



A standards-aligned curriculum guide for grades 4 – 8

PLANET OCEAN: WHY WE ALL NEED A HEALTHY OCEAN

"[C]onveys a strong sense of urgency to clean the global ocean and restore the ecosystems it supports." —Booklist

"The range of nationalities represented and the inclusion of a variety of Indigenous voices make a particularly compelling argument that ocean health is a whole world problem...Worth exploring in depth." —Kirkus



About the book

Age Range: 9 - 14 years

Grade Level: Grades 4 - 8

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A little more than 70 percent of Planet Earth is ocean. So wouldn't a better name for our global home be Planet Ocean?

You may be surprised at just how closely YOU are connected to the ocean. Regardless of where you live, every breath you take and every drop of water you drink links you to the sea. And because of this connection, the ocean's health affects us all.

Dive in with author Patricia Newman and photographer Annie Crawley to visit the Coral Triangle near Indonesia, the Salish Sea in the Pacific Northwest, and the Arctic Ocean at the top of the world. Find out about problems including climate change, ocean acidification, and plastic pollution, and meet inspiring local adults, scientists, kids and teens trying to reverse the ways in which humans have harmed the ocean.

Planet Ocean shows us how to stop thinking of ourselves as separate from the ocean and how to start taking better care of this precious resource.

About the author and photographer

Patricia Newman (left) and Annie Crawley have been friends ever since they created *Plastic, Ahoy! Investigating the Great Pacific Garbage Patch*. It seemed only natural to combine their talents in a book about our relationship to the sea.



Patricia's books inspire young readers to use their imaginations to solve real-world problems and act on behalf of their communities. A Robert F. Sibert Honor recipient, Patricia's books have received starred reviews, Green Earth Book Awards, a Parents' Choice Award, and Bank Street College's Best Books honors. Patricia speaks at schools and conferences to share how children of any age can affect change. Visit her at www.patriciamnewman.com.

As an award-winning producer, photographer, author, and inspirational speaker, Annie Crawley creates programs about our environment focusing on our world underwater. She's a member of the Women Divers Hall of Fame, a PADI Master Scuba Diver Trainer, and holds her Master of Communications from the University of Washington. Annie runs a scuba diving team in the PNW. Join her team and become the voice of the ocean. Find out more at www.OurOceanAndYou.com and www.AnnieCrawley.com.

Curriculum guide objectives

- To engage readers with phenomena-based questions about the health of our ocean
- To help students understand our unbreakable connection to the ocean and how our habits affect its health
- To encourage and empower students to become a voice for the ocean in their homes, schools, and communities
- To increase awareness of the ocean's importance by sharing stories on social media via #PlanetOceanBook

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Common Core State Standards

Reading: R.1, R.2, R.3, R.4, R.5, R.6, R.7, R.8, and R.10
 Language: L.4, L.5, and L.6
 Speaking/Listening: SL.1, SL.2, SL.3, SL.4, and SL.5
 Writing: W.1, W.2, W.3, W.4, W.5, W.6, and W.9

Next Generation Science Standards

Ecosystems: Interactions, Energy, and Dynamics

- LS2A: Interdependent relationships in ecosystems
- LS2B: Cycles of matter and energy transfer in ecosystems
- LS2C: Ecosystems dynamics, functioning, and resilience
- LS4D: Biodiversity and humans

Earth and Human Activity

- ESS2C: The role of water in Earth’s surface processes
- ESS2D: Weather and climate
- ESS3C: Human impacts on Earth Systems
- ESS3D: Global climate change

Ocean Literacy Standards

Ocean literacy is an understanding of the ocean's influence on us—and our influence on the ocean. An ocean-literate person:

- understands the Essential Principles and Fundamental Concepts about the functioning of the ocean;
- can communicate about the ocean in a meaningful way;
- is able to make informed and responsible decisions regarding the ocean and its resources.

Developed through a community-wide consensus-building process, this definition along with the seven essential principles outlined in this volume build on previous efforts to define ocean literacy, assess what the public knows about the ocean, and redress the lack of ocean-related content in state and national science education standards, instructional MATERIALS and assessments.

The essential principles of Ocean Literacy are as follows:

1. The Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean made Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.
7. The ocean is largely unexplored.

(excerpted from the [Ocean Literacy Framework](#))

United Nations Sustainable Development Goals

The Sustainable Development Goals (SDGs) are the world's shared plan to end extreme poverty, reduce inequality, and protect the planet by 2030. A report from the [Nippon Foundation's Nereus Program](#) says, "ocean sustainability holds the key not only to our future prosperity but also for our survival from a comprehensive science-based perspective."

Adopted by 193 countries in 2015, the SDGs emerged from the most inclusive and comprehensive negotiations in UN history and have inspired people from across sectors, geographies, and cultures. Achieving the goals by 2030 will require heroic and imaginative effort, determination to learn about what works, and agility to adapt to new information and changing trends.

