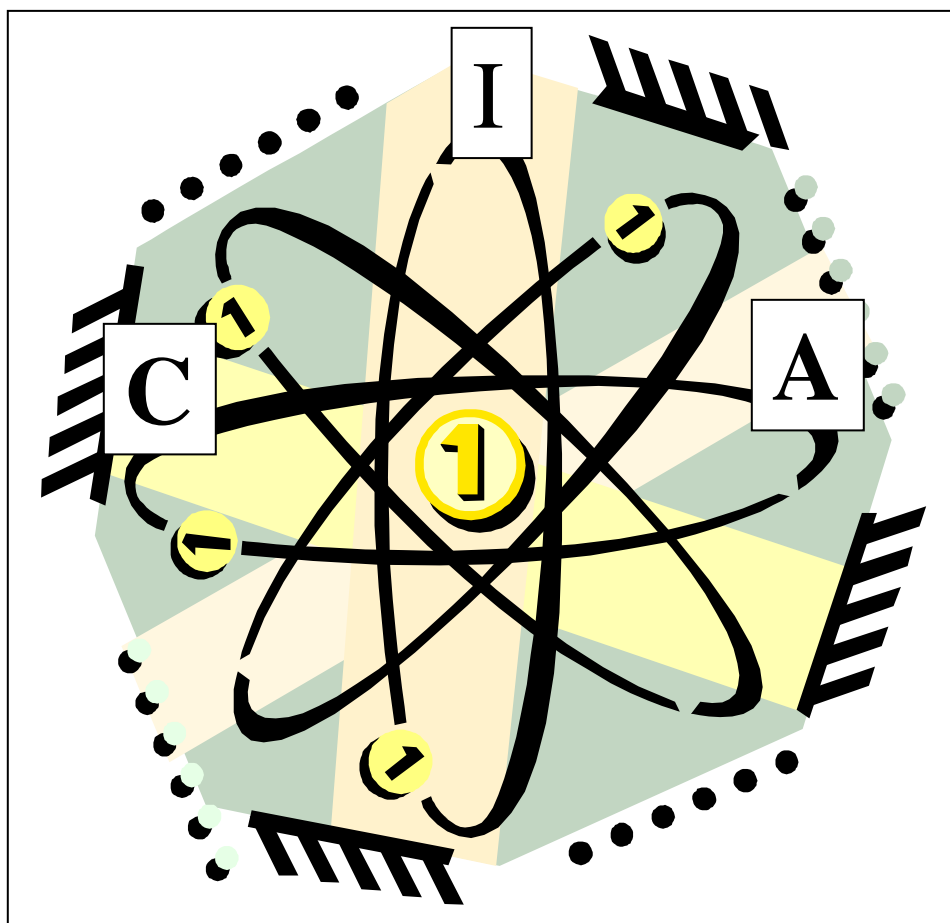


Curriculum, Instruction, Assessment (CIA) Alignment

Science, Grade 3 Unit 4: Oceans

Task Analysis and Hands-on Investigations



Ronald Blocker, Superintendent
Orange County Public Schools
Orlando, Florida

2003-2004



Subject Area: Science
Strand D: Processes that Shape the Earth
Grade: 3

Benchmarks

SC.D.1.2.2: The student knows that 75 percent of the surface of the Earth is covered by water.

SC.D.2.2.1: The student knows that reusing, recycling, and reducing the use of natural resources improve and protect the quality of life.

SC.G.2.2.3: The student understands that changes in the habitat of an organism may be beneficial or harmful.

TASK ANALYSIS	
The student...	OCEANS
• discovers, through probability, that approximately 75 percent of the surface of the earth is covered by water.	
• creates a graph to illustrate that less than one percent of the earth’s water is fresh ground water and fresh water in lakes, rivers, and streams; two percent is fresh water frozen in glaciers and the polar ice caps; and 97 percent is salt water.	
• appreciates the oceans as natural resources that provide many benefits.	
• differentiates ways humans change environments as either beneficial or harmful to themselves and other organisms.	



WATER, WATER, EVERYWHERE



BENCHMARK and TASK

SC.D.1.2.2 The student knows that 75 percent of the surface of the Earth is covered by water.

