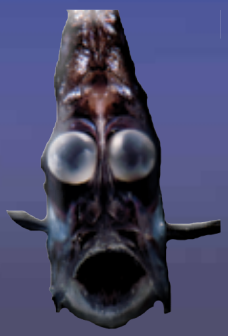
WhaleTimes

# Creep into the DEEPEND™

## Taking Science Deeper™

K-6th grade Classroom Activities

Book 4: Ocean Currents and Pollution Awareness



DEEPEND
DEEP PELAGIC NEKTON DYNAMICS OF THE GULF OF MEXICO

GULF OF MEXICO RESEARCH INITIATIVE

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DEEP PELAGIC NEKTON DYNAMICS OF THE GULF OF MEXICO

**Mission Statement**

The DEEPEND consortium will characterize the oceanic ecosystem of the northern Gulf of Mexico to infer baseline conditions in the water column. This information will establish a time-series with which natural and anthropogenic changes can be detected.

**Scope of Work Statement**

In response to the Deep Water Horizon Oil Spill (DWHOS) and the highlighted absence of baseline data for the deep Gulf of Mexico (200-1500 m) water column, the DEEPEND consortium will conduct a three year sampling, sensing, modeling, and laboratory analysis program to assess ecosystem dynamics, identify drivers of variability, and investigate possible consequences of the spill on ecosystem attributes. Data obtained during the 2010-2011 and 2015-2017 periods will establish a time-series with which ecosystem shifts or responses can be detected.

Keep up on the latest DEEPEND research, visit:
http://deependconsortium.org/

Taking Science Deeper™ Activities

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# Creep into the DEEPEND™

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# Creep into the DEEPEND™

For each activity, we have at-a-glance pictographs showing some of the skills students might use or discover when participating in the activity. We didn't include science, since that's a given!

Language Arts: Discussion, sharing stories, observations or questions

Language Arts: Writing

Visual Arts: Drawing, coloring, sharing discoveries through a visual medium

Visual Arts: creating a craft

Math: The activity introduces some form of math including measurements, graphs, estimates, and other math topics.

Observation

Role-play, dance, or some sort of physical activity

Music, singing, or rhythmic activity

Activity encourages further discovery about topic through various types of research as an addition to the project.

GRADE LEVEL(S): We have noted suggested grade levels, but find most activities can be adapted for younger or older students.

We have noted a general idea of how long the activity will take. However, this will vary depending on length of group discussions, student's age, and other factors. We strongly suggest that part of your prep includes testing the activities so you have a general idea of how long it will take for your students.

MATERIALS: We have endeavored to include everything you will need to complete the activity. All materials you use should be non-toxic child safe, of course. In some cases we have listed options such as, markers or crayons. Choose the medium that works best for your classroom situation and students.

TEACHER'S NOTE: Though not required, with some activities, we suggest using cooperative learning groups with older students because it often encourages participation, brainstorming, and discussion.

# Create a Cold water Current Lab



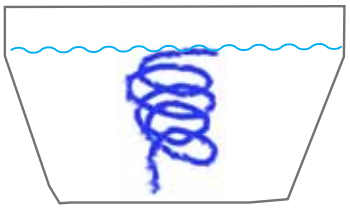
ACTIVITY: Kids create a cold-water current.

GRADE LEVEL(S): K to 6th

20-30 minutes

OVERVIEW: Observe how cold water moves through warm water.

DISCIPLINES: Science, oceanography



OBJECTIVES: Students will be able to:

- create a cold-water current
- describe how water currents move throughout water.
- recognize that even though we cannot see them, currents travel throughout the water column.
- explain how currents move nutrients and pollutants through the water.
- recognize that currents move water vertically and horizontally throughout the ocean
- discuss how animals rely on currents to find food.

MATERIALS:

You'll need

Preparation:

- Food coloring (blue, red, and yellow)
- Ice cube tray

Day of Activity:

Observation Center (aka lab) Set up for watching currents:

- 2-quart clear Acrylic or plastic container, approximately 5-inches tall (one per group)
- Warm tap water (The temperature a student can safely and comfortably wash hands in)
- Pre-made blue ice cubes
- Sturdy tables, flat desks, or other safe child height surface to safely place acrylic containers for kids to observer water.

(OPTIONAL)

- Thermometer
- Flashlight (small) (one per group)

For kids:

- Crayons or color pencils: blue, red, purple, yellow, green
- Writing/drawing paper
- Clipboards

NOTE: In order for the current to flow naturally, kids should not touch water, bowl, and avoid shaking the table. Kids need to be able to see the current from the top and side. Depending on the size of the group, you may want to have a couple observation centers.