The UN Foundation focuses on ideas and initiatives that generate larger impact, advance the SDG imperative to "leave no one behind," and are backed by evidence, practical commitments, and action.

Individuals, innovations, and actions are helping the planet realize the potential and promise of the SDGs.

(excerpted from the [United Nations Foundation](#))



Phenomenon: Why do we need a healthy ocean?

MATERIALS

- Student notebooks
- Packet of small rectangular sticky notes
- *Planet Ocean*

PROCEDURE

- Show students the cover of *Planet Ocean*. Ask them to read the title and the subtitle. Then ask the following questions:
 - Why do we need a healthy ocean?
 - Why are coral, or Arctic ice, or shellfish and salmon so important to the ocean?
 - What is your role in the ocean's health?
- As the discussion progresses, ask students to write their thoughts on small rectangular sticky notes (one idea per sticky note).
- Ask students to recreate the following chart on a two-page spread in their notebooks.

What I think I know	Confirmation (I was right!)	Misconceptions	New Information	Wonderings

- Students put their sticky notes in the “What I Think I Know” column of the chart.
- Then read “The Maps Are Wrong” in *Planet Ocean*.
- After reading “The Maps Are Wrong,” ask students to evaluate their sticky notes in the “What I Think I Know” column. Some of the notes may be moved to either the “Confirmation” column or the “Misconceptions” column. Ask students to write one or two new sticky notes based on the chapter for each of the last two columns: “New Information” and “Wonderings.”
- Repeat the previous two bullet points for each of the other chapters in the book. The book has five chapters and can easily be read within a few days.

Phenomenon: How hard is it to change our habits?

- [Download the challenge.](#)
- How many of the suggestions can your class implement? Challenge students to a zero-waste week, month, or YEAR!
- Ask students to write about their progress.
 - What have they eliminated/changed?
 - How difficult was it to change their habits?
 - Ask students to create a hashtag for each week of their challenge.
 - Share with Patricia and Annie at #PlanetOceanBook.

#RefuseSUP REFUSE SINGLE-USE PLASTIC FOR 30 DAYS MY 30-DAY PLASTIC JOURNAL RETHINK YOUR PLASTIC USE & WRITE DOWN YOUR PROGRESS. SHARE WITH US: PatriciaMNewman.com AnnieCrawley.com					
Skip straws. Keep track of how many you skip with tally marks.	#RefuseSUP drinks. Keep track with tally marks.	#RefuseSUP bags and keep track.	Carry bamboo or metal utensils rather than use plastic utensils.	#RefuseSUP plates, cups, bowls.	Never use Styrofoam. THINK. Why?
Take a photo of your actions. Share using our #RefuseSUP hashtag.	Buy bulk foods packaged in your containers rather than SUP packages.	Investigate your bathroom. Do your products contain microbeads?	Change single-use yogurt to bulk or glass.	Brainstorm with your parents to switch single-use packages to bulk.	Share what you're doing with your grandparents. Ask them to join you.
Write a letter to your favorite restaurant. Ask them to stop using straws.	#RefuseSUP water bottles.	You're halfway there! Email us your photos, videos, stories about your Challenge.	Talk to your friends at school about creating zero waste lunches.	Explore your bedroom. Record the SUP. Brainstorm how to change.	Explore your fridge. How can you create change?
Write a letter to the President. Ask for the change you want to see.	Ask your cousins to join your campaign to help the ocean.	Our ocean gives us oxygen, food, water. How else can you help?	Switch SUP candy to Hershey Kisses. THINK. Why?	Share your campaign with your teacher. Ask her to make it class project.	Brainstorm a list of other people you could convince to #RefuseSUP.
Join the Green Team at school. Ask them to think Blue (as in ocean).	Talk to your coaches. Ask them to #RefuseSUP water/ Gatorade for practice.	Look in your backpack. Are there ways to change and #RefuseSUP?	Carry a reusable bag in your backpack just in case you need it.	Write a letter, take a photo, create a video to share with the Governor.	Share photos, videos, stories with Patricia & Annie about your 30-Day #RefuseSUP Challenge.

Phenomenon: What is ocean acidification?