- The student discovers, through probability, that approximately 75 percent of the surface of the earth is covered by water.

KEY QUESTION

Approximately how much of the earth's surface is covered by water?

BACKGROUND INFORMATION

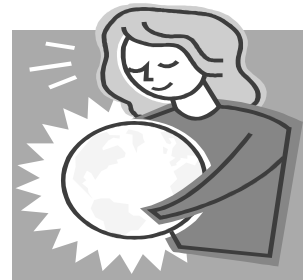
The earth has been called the water planet. Approximately 75 percent of the earth is covered by water. Oceans actually make up 97.2 percent of the water found on the earth's surface. Although all the oceans are connected, different parts have different names: Atlantic Ocean, Pacific Ocean, Indian Ocean, and Arctic Ocean. The Pacific Ocean is the largest.

All the water that has ever been available to our planet is on or in the earth right now.

MATERIALS

Teacher

1 inflatable globe
chart paper with large circle
blue and green markers
Oceans, Adele D. Richardson, Bridgestone



Per student

green crayon
blue crayon
Water, Water Everywhere activity sheet

TEACHING TIPS

1. For hygiene reasons, only the teacher should inflate the globe.
(Clean the mouth tube with alcohol if it has been used before or stored for a long time.)
2. More than one trial may be necessary. If the data collected does not appear to reflect that approximately 75 percent of the earth is covered by water, conduct several trials and find the average.

ENGAGE

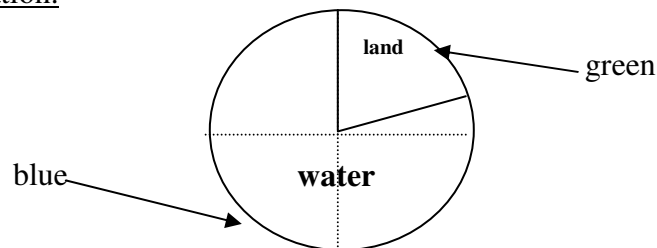
1. Sit in a circle with the students. Toss the inflated globe back and forth a few times and encourage students to examine it closely, concentrating on the amount of water and the amount of land on the globe.
2. Ask students to make predictions about how much of the earth is covered with water. Establish parameters upon which they can base their predictions. (e.g., *Does water cover more than half or less than half of the earth?*)

EXPLORE

1. Explain the rules for tossing the inflatable globe:
 - The globe must be tossed and caught with two hands.
 - The catcher must call out *land/land*, *water/water*, or *land/water* according to where his/her thumbs land on the globe.
 - Students should try to toss the globe to any students who have not had a turn.
2. Draw two columns on the board. Label one land and the other water. Appoint a student to tally the land and water calls as the ball is tossed and caught. (Note: Review with students how to record tally marks.)
3. Keep track of the tosses until the globe has been tossed 25 times. The tally marks should total 50 (25 tosses, 2 thumbs touching the globe each time). Record the number of land tallies and the number of water tallies for the first trial on a chart.

	LAND	WATER
Trial 1		
Trial 2		
Total		

4. Repeat the steps above for Trial 2, choosing another student to record the tallies this time.
5. Determine the total number of tallies for land and water after completing the two trials.
6. Display a large circle that you have drawn. Think aloud as you model how to divide the circle into four equal parts. (You can fold the circle or draw intersecting lines through the center to divide the circle.) If you think of the circle as representing one hundred parts (or percent) of the number of tallies collected, each section would represent 25. Tell students that will be your guide for dividing the circle graph into the two sections representing land and water. For example, if the tallies collected were 22 for land and 78 for water, you would have a guide for marking the section representing land by drawing the radius at a point on the circle slightly less than 25. The rest of the circle would represent water. Stress that this is an approximation.



7. Label each section and color for emphasis (use markers).
8. Distribute the *Water, Water Everywhere* activity sheet. Have students divide the circle into fourths. Then ask them to think about how they could determine where to mark the lines to show the approximate land and water areas, based on the tallies collected. Have students share their strategies.
9. Students should use blue and green crayons to color the land and water sections.