**☺This is a simple and excellent activity. Don't let the materials list scare you! ☺**

The ice cubes and water do all the work! Most of the list is the set-up so the kids can become scientists and really observe, discuss, and note what they discover.

**Preparation:**

At least a day before: Make dark blue ice by adding several drops of food coloring to water in each compartment of ice cube tray(s). Make one ice cube for each observation center/ group. Freeze.

The day of:

1. Place bowls at each group's observation center.
2. Have warm water, ice, yellow and red food coloring (if using), and flashlights nearby.
3. Have clipboards, paper, writing utensils ready for students.

WHAT TO DO:

**Introduction Discussion**

Tell the kids they'll be ocean scientists observing water and thinking about how and why it moves. Explain that when observing, scientists don't interfere with what they're watching (You might ask kids if they know why). Explain that scientists don't want to change or disrupt what would naturally happen. Since the kids will be scientists, they must not touch the water, ice, or bowls, and need to be careful not to bump the table(s).

Like scientists, the kids must use their eyes and brains. Also, like scientists, kids should record observations by drawing what they see. Hand out clipboards and writing utensils.

**Activity**

STEP 1: Carefully fill one container (about 4/5ths of the container) with warm water. Measure the water temperature (share temperature or have students read themselves). Ask: *Is it cold or warm?* (Help them with answer if necessary).

STEP 1A: If more than one lab set up, pour water into each bowl before moving on to Step 2.

STEP 2: Show kids the blue ice cube. Ask: *What is this? Is it cold or warm?* Tell students they will observe what happens to the "blue" as it melts. The blue will create a current they can see in the water.

STEP 3: Gently set a blue ice cube into center of water of each bowl. (Remind kids not to touch the bowl, ice or water.) Let them know the ice should melt slowly enough to allow everyone to get a close view, so they can take their time to observe.

STEP 4: Have kids observe what happens from the top and side.

STEP 5: Encourage kids to discuss, describe, and draw what they see. Have them hypothesize what might be happening and why. You may want to ask questions to get them thinking, but allow them to brainstorm freely. You might ask.

- *What happens when the ice cube melts?*
- *What do scientists call water moving through water?*
- *Is the blue water current warm or cold?*

- *Where does the cold water go? Why?*
- *Why does the cold water sink?*

STEP 6: Once the ice cube melts completely, ask: *Do you think the cold water current is still moving? Why or why not?*

STEP 7: Squirt a couple drops of red food coloring into the water above the blue current. (Do not stir or touch water.) (NOTE: The cold current becomes purple, allowing the kids to see how the cold water current continues to move through the warm water.)

STEP 8: Again, have kids discuss, describe, and draw what they see with their group and share with class. Be sure to view the current from top and side – eye level.

OPTIONAL: Give each group a flashlight and have kids take turns using it to highlight the current.

STEP 9: When the red seems to be completely incorporated, add a couple drops of yellow food coloring. Keep observing. (NOTE: The current pulls in the yellow color.)

**If working with younger students, move on to Step 11**

STEP 10: With older kids, after swirling cold water current slowly sinks, you might ask:

- *Where did our cold current start?*(Note: at the surface)
- *Where is the current, now?* (Note: middle or bottom)
- *What does that tell you?* (You can lead them with, Does that mean water at a certain temperature is heavier or lighter than another? So cold water sinks because it is...?)
- *In the ocean, is the water at the surface usually warmer or cooler than below?*
- *Is the water further down usually warmer or colder? Why?*

STEP 11: Discuss the steps of what they saw from the ice to the yellow food coloring. Let kids share observations and thoughts. Explain that the ocean is full of warm and cool currents. Let them finish their drawings of the current.

**REMEMBER: Food coloring can stain clothes, carpeting, and furniture.**

Allow students time to write down (or draw) their thoughts, discoveries, and questions in their *Deep Thoughts Journal* and/or add their drawings of the currents in the journal.

# Go with the Flow

ACTIVITY: Students recreate the movement of currents through role-play and art.

GRADE LEVEL(S): K to 5th

30-45 minutes

OVERVIEW: Students create their own ocean current using sidewalk chalk

DISCIPLINES: Science, oceanography, art, music, dance, physical activity

OBJECTIVES: Students will be able to:

- role-play movement of water
- describe and draw an ocean current
- describe how water currents move throughout water.
- recognize that even though we cannot see them, currents travel throughout the water column.
- explain how currents move nutrients and pollutants through the water.
- discuss how animals rely on currents to find food.