PREPARATION

- Educators, you may prepare for this lesson by downloading the following instruction sheets and/or watching videos on the Washington Sea Grant website. We've summarized the lessons below.
 - Tale of Two Acids experiment:
 - [Washington Sea Grant's detailed classroom instructions](#)
 - [WSG video](#)
 - Hold Your Breath demonstration
 - [WSG's detailed classroom instructions](#)
 - [WSG video](#)

MATERIALS

- Student notebooks
- Per group of 4 students:
 - pH indicator solution (purchase OR boil purple cabbage leaves in 1 to 2 cups of water; steep until cool)
 - 3 clear cups or glasses (please try not to use single-use plastic!)
 - Pitcher of water
 - 1 stainless steel, paper, or glass drinking straw
 - 1 lemon or lime (plus a knife and cutting board to cut it)
- Copy of We Speak Like Scientists! chart (next page)



Photo credit: OurOceanandYou.com AnnieCrawley.com
#PlanetOceanBook

PROCEDURE: Part I: Tales of Two Acids

- After reading “The Coral Triangle: Cities of the Sea” and “The Salish Sea: Our Connection is Real,” ask students to write a brief definition of ocean acidification in their notebooks.
- Divide students into groups of four and ask them to read, critique, and revise their definitions.
- In the same groups, conduct the Tale of Two Acids experiment designed by Washington Sea Grant. Because we exhale carbon dioxide when we breathe, we can simulate ocean acidification by bubbling carbon dioxide through a straw into a cup.
 - Read (or paraphrase) enough of WSG’s narrative to get students started.
 - Dilute 1 part cabbage solution with 3 parts tap water (you can use seawater, but it’s not necessary).
 - Distribute the solution equally between the 3 clear cups/glasses.
 - Set one cup aside as the control.
 - Add lemon/lime juice to the second cup. Students will see a marked color change.
 - Blow through the straw to add carbon dioxide to the third cup. Students will see a slight color change which is indicative of what’s happening in the ocean.
 - Ask students to record their materials, procedure, and results in their notebooks.
 - Ask them to write a paragraph explaining why they saw the changes they did.
 - Discuss students’ conclusions as a class. Use the following questions to discuss what ocean acidification is and is not. Be sure they use We Speak Like Scientists! language (see chart on next page).
 - What happens when carbon dioxide enters the ocean?
 - Does this mean the water is so acidic it will burn our skin?
 - Why is ocean acidification harming marine life? Ask students to give examples from *Planet Ocean*.
 - Why is a small change in the acidity of the ocean such a big deal for shellfish and coral?

PROCEDURE: Part II: Hold Your Breath Demonstration

- Ask students what happens when we breathe? (Possible responses include we inhale oxygen and exhale carbon dioxide.)
- Now, ask students to hold their breath while you read about ocean acidification from WSG’s classroom instructions. Students should raise their hands when they can’t hold their breath any longer.

- Ask students to explain what's happening. Then, explain the following:
- They might say their brains are running low on oxygen, but actually their brains are registering an increase in CO₂. Because they can't exhale their CO₂, their blood is becoming slightly more acidic, just like the ocean.
- The ocean has become slightly more acidic because of ocean acidification -- by about 0.1 units. If our blood pH dropped 0.1 we would have trouble thinking clearly, our speech might be slurred, and our balance would be off.
- If our blood pH were to drop by 0.3 units, we'd go into a coma and maybe even die. At our current rate of emissions, a 0.3 unit drop in pH is exactly where our ocean is headed.
- Create an infographic that explains ocean acidification and the effect ocean acidification has on shellfish or corals (choose one).

We Speak Like Scientists!

Scientists share their own thinking	Scientists agree and build on each other's ideas.	Scientists respectfully challenge each other's ideas.
I observed _____.	I agree with _____ and can add that _____.	I would argue that _____.
Based on my observations, I think _____ because _____.	I want to build on your idea about _____ : _____.	My data suggests something else: _____.
For example, _____.	What _____ said about _____ makes me wonder _____.	Could you elaborate on why you think _____?

Phenomenon: What is phytoplankton? How does it survive? Who eats it?

MATERIALS

- Student notebooks
- Water sample from a pond, a river, a lake, or the ocean
- *Planet Ocean*
- White drawing paper
- Recycle bin materials
- A few tall cylinders or bins filled with water
- Red and pink beads to represent krill for Bioaccumulation Game

PROCEDURE: Part I: Investigating phytoplankton

- Either as a class or in small groups, ask students to review Chapter 2: The Salish Sea in *Planet Ocean*, specifically for phytoplankton references.
- Students write two facts about phytoplankton and two questions they have.

- Explain to students that phytoplankton come in a variety of shapes and sizes — spirals, cones, squares, circles.
- Watch [*The Diatomist*](#), a video about an artist who collects phytoplankton and creates art with it.
 - Ask students to discuss what part art plays in science. Think of *The Diatomist* and *Planet Ocean*.
- If you have access to microscopes, take a sample of pond, river, lake, or ocean water and look at it under the microscope. Ask students to draw what they see.