EXPLAIN

1. Have students make statements about what the circle graph shows regarding the amount of water and the amount of land on the earth. Remind students that the globe is a fairly accurate model of the earth's surface.
What did you learn about the earth by doing this activity? (The earth has much more water than it does land.)
Approximately how much of the earth is covered by water? (About 75 percent or $\frac{3}{4}$ of the earth is covered by water.)
What factors might have affected the outcome? (Students called out the wrong information; the class needed to collect more data; thumbs landed on a water/land boundary.)
What do you think would happen if we repeated the experiment? (The data should be very close to that from the first investigation.)
If you got only one toss, where would you predict your thumbs would land – on land or on water? Why? (Water – because the earth has more water than land)
2. Repeating this activity several times (or enlisting other classes to do the investigation and share their data with you) would help students build confidence in the data.

EXTEND/APPLY

1. Ask students to think of all of the places where water can be found on earth. Accept all answers (e.g., lakes, rivers, drinking fountains, puddles, swimming pools) and record them. Next, ask students to name any *natural* bodies of water that may be in the neighborhood or with which they are familiar (e.g., oceans, streams, lakes, icebergs). Ask them to think of descriptive words for each body of water (e.g., oceans are salty, large, wavy). Stress that while most of the earth's water is in the oceans (about 97 percent), only three percent of the water is fresh. Fresh water may be found in lakes, rivers, streams, and ponds, but most of it is locked in the icecaps at the poles.
2. Explain to students that while we speak of four different oceans, they are actually one body of water. Have students use one finger to trace a path from one ocean to the next on a globe or map.
3. Share the book, *Oceans*, by Adele D. Richardson.

EXTENSION

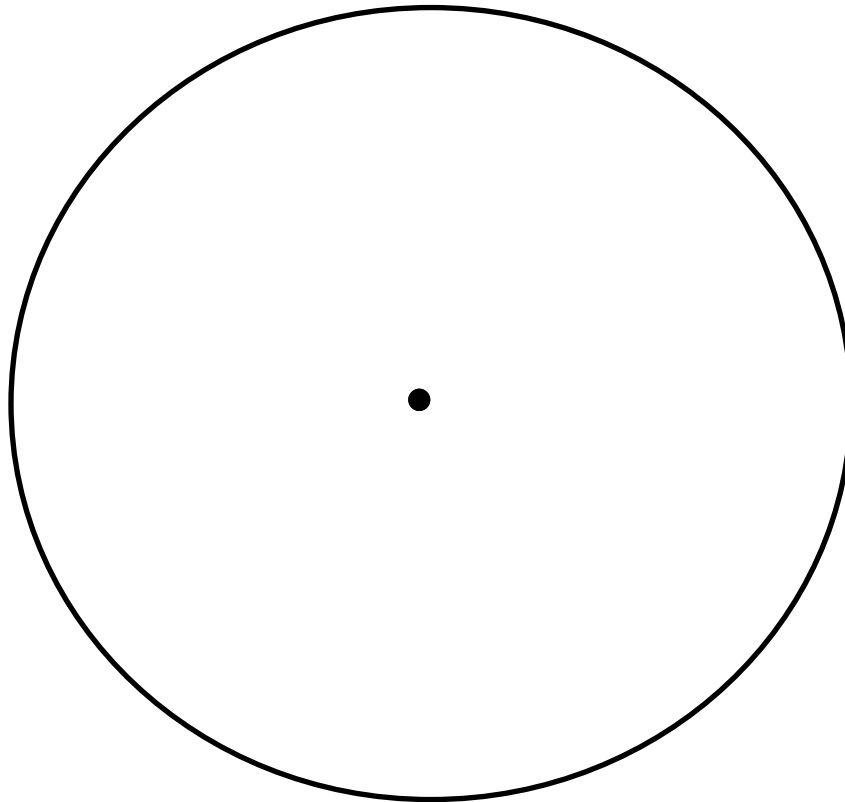
Repeat the globe toss activity and have students name the specific ocean or continent on which their thumbs land.

