deSTEMber
SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH
PRESENTED BY: girlstart

Plastic Rescue

Earth's oceans are home to billions of animals and plants, but millions of tons (1 ton = 2,000 pounds) of plastics pollute our oceans today. Learn about different physical properties of plastics and design a device that collects plastics and removes trash to help save animals and plants in the ocean!

TEKS:

6.2B Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.
7.4A Use appropriate tools to collect, record, and analyze information, including journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed.
8.6B Compare and contrast potential and kinetic energy.

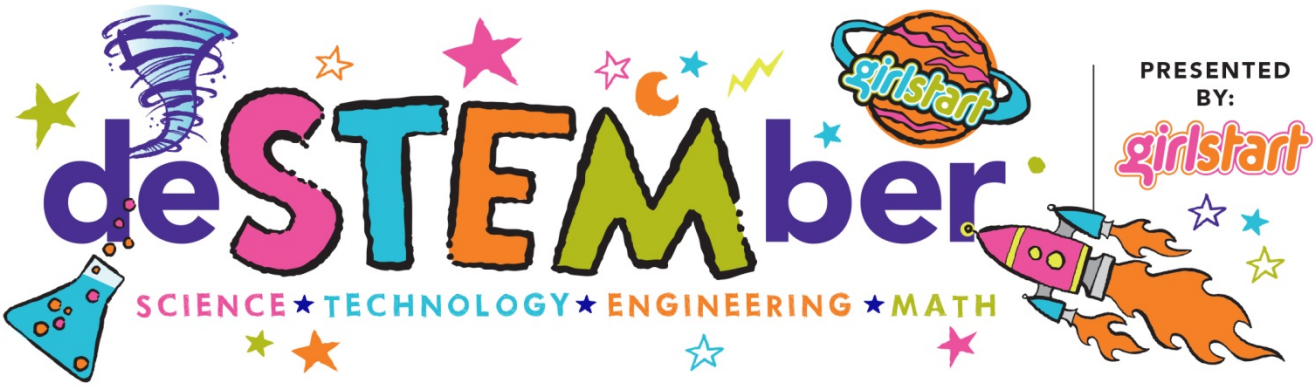
Materials:

- Scissors
- Markers
- Various types of plastic containers (one of each plastic type, by number)
- Shoe box and cardboard
- String/yarn
- Pool noodles
- Nets/mesh
- Rubber bands
- PVC pipes
- Toilet paper rolls
- Popsicle sticks
- Aluminum foil
- Duct tape
- Plastic tub (for density testing)

Types of Plastic:

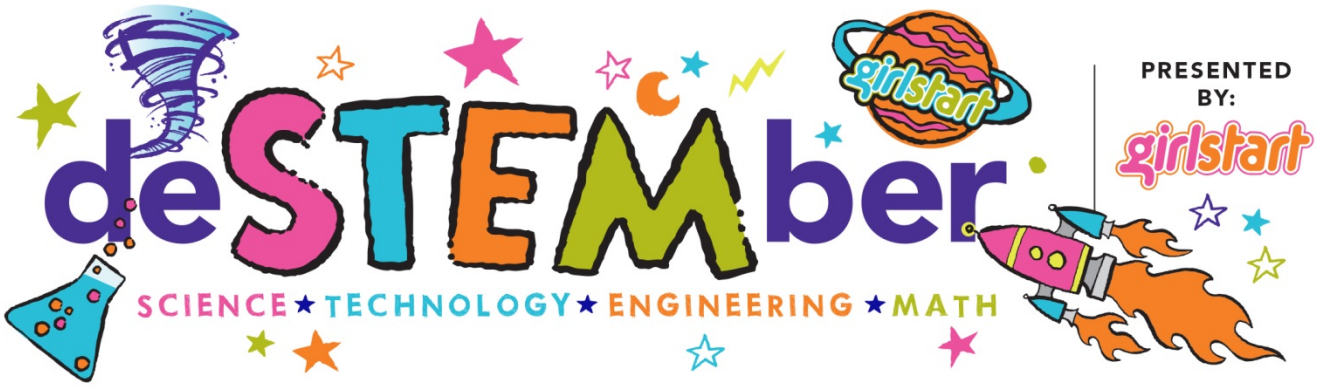
- #1 plastic: clear bottle (soda, water, mouthwash, or salad dressing)
- #2 plastic: opaque bottle (milk, orange juice, shampoo, or lotion)
- #3 plastic: PVC pipe
- #4 plastic: lightweight bag (bread bag, sandwich bag, or grocery bag)
- #5 plastic: tub (yogurt, ketchup bottles, or butter containers)
- #6 plastic: Styrofoam products (disposable plates/cups, or plastic utensils)