Photo from NASA

MATERIALS:

- Ocean current photograph (provided in activity)
- Sidewalk chalk
- Sidewalk or large concrete area to draw
- Music (calm, soothing instrumental)

WHAT TO DO:

STEP 1: Show NASA's ocean surface currents photograph. Point out the coastline. Explain that this is a photo of the ocean and scientists drew in the currents we normally cannot see to show how currents move and connect with each other. Have students describe the shapes they see (circles, spirals, half-circles, swirls, curves, squiggly lines...etc.). Ask, *Do any of the currents in this photo look like the ice cube current? Do you see how the currents sometimes seem to join or wrap around each other.* Let students share what else they observe.

STEP 2: Have students become the water and mimic how they think a current moves through the water. Have students stand an arm's length apart. Play music. Encourage students to move gracefully and slowly. They can spin, walk in spirals, flow back-and-forth, even swirl their hands and arms, to create their own current.

STEP 3: Have the students use sidewalk chalk to draw their own ocean current map. Tell students they will create a giant ocean current map, like the photograph. Students can choose whichever current shape they prefer. Encourage them to use the space and draw huge currents.

Suggestions:

- Have students stand arm's length or a little further apart so each student has a drawing area, but still keeps the currents connected -- just like in the ocean.
- Play music while students create.
- Your *Go with the Flow* ocean current map might look like this.

- **OR** combine the activity with the *Follow the Current* game and have a pre-drawn path to draw.

STEP 4: After students finish drawing their currents, take time to observe and enjoy the giant art piece in different ways.

STEP 5: Play music and have students become the water and follow the chalk current map.

Go Deeper:

- Count the number of spiral currents, swirls and other shapes
- Graph the number of spiral currents, swirls and other shapes
- Discuss how the currents flow into each other connecting to the next current connecting the entire world.
- Use the chalk currents to introduce or reinforce discoveries, such as how animals and trash might move with currents.
- Use with other Taking Science Deeper Activities:
  - Learn the *Jelly Dance Song.* Sing and role-play jellies moving through current map.
  - Play the *Follow the Current Game* obstacle course

**A bit of background about currents:** The ocean is in constant motion moving. Ocean currents move water up and down and across the sea. Currents move water, nutrients, animals, even pollution around the world. Scientists describe this movement as a "conveyor belt." The conveyor belt starts in the Norwegian Sea, where water warmed by the Gulf Stream heats the atmosphere, cooling the water and causing it to sink. It takes about 1,000 years for this water conveyor belt to make a trip or one cycle around the world.

Throughout the world, ocean animals rely on currents. Plankton (tiny plants and animals) and jellies depend on currents. With little or no ability to move through the water on their own, they go wherever the currents take them. Sharks, whales, seabirds, and fish follow the nutrient-rich currents to find food.

For more information on currents visit these NOAA pages:

What is a Current (oceanservice.noaa.gov/facts/current.html)

What is the Global Ocean Conveyor Belt? (oceanservice.noaa.gov/facts/conveyor.html)

Why does the Ocean get colder at Depth? (oceanservice.noaa.gov/facts/coldocean.html)

# Go with the Flow

NASA-created image of wind-created surface currents off the coast of Florida.

Photo Credit NASA

# Follow the Current Game



ACTIVITY: Kids play a game to discover how animals must overcome natural and human-caused obstacles following current

GRADE LEVEL(S): K to 5th

15 minutes

OVERVIEW: Science, conservation, physical activity

DISCIPLINES: Science, oceanography

OBJECTIVES: Students will be able to:

- discuss how and why animals follow ocean currents
- recognize that pollution travels around the world in currents
- discuss how pollution is detrimental to animals and the ecosystem

MATERIALS:
- color index cards or paper
- poker chips or other kind of token to represent "fish chips"
- Pre-written "Obstacles and Opportunities" in bowl

OPTIONAL for obstacle course:
- Safety traffic cones
- Hula hoops

WHAT TO DO:

Preparation:

On small pieces of paper, write different obstacles and opportunities a penguin might face in the ocean. Kids can earn or lose fish chips, have to start over, (and with older kids) be out of the game. Examples include

- Trash in the current gets in your way. Go back two swirls.
- You find a huge school of fish. Get three fish chips.
- You think a piece of plastic bag is a fish. You eat it and get sick. Start over.
- You swim into a school of sharks, but survive! Take 1 fish chip.
- The wind stops, which causes the current to stop. Stay in this spot one round.
- You can't find any fish. Lose 2 fish chips
- A sudden storm blows you off-course. Start over
- A plankton bloom causes the fish population to explode. Take 5 fish chips.
- A fishing boat just caught all the fish. You're out!
- You got caught in an oil spill. Scientists rescued and released you. Take 2 fish chips.