ASSESSMENT

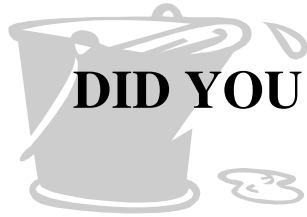
Have students answer the Key Question and explain their reasoning: *Approximately how much of the earth's surface is covered by water?*

WATER, WATER, EVERYWHERE

Use your teacher's circle graph as a guide to complete your own graph. First divide the whole circle into four equal parts to help you determine which part should represent water (blue) and which part should represent land (green).



Approximately what part of the earth's surface is covered with water? Refer to the circle graph to support your reasoning. _____



DID YOU EVER WONDER ABOUT WATER?

BENCHMARKS and TASK

SC.D.1.2.2 The student knows that 75 percent of the surface of the Earth is covered by water.

SC.D.2.2.1 The student knows that reusing, recycling, and reducing the use of natural resources improve and protect the quality of life.

- The student creates a graph to illustrate that less than one percent of the earth's water is fresh ground water and fresh water in lakes, rivers, and streams; two percent is fresh water frozen in glaciers and the polar ice caps; and 97 percent is salt water.



KEY QUESTIONS

About how much of the earth's water is fresh water?

Why is it so important to conserve fresh water?

BACKGROUND INFORMATION

The earth has been called the water planet. All the water that has ever been available to our planet is on or in the earth right now. About $\frac{3}{4}$ of the planet's surface is water. Oceans actually make up 97.2 percent of the water found on the earth's surface. Only three percent of the water on earth is fresh and most of that (about two percent) is frozen (in a solid state) in the polar ice caps. Less than one percent of all water on earth is available for use by humans and other creatures.

MATERIALS

Teacher

1 one-liter bottle
blue food coloring (optional)
water
4 large graduated cylinders
container/basin to hold discarded water

Per student

Water Wonders sheet
blue crayon
red crayon
yellow crayon

TEACHING TIP

Use the following measurements:

1000 mL = 100% of earth's water

970 mL = 97% salt water

20 mL = 2% fresh water frozen in glaciers and polar ice caps

10 mL = 1% fresh ground water or fresh water in streams, lakes, and rivers

ENGAGE

1. Talk about the circle graph from the *Water, Water Everywhere* activity.
2. Look at maps to find the locations of water on the earth's surface (e.g., lakes, rivers, oceans, glaciers).

EXPLORE

1. Pour 1000 mL of water from the one-liter bottle into a graduated cylinder. (Add blue food coloring for effect.)
2. Explain to students that the 1000 mL represents ALL the water on earth (fresh, frozen, and salty).
3. Tell students that you will remove the amount that represents earth's fresh water – which is not salt water. Pour out 30 mL into a second graduated cylinder. State that the 970 mL left in the first cylinder is ocean water. Ask: *Why can't we use this water for most purposes?*
4. Next, tell students that from the 30 mL (fresh water), you will now remove all of the earth's frozen water. Pour out 20 mL into a third graduated cylinder. Ask: *Why can't we use this water?*
5. Have students note how much water is left in the second cylinder (10 mL). Explain that this water represents all of earth's fresh water (rivers, streams, underground) available for use by humans and other animals.
6. Have students color in the grid on the activity sheet to illustrate the distribution of earth's water supply. Instruct students to:
 - color 10 squares yellow to represent all the fresh water available for use by humans and other animals.
 - color 20 squares red to represent all the frozen water.
 - color the remaining 970 squares blue to represent all the salt water.

EXPLAIN

1. Have students make observations about the activity.
2. Ask:
What did you learn about the earth's water supply?
Why should we conserve and not pollute our drinking water supply?

EXTEND/APPLY

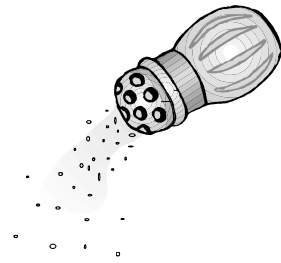
1. Have students make a list of ways they can conserve water at home and at school.
2. Have student teams create posters showing various forms of water conservation.

ASSESSMENT

Have students write statements on the back of the activity sheet about the need to conserve water (e.g., We should fix leaky faucets because there is only a small amount of water for us to use and we should not waste it.).



A SALTY SITUATION



BENCHMARK and TASK

SC.D. 2.2.1 The student knows that reusing, recycling, and reducing the use of natural resources improve and protect the quality of life.