PROCEDURE: Part II: Build a food web/Energy transfer

- Ask students to choose one ocean region from *Planet Ocean* — the Coral Triangle, the Salish Sea, or the Arctic.
- Students sketch pictures of different kinds of marine life found in that region, and cut them out. Use the images in *Planet Ocean* or the QR codes for reference. Students must have a variety of types of marine life from their ecosystem. Salish Sea ecosystem example: phytoplankton; krill; salmon fry; adult salmon; shellfish; eagles; sea lions; giant Pacific octopus; orca.
- Ask the students to tape/glue their sketches in their notebooks in a food web to determine the flow of energy through the ecosystem.
 - Begin with phytoplankton, and ask students what provides energy to these single-celled plants. They should say the Sun, so students should draw an arrow from the Sun to phytoplankton.
 - Then, what eats phytoplankton? Draw an arrow facing the way the energy flows.
 - Ask students to keep adding organisms until their food web is complete.
 - Did students use all of their marine life sketches? Why or why not?

PROCEDURE: Part III: Bioaccumulation game

- Object: To survive in one specific Salish Sea food chain
- Divide students into grizzly bears, salmon, and herring; a 1:3:9 ratio works best. Herring eat krill (represented by red and pink beads). Salmon eat herring. Grizzly bears prefer salmon, but will also eat herring.
- Place several red and pink beads around the play area. Tell students there is no difference between the different color beads. In reality, the pink beads represent krill exposed to toxins, such as mercury, DDT, or run-off from toxins in car tires.
- Set a timer for 15 minutes. Give the herring a 45-second head start to gather krill.
- Then the salmon and grizzly begin playing. All players play simultaneously in their search for food. Players “eat” lower trophic level organisms by playing play rock, paper, scissors. If the higher organism wins, s/he “eats” the lower organism, who sits out for the remainder of the game. If the lower organism wins, it survives and the predator must move on without eating.
- When the timer rings:
 - Students tally their red and pink beads separately.
 - Herring that have not been eaten who hold at least one pink bead are dead.
 - Salmon with more than half of their krill in pink beads are also dead.
 - Grizzlies with pink beads can no longer reproduce.
- Play the game again, with two different color beads (green and blue, for example) so students won’t know which beads represent fish exposed to pollutants. This time, distribute fewer beads around the play area. What changes did you notice?
- After the game is over, ask students to research the most common pollutants found in seafood and the impacts these pollutants have on human health.
- Where do these pollutants come from?

PROCEDURE: Part IV: Plankton float races

- The name plankton refers to a wandering lifestyle. Plankton are organisms that cannot swim against currents, they simply drift.
- Divide students into teams.
- Using materials from home recycling bins, ask each team to design three new species of phytoplankton that float. Students may have to experiment with different materials and designs until they are satisfied.
- Using the water-filled bins or cylinders, have a float race. Which plankton can float the best and sink the slowest?
 - What adaptations helped plankton to float longest?
 - What kinds of environmental variables might impact it in the ocean?
 - How do waves and wind affect your plankton’s ability to float. Make waves by slowly rocking the water container. Make wind with an electric fan.

Phenomenon: How can we make a difference?

MATERIALS

- Student notebooks
- Writing materials
- Letter-writing template (below)

PROCEDURE—Corporate responsibility

- The [Girls Scouts](#) convinced Alaska Airlines to get rid of plastic straws. Annie's Dive Team has started the [Our Underwater Backyard Project](#) for Edmonds Underwater Park to speak out for the ocean. How can you make a difference?
- Ask students to choose one company whose products they use. Examples might include Amazon, McDonald's, Nabisco, Major League Baseball, Coca Cola, Starbucks.
- Ask students to research the corporation's environmental policies.
 - List three facts about the company's policy.
 - List three questions about the company's policy.
- Ask students to share what their company is doing well and what it could do better.
- Ask students to write the company a letter using the template provided, and either:
 - Congratulate the company on their green policies, or
 - Spell out changes they think the company should make.

PROCEDURE—Political responsibility

- Ask students to divide a two-page spread in their notebooks into four or five columns.
- At the top of each column, students list the four or five environmental problems most important to them.
- Underneath the problem heading at the top of each column, students then develop a list of talking points about these issues. Talking points may include facts, scientific research, quotes from scientists, how environmental impacts affect their community, changes students have seen, etc.
- Ask students to write letters to their representatives in local, state, or federal government to share how they feel about these issues. Ask the representatives how they propose to incentivize environmental stewardship at the corporate level or how their state/country laws hold environmental polluter's accountable.
 - Note: If we are in an election cycle, students can research the candidates' environmental policies -- what does s/he support? How does s/he demonstrate that support? What could s/he do better?
- You may have to help them find the names and addresses of their representatives. We've provided some links to assist you:
 - [State government representatives](#)
 - [US House of Representatives](#) -- use the zip code look-up in upper right corner of page
 - [US Senate](#)

Letter-writing template

Your name
Address
Date
Company name
Address
Salutation,
Paragraph #1: Introduce yourself and state why you are writing.
Paragraph #2: Explain what you like and don't like about the company's environmental policies, and why.
Paragraph #3: If the company's policies need improvement, give one or two suggestions.
Closing,
[your signature]
Your name

Phenomenon: What are photos telling us?