Obstacle Course:

- You can use the *Go with the Flow* current map or create a new one.
- Determine the start line and the direction kids will travel.
- Randomly place different color index cards or paper throughout course along with "fish chips."

STEP 1: Tell the kids that they will become penguins following fish. The fish are following the cold-water currents to find food. This is not a race.

Explain that they will follow the movement on the current map. Like penguins, they'll run into obstacles that make it hard to survive and opportunities that help them survive. When you call "obstacle" have students move to closest card. More than one student can stop at a card.

STEP 2: One at a time, have the kids start following the currents. If younger students, have them flap arms up-and-down to mimic a swimming penguin. If the get to the end, the start over until they're out or the game is over.

STEP 2: Call "obstacle." The kids have to move to the closest piece of paper.

Choose a color. Then choose a pre-written obstacle/opportunity and read it to the kids. For example, tell anyone on purple: "A bigger penguin ate your fish. You lose 1 fish chip." Have the students leave one chip in that pile.

Continue with game. Repeat as many times as desired.

STEP 3: At the end of the game, discuss how many kids made it through the current, how many fish they got, and discuss natural and human-caused (pollution, loose nets, overfishing) obstacles animals in the ocean face, and how kids can make it easier for ocean animals (reduce, reuse, recycle).

Allow students time to write down (or draw) their thoughts, discoveries, and questions in their *Deep Thoughts Journal.*

# Turtles and Trash Don't Mix

Activity: A whopper of a story helps kids understand how a sea turtle might confuse plastic bags with jelly.

Grade Level(s): K to 6th

20 minutes

Disciplines: Science, conservation

Objectives: Students will be able to:

- discuss how an animal can confuse trash with their food
- recognize the importance of reducing, reusing, and recycling

Materials:

- Small acrylic aquarium (approximately 1.5 gallon) or clear acrylic container
- Water
- Plastic bag (pre-cut into to look like jelly)
- Small rock (1-1/2 inch diameter)
- Aquarium plants, rocks, and/or decorations

Background: Leatherback sea turtles (Dermochelys coriacea) search for jellyfish in the deep sea throughout the world including the Gulf of Mexico. Leatherbacks are the largest kind of turtle, reaching lengths up to 6 .5 feet (2 m) and weights up to 2,000 pounds ( (900 kg). Unfortunately, to a hungry sea turtle, a plastic bag floating in the water might look like jelly. When a sea turtle eats a plastic bag, the bag does not digest. It tricks the turtle's body into thinking it's full. Then the sea turtles will not hunt or eat enough and can become weak, even slowly die of malnutrition or starvation.

Photo courtesy NOAA

Background information:

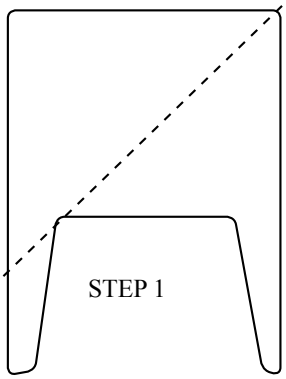
Leatherback Sea Turtles, NOAA:
www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm

"Leatherback Turtle Threatened By Plastic Garbage In Ocean" Science Daily:
www.sciencedaily.com/releases/2009/03/090315224258.htm

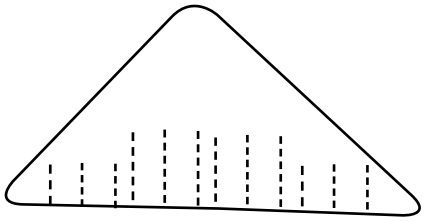
WHAT TO DO:

Preparation
Turn the plastic bag into a jelly.

Step 1: Cut–off the bottom corner of the plastic bag to make the jelly. Be sure no letters, art, or logo are part of the jelly. Save the unused portion of the bag to stuff the jelly in STEP 3.




Step 2: Make tentacles by cutting the bottom of the jelly into strips. Also, cut some fringe onto either end of the cut handle.



STEP 2

Step 3: To give the jelly some shape, stuff the extra plastic into the corner of the jelly. Because it floats so well, add a small rock or two to help it slightly sink. Tie the cut-off bag handle around the jelly.

Step 4: Decorate the aquarium with the rocks and plants. Fill with water.

Step 5: Place the jelly inside. Swish it around until it looks jelly-like. Play with the aquarium layout and where the kids will sit to help create the illusion that it's a real animal. (Suggestions: You may want to cover the aquarium so kids can't see it until you're ready.)

Example of "jelly" in water.

Activity

Step 1: Introduce some sea turtle facts. If younger students, have them role-play a swimming and eating turtle.

