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Ocean Clean-up Design Challenge

Students develop a model of an ocean clean-up device. This activity meets the following NGSS standards:

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Developing and using models	ESS3.C Human Impacts on Earth's Systems	Cause and effect
Using mathematics and computational thinking	LS4.C Adaptation	Patterns
Obtaining, evaluating, communicating information	LS4.D Biodiversity and Humans	Scale, proportion, quantity
	ETS1.B Developing Possible Solutions	Stability and change
		Influence of science and technology on society and the natural world

Objective

Design an ocean clean-up device that filters out plastics/microplastics, disturbs the ecosystem as little as possible, and includes a plan for what happens to the collected debris.

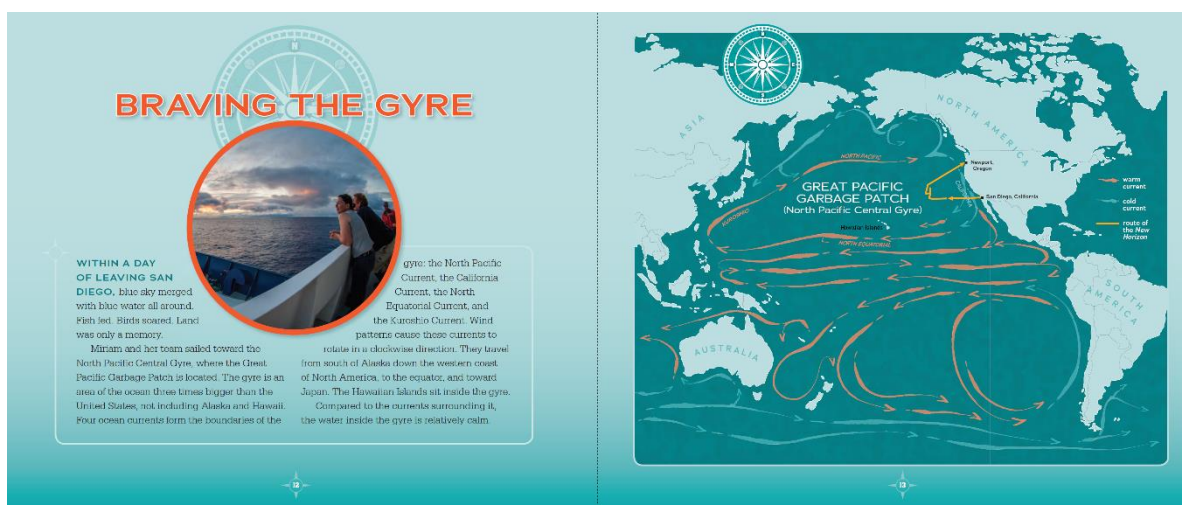
Materials

- ✓ Copy of *Plastic, Ahoy! Investigating the Great Pacific Garbage Patch*
- ✓ Pencil and paper
- ✓ Any combination of building materials, such as Legos, blocks, pipe cleaners, Wikki Stix, popsicle sticks, etc.

Preparation activities

- ✓ Ask students the following questions
 - Have you ever seen trash where it doesn't belong?
 - Where and what kinds of trash?

- Where does it go?
- Discuss this phenomenon: Why is there so much plastic in the ocean? Activate students' prior knowledge.
- Read the first two chapters of *Plastic, Ahoy!* (pages 4 through 11).
 - Was any of the students' prior knowledge confirmed? Modified?
- ✓ Show students The Majestic Plastic Bag, a mockumentary: <https://youtu.be/GLgh9h2ePYw>.
 - Discuss this phenomenon: How does the trash get to the ocean? Again, activate students' prior knowledge.
- ✓ Read the "Braving the Gyre" chapter (pages 12 to 15) of *Plastic, Ahoy!*
 - Pay special attention to the map of the currents on page 13.



- Was students' prior knowledge confirmed or were there misconceptions?
- ✓ Send students on a fact-finding scavenger hunt to find:
 - The number of straws we use in a year
 - The amount of trash in the sea
 - The number of species that eat plastic trash
 - The number of plastic shopping bags we use each year
 - The number of plastic water bottles we use each year
 - How much oil is necessary to make all those water bottles
 - Or other statistics you'd prefer to add
- ✓ Read "Miriam's Hitchhikers" (pages 16 to 23) and "Darcy Follows Phytoplankton" (pages 24 to 29).
 - Discuss some of the properties of plastic students learned from these chapters (Algalita has a free kit with a lesson about the properties of plastic-- <https://algalita.org/educators/>):
 - Buoyancy
 - Rafting

- Entanglement
- ✓ Discuss this phenomenon: How does plastic affect us? Activate students' prior knowledge, but also ask them to make a prediction.
 - Read "Chelsea's Plastic Puzzle" (pages 30 to 36).
 - Discuss two more properties of plastic
 - Toxicity
 - Ingestion
 - Discuss whether student predictions were accurate or needed modification.

Design Challenge: Draw or create a model of an ocean clean-up device

- ✓ Divide students into groups of 2 or 3
- ✓ Using students' background knowledge of the ocean and plastic debris, ask them to identify some design considerations they should take into account. Some ideas may include:
 - Weather
 - Ocean currents and waves
 - Properties of plastic
- ✓ Ask students to draw and/or create their models with available building materials. Students should:
 - Label important parts of their diagram/model.
 - Use arrows and labels to direct readers through the flow of their design.
- ✓ Share with the class. Students should be able to:
 - Respond to audience questions
 - Explain their thought process and discoveries along the way
 - Explain the prior knowledge they used

Changing Habits

- ✓ Search for other ocean clean-up ideas. Two possibilities include:
 - Seabin: <https://youtu.be/ySp7HKD7jaw>
 - Ocean Clean-up: <https://youtu.be/O1EAeNdTFHU>
 - Can students find others?
- ✓ Read "Charting the Answers" (pages 36 through 42) and discuss how your class can make changes to reduce its single-use plastic consumption. Can the class commit to zero waste?

Extension Activities

- ✓ Conduct the Aging Plastic Experiment to determine how long it takes items we throw in the garbage to decompose (found on my [STEM + Literacy Activities](#) page of my website).
- ✓ Conduct a Waste Audit Analysis to see if students can reduce their single-use plastic consumption at home (found in my [Plastic, Ahoy! teacher guide](#)).