Annie's photos capture moments in the ocean's history. They elicit a spectrum of emotions, insights, and experiences, and are powerful tools of change that can propel lines of thinking and action. Use this activity to help students "read" the photographs in *Planet Ocean* to understand their meanings and messages.

MATERIALS

- A photo from *Planet Ocean* or the [Dropbox link](#) of photos and video clips
- 4 different color markers
- A smart board to project image (or a virtual whiteboard like [Jamboard](#), if teaching virtually)

PROCEDURE

Project the chosen photo on the board (or load it into Jamboard and share the link with students).



Photo credit: OurOceanandYou.com AnnieCrawley.com
#PlanetOceanBook

Describe — Look at the facts/what do you see?

- colors
- time of day
- the people
- the landscape
- shapes and textures
- text

Students write their answers using the chosen color (or add virtual sticky notes in the chosen color on Jamboard).

Analyze — Ask questions, begin an inquiry.

- What draws your eye immediately?
- What is going on in the foreground, background, middle ground?
- Are there any recognizable buildings or landmarks?
- What is the overall mood or feeling?
- Photographer choices: Why this angle? What's left out?
- 5 W's and an H (who? What? where? When? Why? How?)

Students write their answers using the chosen color (or add virtual sticky notes in the chosen color on Jamboard).

Interpret— Use the descriptions and questions to infer what is happening

- Use the information you have (description and analysis) to draw conclusions about the photograph. Use all the clues and connect them together so they make sense.
- Can you infer what is happening in the photograph?

Students write their answers using the chosen color (or add virtual sticky notes in the chosen color on Jamboard).

Evaluate — Title the work by synthesizing what you've learned

- What do you think about this work?
- What is the photographer trying to say? What's the big idea?
- Why did the photographer choose this angle?
- What is left out of the photograph?
- Make a judgment about the value, significance and importance of the photograph.
- What would you title/name the photograph?

Students write their answers using the chosen color (or add virtual sticky notes in the chosen color on Jamboard).

Phenomenon: How can we combine science with the art of storytelling?

Planet Ocean contains many stories about people who want to be a voice for the ocean. But we *all* have stories to tell, and it's more important than ever that we are able to articulate our feelings and communicate scientific information.

IMPORTANT NOTE ABOUT CITATIONS: This lesson includes a link to some of Annie Crawley's photos and video for students to download and use in their projects. All images are watermarked, but just as Patricia Newman cited her sources for *Planet Ocean* on page 57 through 60, we ask that students cite Annie as a source in their projects. If students download any of the footage/images from the link below, please advise them to credit Annie using the following: OurOceanandYou.com AnnieCrawley.com [#PlanetOceanBook](https://twitter.com/PlanetOceanBook). Thank you!

MATERIALS

- Student notebooks
- *Planet Ocean*
- Storyboard [graphic organizer](#) (pictured below)



Photo credit: OurOceanandYou.com AnnieCrawley.com
#PlanetOceanBook

PROCEDURE

- Re-read "It's Your Turn: The Ocean's Story is Our Story" (pages 44-51). Ask students to brainstorm story topic ideas and/or make an idea map of all the things they love about the ocean. Then ask them to respond to all/some of the following prompts in their notebooks:
 - Ask them to circle the two topics they like the best.
 - For each topic, ask students to list three intriguing things.
 - Write down one thing about the ocean they didn't know before reading *Planet Ocean*.
 - Ask students to write a list of words that mean OCEAN to them.
 - Now, students tell a partner what they'd like to say about either of the two circled topics.
 - Ask students to choose their favorite *Planet Ocean* QR code. Why did they like it? How did the storytelling capture them?
- The Magic-4 of storytelling: Ask students to keep these principles in mind as they write a first draft of their script/article/infographic, etc.
 - Audience -- The age of the readers/viewers
 - Tone -- What's the goal of the piece? To persuade, inform, entertain, or create a sense of wonder?
 - Writing -- Language matters (similes, metaphors, active verbs); write tight (delete excess words)
 - Theme -- After students write a first draft, ask them to explain their piece in only one sentence or phrase.
 - Ask students to return to their favorite *Planet Ocean* QR code. Identify the audience, tone, and theme. Ask students to choose a line or two of narration they particularly liked.
 - Determine the media platform for student projects -- video, flipgrid, PowerPoint, TikTok, Prezi, Canva, etc. or an oral presentation to the class.
 - Students may choose to storyboard their piece using a graphic organizer such as the one pictured.
- Images and video:
 - After students complete What Are Photos Telling Us? on the previous page, ask them to choose images/video to illustrate their stories. Feel free to direct students to the images and video clips uploaded to the *Planet Ocean* [Dropbox link](#).
 - Encourage students to also take their own photos. "Annie's Pro Tips" on page 52 of *Planet Ocean* will guide them.
 - Share student projects using #PlanetOceanBook on Twitter or Instagram.