- The student appreciates the oceans as natural resources that provide many benefits.

KEY QUESTION

How is the sea beneficial to humans?

BACKGROUND INFORMATION

Aquatic **habitats** provide us with a wide range of products. Some are obvious—fish, shellfish, and other foods—while others, such as fertilizer and vitamins, are not so well known.

Many people eat and/or use products containing ocean resources and do not even realize it. For example, many fast food restaurants use seaweed in their low-fat hamburgers. Seaweed may also be used in other products, such as toothpaste and jelly.

Salt is also an ocean resource that people use. Companies that sell table salt obtain the salt either from ocean water or from salt mines left behind by ancient oceans that evaporated. Most of the table salt comes from oceans. Workers flood wide shallow ponds with ocean water. When the water evaporates, salt is left on the bottom of the ponds. It is then transported to factories where it is desalinated and processed for human consumption.

Some resources are mined from the ocean floor. Manganese, diamonds and petroleum are examples of such resources. The manganese is used in making glass, steel and batteries. Plastics, gasoline, and other products are made from petroleum.

MATERIALS

Per group

1 clear plastic cup
1 zipper-type baggie
1 saucer for the cup
water
masking tape
1 sheet black construction paper
small container of salt
1 plastic spoon
scissors

ENGAGE

Ask:

If you were shipwrecked on an island, would you drink the salty water?

What would happen if you did?

Why shouldn't humans drink ocean water? (Anything that lives in the ocean and ingests salt water must have cells that aren't destroyed by the salt or have body parts that get rid of the extra salt. Humans have cells that would shrink, causing us to eventually die from too much salt.)

Is there anything you could do to make ocean water drinkable?

EXPLORE

1. Organize groups and distribute materials.
2. Tell students to wrap black construction paper around the plastic cup and tape it to secure it. (Tape the paper to the cup, not just to itself.)
3. Next, have students fill the cup $\frac{3}{4}$ full of water. Tell students to add a spoonful of salt to the water and stir until the salt dissolves.
4. Tell students to place the cup on the saucer, and then place both the cup and the saucer carefully inside a plastic bag and seal it. Have groups place their bags in a sunny location for the next several hours.
5. After several hours, have students observe the plastic bag and the dish.

EXPLAIN

1. Discuss:
What changes did you notice? (There should be some water on the inside of the bag or on the dish.)
Do you think there is any difference in the water inside the cup and outside the cup?
How could you find out if the water is different? (Taste it.)
Why do you think it was necessary to wrap the cup in black paper?
Why did you have to place the cup in a sunny spot?
2. Explain that the process of obtaining fresh water from the sea is called desalinization. The device the students constructed is a model of a solar still. Ask students to think about the process they used to desalinize the salt water. Ask: *Why do you think desalinization isn't a bigger industry at this time?*

EXTEND/APPLY

1. Have students research and then create a Tree Map showing the many ways that oceans benefit humans.
2. Compile a list of natural and human activities (both constructive and destructive) that impact ocean resources. Explain why each one is constructive or destructive.

EXTENSION

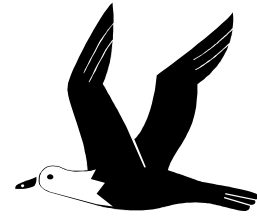
Plan a Sea Appreciation Day and include a potluck meal or snack with sea products as part of the menu.

ASSESSMENT

Have students illustrate and explain in their journals how seawater can be made suitable for drinking.



TARRED AND FEATHERED



BENCHMARK and TASK

SC.G.2.2.3 The student understands that changes in the habitat of an organism may be beneficial or harmful.

- The student differentiates ways humans change environments as either beneficial or harmful to themselves and other organisms.

KEY QUESTION

What happens to water birds when their habitat is polluted by oil?

BACKGROUND INFORMATION

Birds are the only living creatures that have feathers. The feathers cover and protect the bird's body while also giving it shape and color. Feathers are designed to help birds fly, to keep them cool or warm, as needed, and to help them hide, or attract a mate. There are two main kinds of feathers—stiff contour feathers found on the body, wings, and tail and soft, fluffy down feathers. Down feathers lie close to the body and are especially useful for warmth. Air is trapped between the feathers and acts as an insulator to keep the bird's body heat in and cold air out. This insulation is one reason that certain birds can live in Antarctica and other cold places.