31 Days of STEM Fun!



How To:

1. Cut out a small sample of each type of plastic (#1-6). Use a permanent marker to label each sample by number.
2. Think about plastics. Name as many things as you can think of that are made of plastic. What do we use plastic for in our lives? Where and how do we dispose of plastics? Are all plastics the same or are some different than others? Notice the physical properties of each type of plastic, including transparency and rigidness. Write down the characteristics you notice in the chart on the next page.
3. Fill the plastic tub with water.
4. Using a pencil, push each sample down into the water and observe whether it floats or sinks. Record your results in the chart below.
5. Now that you know more about the differences in plastics, brainstorm ideas for a device that can remove trash, while not harming the environment and ocean wildlife any further. Ask yourself the following questions:
    a. What will your device look like?
    b. How will your device be fueled?
    c. How does your device affect marine life?
    d. Will your device pick up all plastics or only specific types?
6. Sketch a design for your device on a piece of paper.
7. Using the materials listed above, create your device. Remember to be frugal with your materials – you don't want to create more trash that will pollute the ocean further!
8. Evaluate your device. Ask yourself these questions:
    a. How does it work?
    b. What are its pros and cons?
    c. Since this is a small model, what would need to be done to make it a large, to-scale usable device?
9. Make any necessary changes to your model and share it with family or friends!



Plastic Sample		Transparency Clear or opaque?	Luster Shiny or dull?	Brittleness Breakable or not?	Rigidness Flexible or tough?	Density Sinks or floats?
#1	**Clear bottle** (soda, water, mouthwash, or salad dressing)					
#2	**Opaque bottle** (milk, orange juice, shampoo, or lotion)					
#3	**PVC**					
#4	**Lightweight bag** (bread bag, sandwich, or grocery bag)					
#5	**Tub** (yogurt, ketchup bottles, or butter containers)					
#6	**Styrofoam products** (disposable plates and cups or plastic utensils)					