Student Name:	Date:	Class:	Period:
Image #	Transition	Voice Over:	Notes:
		Music:	
Image #	Transition	Voice Over:	Notes:
		Music:	
Image #	Transition	Voice Over:	Notes:
		Music:	

Phenomenon: Where do we stand? A debate

MATERIALS

- Notebooks (one per student)

PROCEDURE

- For each team of two students, choose a controversial topic from the list below or use a topic of your own.
- Assign one student to the “for” viewpoint and the other student to the “against” viewpoint.
- Students find credible sources online, in the media, or in the library that argue their side of the issue. You may need to describe what a “credible source” means, e.g. an expert in the field, NatGeo, Scientific American, etc.
- Either in class or for homework, students write a summary of their issue that is concise, clear, and accurately describes the assigned viewpoint of the issue.
- On Debate Day:
 - Each team of two presents their summaries to the class.
 - The rest of the class writes notes on each student’s topic in their notebooks and chooses whether they are for or against the topic (see a suggested format below).

Possible topic ideas (feel free to add your own):

- Should we ban single-use plastic like the European Union? Yes or no?
- Should we search for oil and minerals in the Arctic and Antarctic?
- Should the US adopt a national climate change policy?
- Should our school begin separating waste -- compost, recycle, trash -- and eliminate lunch room plastic?
- How should the US deal with corporate polluters?
- Will the ocean run out of fish from overfishing? Yes or no?

Debate Notetaking Template — students reproduce in their notebooks

Issue:	
Arguments FOR the issue:	Arguments AGAINST the issue:
I am FOR/AGAINST this issue because:	

Phenomenon: How do we develop leadership skills?

Do you have a Green Team at school? Encourage it to Go Blue!

- Ask the team to brainstorm a list of ways their school could become more ocean-friendly
- Ask students to choose two or three ideas to implement.
- Develop a plan for how to make the items on their list a reality
- Ask students to present their plan to a teacher or administrator to see how the school/district can support them.
- Ideas
 - Feel free to use ideas in the Go Blue with Annie section of *Planet Ocean* (page 53).
 - Transform your school cafeteria from a single-use plastic nightmare to a zero-waste ocean-friendly oasis. [Cafeteria Culture](#) has the tools you'll need.
 - Create an ocean awareness art project using single-use plastic. Present some of the ocean acidification experiments in this guide.
 - Sponsor a walk-to-school-a-thon.
 - Create a cookbook of favorite vegetarian recipes submitted by students
 - Sponsor an ocean talent night with songs, stories, and poems about our ocean.

Phenomenon: How can we share our message?

MATERIALS

- Grocery bag
- Scissors
- Paints/markers/crayons/pastels or other art supplies
- Paper

PROCEDURE—Part I

- Reducing waste is very important, and so is recycling. Have you ever forgot your reusable grocery bags at home? Did you have to use a paper bag instead? Don't let that bag go to waste, let's turn it into art!
 - Remove the handles from the grocery bag.
 - Split the bag open down the side to open it up
 - Cut any shape out of the bag to use as a canvas.
- Answer one of the following questions with art:
 - What kind of ocean do you want to swim in?
 - What does planet ocean look like?
- Consider hanging the art around the classroom.
- After the students leave for the day, use clean waste (water bottles, straws, paper cups, plastic bags) to depict ocean pollution on the students' art.
- When the students arrive the next morning to see their art, have a discussion about how to reduce waste so we do not become "planet plastic" instead of "planet ocean".
- Create a list of these ideas to send home with students to share with their families.

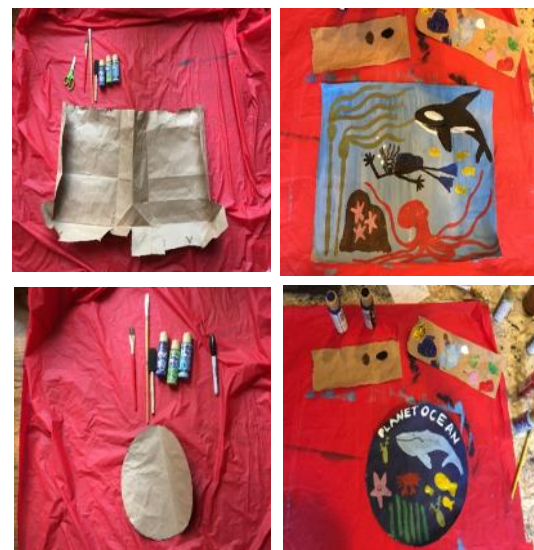


Photo credit: Abbey Dias, #PlanetOceanBook

PROCEDURE—Part II

- As a class, invite students to suggest guidelines they can use to help live a more ocean-friendly life. Feel free to use the ideas on page 53 of *Planet Ocean*.
- Revise the list via class discussion.
- Print the final list on a piece of paper.
- Ask students to decorate the guidelines and share with their families.