Tankers sometimes run aground and spill oil into the sea. The **pollution** from oil spills can have devastating effects on wildlife. Some animals ingest the oil directly; others eat contaminated prey. When birds' feathers are coated with oil, they lose their ability to stay warm.

MATERIALS

Teacher

Prince William, Gloria Rand
down jacket, vest, or comforter (optional)
pictures of ocean water birds

Per student

1 sheet of drawing paper
plastic gloves (optional)

Per group

2 bird feathers (preferably natural)
several magnifiers
1 disposable plastic bowl
1 bowl of water
paper towels
newspaper
small container of liquid dish detergent

Per class

container of cooking oil

TEACHING TIP

You may wish to provide plastic gloves for students to wear since they will be working with oil.

ENGAGE

1. Display pictures of several ocean water birds (e.g., seagulls, pelicans). Ask students to think about common characteristics of the birds; develop a list from their responses (e.g., feathers, beaks).
2. Display different types of feathers. Ask: *Why do you think birds have feathers?*
3. Put on a down jacket or display a down comforter. Tell students the jacket contains a special kind of feathers. Ask why they think someone would want to wear a jacket filled with feathers. Tell students that the jacket contains a special kind of feathers called down. Explain that certain birds, such as ducks, have a layer of soft down feathers next to their bodies to provide warmth.

EXPLORE

1. Have groups cover their working area with several layers of newspaper and then distribute materials.
2. Have students divide a piece of drawing paper into fourths and label section #1 - dry feather, section #2 - wet feather, section #3 - oily feather, and section #4 - oily feather cleaned in detergent.
3. Have students use magnifiers to observe the feathers and then make a detailed drawing in section #1. Then tell each group to place one of the feathers in the bowl of water and observe. Students should then dry the feather and make a detailed drawing in section #2.
4. Have one student from each group bring the feather to the oil pan on your table. Move the group's feather back and forth through the oil and then place it in an empty disposable bowl to be carried back to the group.
5. Groups should explore to find out if the feather behaves the same way in water as it did before being coated with oil. After making observations, students should dry the feather and draw a detailed picture in section #3 of their papers.
6. Explain that people clean birds with soap after an oil spill. Challenge students to clean the oily feather using a small amount of dish detergent.
7. After cleaning the feather, have students place the feather in a bowl of water and observe it. Again, students should dry the feather and make a detailed sketch in section #4 of their papers.
8. Have students compare the cleaned feather with the natural, dry one.

EXPLAIN

How do birds get oil on their feathers?

How did the feather change after it had been dipped in oil?

How did the feather behave in water after it had been dipped in oil?

Did the oil-covered feather float? Did it absorb water?

How did the feather behave in water after it had been "cleaned"?

Did the cleaned feather float? Did it absorb water?

How did the feather you drew in sections #3 and #4 look different from the feather you drew in sections #1 and #2?

How do you think this change in the feathers would affect a bird's normal activities, such as swimming or flying?

Do you think detergent is the best way to solve the problem of removing oil from a bird's feathers?

Could the oil affect the birds in any other ways?

What do you think happens to birds that swallow some of the oil or eat oil-coated foods?

EXTEND/APPLY

1. Read *Prince William* by Gloria Rand.
2. Encourage students to find related articles in the newspaper.

EXTENSION

Explore the following question: *How could an oil spill affect the success of birds nesting near the water?* To demonstrate the effects of oil contamination on bird eggs:

- Hard-boil two eggs. Leave the eggs in the shells.
- Have students make observations about the properties of the eggshell and then peel the egg.
- Have students make observations about the surface of the white of the egg and then cut the egg in half so they can make observations about the inside. Save this egg.
- Students should submerge the other hard-boiled egg in oil overnight. Clean the shell gently with dish detergent and repeat the observations with this egg, comparing it to the uncontaminated egg.
- Discuss the effects of oil spills on nesting birds and their eggs.

ASSESSMENT

Have students write in their journal about other negative effects of human-caused pollutants on people, wildlife, and the environment.