- Most sea turtles eat jellies.
- Sea turtles swim through the sea in search of jellies to eat.
- Sea turtles do not chew their food. They quickly grab it and swallow it whole.

Step 2: Tell the kids that sea turtles often mistake plastic bags floating in the sea for the jellies they hunt. To get students to think about this, you might ask:

- *Do you think it'd be healthy to eat a bag?*
- *Does an animal use, know about, or understand plastic?*
- *What do you think happens if an animal eats a bag? (The stomach sends a signal to brain that the turtle is full or not hungry.)*
- *What if a person doesn't eat for a long time, what happens? (Starve, not get vitamins and minerals you need, get weak)*
- *What might happen to a sea turtle if it doesn't eat? (Explain that it can make the turtle very sick.)*

Sum up the discussion with something like, "So a sea turtle eats a plastic bag because it expects it to be a jelly."

Ask (sort of incredulously): *Can you imagine thinking a plastic bag is a jelly? Hard to believe isn't it?*

Step 3: Sell the Tale: In a hushed, but enthusiastic voice, tell kids that you have something exciting to share with them – a jellyfish you were able to bring into the classroom. However, they have to keep their distance, and be very still and quiet so it does not become scared. Show them the jelly. Have kids role-play how a jelly moves through the sea. Maybe share a fact or two about jellies (no eyes, no bones, mostly water...)

Step 4: The big reveal. Say, *Oh, and one more thing...* Then reach into the aquarium and pull out the bag. (Allow kids time to realize and react to discovering that it is a plastic bag and not a jelly.) Then add, Maybe it's not so hard to confuse a plastic bag with a jelly!

Step 5: Let the kids share their thoughts about discovering it was a plastic bag when they expected it to be a jelly.

NOTE: This is a basic skeleton of how to tell the tale. Make it your own by add cool facts and tell the tale in your own way.

ACTIVITY: Discover how our accidental trash and pollution makes its way from a neighborhood to the ocean and eventually to the deep.

GRADE LEVEL(S): K to 6th

20 minutes

OVERVIEW: Experience ocean pressure

DISCIPLINES: Science, geography, conservation

OBJECTIVES: Students will be able to:

- understand their role in protecting the ocean
- describe how pollution and trash is carried by water and wind to the sea
- discuss what might happen to the pollution, chemicals, and trash that gets into the sea
- name two ways pollution or trash harms ocean animals
- list three ways they can help reduce pollution and trash

MATERIALS:

Each learning group needs:

- Paint roller tray or liner
- River and/or decorative rocks
- Food coloring: yellow, green
- Small spray bottles with clean water
- Laminated photo of a local neighborhood or skyline (cover in plastic) OR Miniature houses, cars or other objects to represent a neighborhood

Suggested Pollution/Trash: Each group needs a small amount

- oregano (dried) (Represents plant/dirt run off or misc. pollution)
- crushed popped popcorn (Represents: plastics, Styrofoam)
- decorating sprinkles (Represents: trash)
- food coloring (Represents: soap, pesticides, fertilizer, oil and gasoline from cars)
- kosher or sea salt (Represents chemicals such as soap, pesticides, fertilizer, oil and gasoline from cars that sinks to deep.)

WHAT TO DO:

Preparation

- Find and print out a photo that represents a local neighborhood or your city. Laminate or cover in plastic. (One photo per learning group.)

- Tape the photo to the top of the paint tray, facing the inside of the tray.

Activity

Step 1: Have kids use rocks to create a local stream or river that runs from the neighborhood or city (top of paint roller tray) and eventually meets up with the sea.

Step 2: Show kids each kind of pollution and explain what each represents. (Gently, but clearly be sure kids understand that it's the kind of trash or pollution individuals create living our lives.)

Step 3: Have kids sprinkle a pinch of each kind of "trash" in the neighborhood and in and along the river. (Depending on the grade, you might want to direct how students take turns.)

Step 4: Have kids recreate rain with squirt bottle. Have them observe and discuss where or how far the pollution travels. What sinks? What floats?

Step 5: Next, add a couple 1 or 2 drops of the "chemical" pollution (food coloring) and a pinch of salt in the neighborhood. Once again, have kids recreate rain with squirt bottle to observe and discuss where or how far the pollution travels. What sinks? What floats?

Step 6: Have kids discuss what happens in the real world. Ask:

- *Where did all the pollution, the plastics, chemicals, and other pollution from our neighborhoods end up?*
- *What happens when the pollution gets into water?*
- *Besides rain, how else can pollution end up in streams, rivers then finally the ocean?*
- *Are there things we can do to protect the ocean?* (Make sure kids think about what they can personally do, not say what companies of factories should do.)

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