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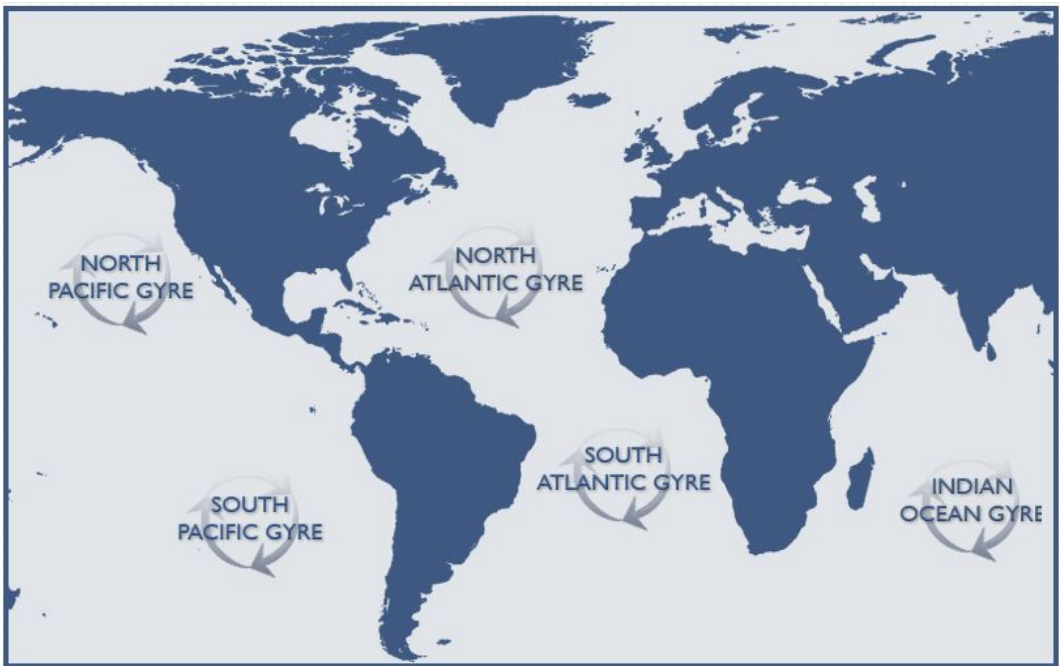
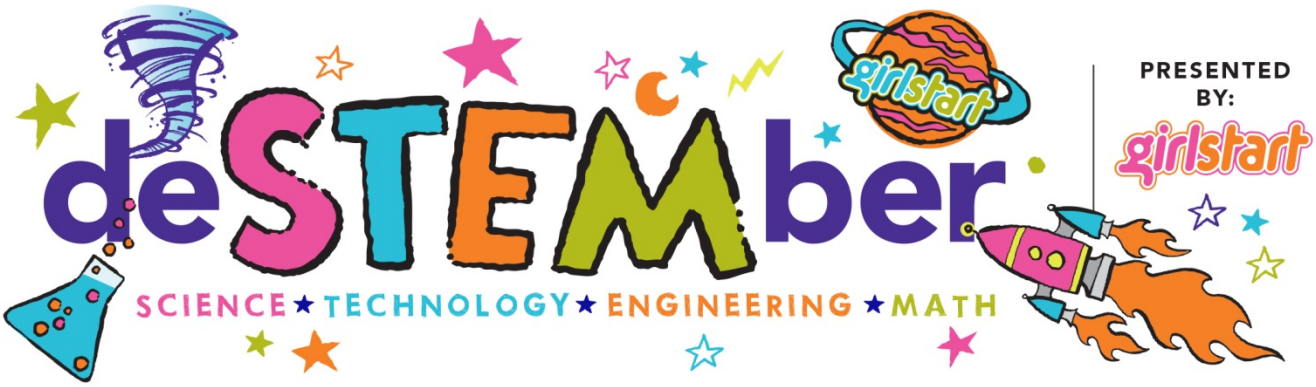
Why Does It Work?

Millions of tons of plastic debris currently pollute the world's oceans. Plastic reaches the oceans mostly from land through rivers and waterways and then accumulates in 5 areas of high concentration, called gyres (see the picture below). Not only does plastic pollution directly kill hundreds to thousands of aquatic animals annually, it may spread harmful algae and other invasive species. It also serves as a transportation system for pollutants that accumulate in the food chain. Plastic pollution costs governments, companies, and individuals millions of dollars in damages per year, due to loss in tourism, vessel damages and inefficient beach cleanups.



A recent study found an average of 334,271 pieces of plastic per square mile in the North Pacific Gyre. The North Pacific Gyre occupies an area roughly twice the size of the United States. Plastic marine debris affects at least 267 species worldwide, including 86% of all sea turtle species, 44% of all sea bird species, and 43% of all marine mammal species. Mobile marine animals often ingest plastics that they mistake for food, or become entangled in debris that can cause serious injury, and delicate ecosystems (e.g. coral reefs) can be damaged by plastic debris suffocating or breaking coral.



Career Connection:

Marine Engineers design and oversee construction and repair of marine craft and floating structures such as ships, barges, tugs, dredges, submarines, torpedoes, floats, and buoys. They must evaluate the performance of the crafts they design during dock and sea trials and determine any design changes that must be made to conform to national and international standards.

Resources:

- http://www.takepart.com/oceans/
- http://marinedebris.noaa.gov
- http://www.oceancareers.com/2.0/career_description.php?career_id=17
- www.scigirlsconnect.org

Additional Resource:

- Watch the Majestic Plastic Bag video to see what happens to plastics that aren't recycled: http://www.youtube.com/watch?v=GLgh9h2ePYw