Phenomenon: Can we eat more sustainably?

MATERIALS

- Student notebooks
- Watch [Healthy Oceans: Sustainable Seafood by the California Academy of Sciences](#)

PROCEDURE

Activity A: *Planet Ocean* introduces readers to a number of types of fish and fishing techniques. Choose one fish or mammal, such as salmon, oysters, shark, clams, mussels, tuna, turtles, whales and research how these animals are fished/hunted.

- Answer the following questions:
 - Who is doing the hunting — individuals or corporations?
 - What kind of equipment is used?
 - What types of fishing techniques are used? Are these techniques sustainable?
- Ask students to share information about their fish species, either with an infographic in their notebooks, or a poster or a video.
 - Why the species is threatened and how
 - What we can do to help?
- [Duke's Chowder House](#) is a restaurant in Seattle near Annie's house that only serves sustainably caught seafood. Is there a similar restaurant in your area that educates patrons about sustainable seafood? What kinds of questions might you ask before ordering seafood in a restaurant?

Activity B: On pages 40 and 41 of *Planet Ocean*, readers learn about giant fishing trawlers that “measure more than 78 feet (24 m) long and drag nets along the ocean floor that are big enough to scoop up twelve jumbo jet airplanes at once.” As a class, construct a scale model of a trawler with nets of string to visualize the effect on the sea floor.

Activity C: Investigate fish farming for species such as sea bass, tilapia, oysters, and Atlantic salmon. Develop a list of pros and cons about fish farming.

Activity D: Ask students to create eco-friendly menus for breakfast, lunch, and dinner and record the ingredients for each meal in their notebooks. Ensure that each item is sustainably sourced and/or organic. Ask students to cook their menus for their families.



Photo credit: [OurOceanandYou.com](#)
[AnnieCrawley.com](#) #PlanetOceanBook

Phenomenon: How do scuba divers “talk” underwater?

Scuba hand signals are universal and allow divers around the globe to communicate with each other. The following activities use the hand signal cards on pages 15 to 17.

MATERIALS

- Scuba Hand Signal cards
- Student notebooks

PROCEDURE: Activity A: Coded messages

- Teach students the Scuba Hand Signals using the instructions and images on the following cards.
- Challenge them to make coded messages for their classmates to figure out. You can either play this game like Charades or like a spelling bee, where one team tries to stump the other

PROCEDURE: Activity B: Skits

- Shuffle and deal out a few Scuba Hand Signal cards to teams of players.
- Students look at their cards and devise a skit using all of the signals. Make a table of ocean-related props available for the skits.

PROCEDURE: Activity C: Create a comic strip

- Students draw 3 boxes side-by-side in their notebooks. These boxes can fill up the width of one page or an entire spread.
- Students draw a 3-panel comic about our underwater world where the characters use some scuba hand signals. Use the Scuba Hand Signal cards for reference.

PROCEDURE: Activity D: Concentration

- Cut apart the Scuba Hand Signal cards so the pictures are separated from the meanings. Shuffle all the cards and place them face down on a table or the floor in a 6 x 4 grid.
- Divide students into teams of two: Player One and Player Two
- Player One turns over two cards at a time.
- If the cards match, the Player One keeps the pair and takes another turn.
- If the cards don't match, Player One turns both cards over again.
- It is now Player Two's turn.
- Play continues until all cards are matched.
- The student with the most matches wins.

Scuba hand signal cards—print on cardstock and cut apart

“Are you OK?” or “OK!”

Use to ask your buddy if they are OK or to signal to your buddy that you are OK



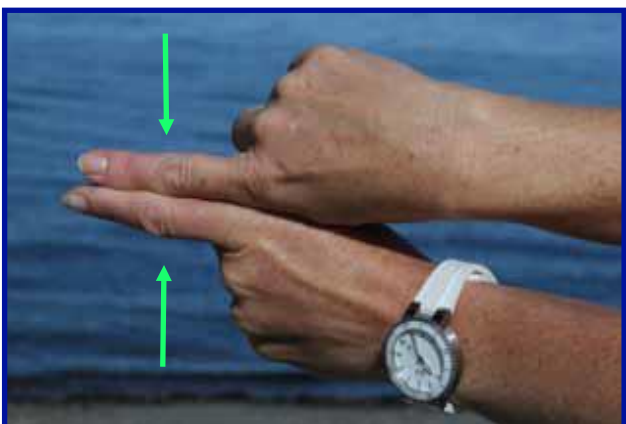
“Go up” or “Are you ready to go up?”

Use to signal to your buddy that you are ready to go to the surface



**“Go down” or
“Are you ready to go down?”**

Use to signal to your buddy that you are ready to go to the surface
Use to signal to your buddy that you are ready to go dive



“Get with your buddy”

Use to signal to a group that each person should get closer to their buddy

Scuba hand signal cards—print on cardstock and cut apart**“Hold hands”**

Use to signal to your buddy that they need to hold your hand to stay close

**“Look at” or “Watch”**

Use to signal to your buddy when you want them to look at something or watch you

**“Me” or “I”**

Use to indicate to yourself to your buddy

**“Stop”**

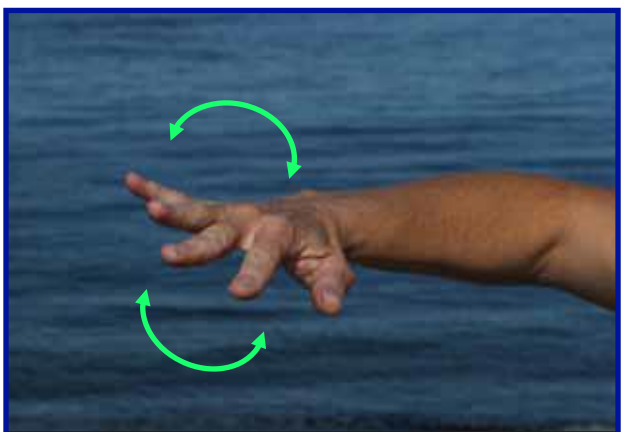
Use to signal to your buddy that you would like them to stop

Scuba hand signal cards—print on cardstock and cut apart**“Think” or “Remember”**

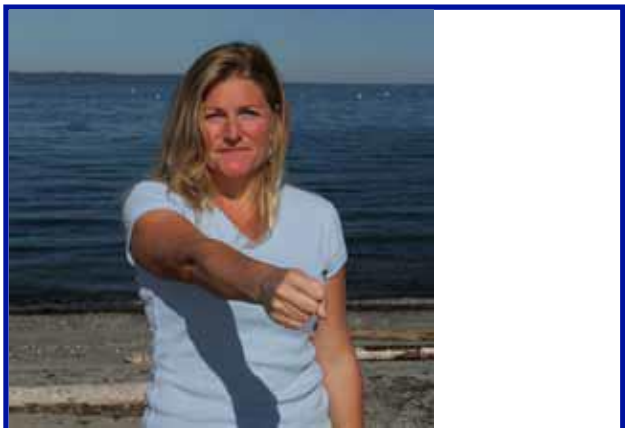
Use to signal to your buddy when you want them to think or remember something

**“Slow down”**

Use to signal to your buddy that they should slow their breathing or stop moving fast

**“Something is wrong”**

Use to signal to your buddy that something is not right

**“Danger!”**

Use to signal to your buddy that something is dangerous and they should be careful

Additional Ocean Resources

- HHMI's lessons on [coral bleaching](#) and [ocean acidification](#)
- Other [Washington Sea Grant demos](#)
- NOAA [video](#) about dungeness crab and ocean acidification research
- ["Save the Plankton, Breathe Freely"](#) from National Geographic
- [National Ocean Service](#) -- building ocean, coastal, and climate literacy for students and educators
- [National Center for Science Education](#) -- Five climate change lesson plans to challenge misconceptions and encourage students to follow the science.
- Climate change documentaries
 - [Time to Choose](#) by Charles Fergusson
 - [Living in the Future's Past](#) by Jeff Bridges
 - CNN's [climate change quiz](#)
- A variety of online resources compiled by the [California Science Education Conference Climate Summit 2018](#)
- NGSS-aligned curriculum for [Explore the Salish Sea: A Nature Guide for Kids](#).

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- Page 6: We Speak Like Scientists graphic courtesy of [Community Resources for Science](#).
- Page 6: What is phytoplankton? How does it survive? Who eats it? Developed under the guidance of Michele Hoffman, Microcosm founder and an active faculty member at Columbia College, School of the Art Institute, and Roosevelt University in Chicago. The Bioaccumulation Game is adapted from [Stephanie Clark's article](#) on the Science Teachers of Ontario website.
- Page 9: Photo activity from Noa Daniel, [Building Outside the Blocks](#). Adapted from McCoy, Laura. "Decoding Photographs." Collections Canada. Government of Canada, n.d. Web. 15 Aug. 2013.
- Page 11: Where do we stand? A debate modeled after [Debate an Environmental Issue on Teacher.org](#).
- Page 12: How can we share our message developed by Abbey Dias, a member of Annie Crawley's Dive Team.