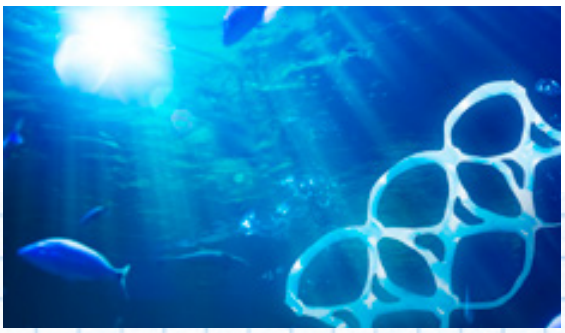
SCIENCE FAIR CENTRAL

Maker Corner Activity



TRASH FISHING

Grades 6–8

MAKE. CREATE. EXPLORE.

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THE HOME DEPOT

Discovery EDUCATION

Trash in marine ecosystems can have a devastating impact on acquatic life.

Overview

Worldwide, it is estimated that between 4.8 and 12.7 MILLION METRIC TONS of plastic alone, entered marine environments in 2010.

Plastics and other forms of trash in the water, typically start out as litter on land. When this trash makes its way into marine ecosystems, it can have a devastating impact on all forms of life in the water as well as wildlife that is dependent on the water.[1]

In this activity, students will learn about the impact plastic and other pollutants have on marine environments. Then students will design, build, test, and refine a device that will allow them to fish trash out of local waterways while standing on the shoreline. Removing trash will positively impact the health of the local waterways, estuaries, and ultimately oceans.

Note: If possible, take students outside to design, build, and test their tools, although being outside is not required. The testing station area is likely to be wet. You should put out old towels or a water resistant tarp (indicated in the materials) in the testing area if you are doing this inside.

This activity focuses on the "Designing Solutions", "Creating or Prototyping", and "Refining and Improving" stages of the Engineering Design Cycle.

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Engineering Design Cycle

- Defining the Problem
- **Designing Solutions**
- **Creating or Prototyping**
- **Refining or Improving**
- Communicating Results

Objectives

Students will be able to:

Understand where trash goes and the impact it has on the environment when it enters local waterways.
Evaluate the best method remove the trash from a waterway.
Create a tool that can be used on the shoreline to remove trash from the waterway.

Litter can travel huge distances once it reaches a water system.

Materials

- Trash pieces of varying sizes to include plastic containers, cans, the plastic rings that go around cans, and plastic bags
- What's the Big Picture? (1 per group)
- Peer Review (1 per student)
- 1 Large Mixing tub (more based on budget)
- 1 Large Tarp or Drop Cloth (purchase same number as mixing tubs and place under)
- Dowel Rods (1-2 per group based on budget and class size)
- Adjustable Rods (optional based on budget)
- (1) Duct Tape
- Craft Spools
- (1) Knobs (10 count)
- (1) Craft Sticks (10 count)
- Small Paint Roller
- (1) Large Steel Hooks (100 count)
- (1) Thread Eye Hook (100 count)
- (1) Twine
- (1) Wire
- (1) Wire Cutters
- (1) Wood Glue
- Clipboards (optional, 1 per student)
- Large Bicycle Hooks (1-2 per group based on budget and class size)
- (1) Roll Netting (teacher can determine if it should be cut into even pieces ahead or if students can have a design plan approved and have it cut to size)

Have you ever wondered . . .

When you see someone litter, where does that trash go and what does it do to the environment?

Most trash starts off on the land where it stays until it rains. During heavy rains, trash gets carried away to a storm drain in the runoff water. The water travels to small creeks and streams before making it to a larger river. The water in rivers will follow gravity flowing down to sea level, until eventually emptying into an ocean. The real problem, is that not only does the water follow gravity, but so does the trash in this water until it eventually reaches an ocean or larger body of water.[2]

Wildlife that lives in water or depends on water will suffer the most as a result of this trash. Fish, birds, and sea turtles are just some examples of the animals that die when they eat the trash, get infections from it, suffocate from it, or get tangled in it.[3]

What could you do to help prevent trash from going into the ocean?

Trash can impact the wildlife living in or near a small stream in the same ways it would impact the wildlife found in or around the ocean. By designing and building a tool that will collect trash from the shoreline of a local waterway, you can help improve the water quality conditions for all life forms that rely on the water. The local wildlife will not be exposed to the dangers that trash causes and you will be decreasing the amount of trash that travels further endangering wildlife in the oceans.

Use your new trash fisher to help clean up your local waterways.

Make connections!

How does this connect to students?

Chances are you have been to the ocean at some point or gone swimming in a natural place like a lake, pond, or river. Would you want to go swimming with trash? Try to imagine what it would be like to actually live in a body of water filled with trash.

How does this connect to careers?

Hydrologist—Hydrologists study the movement of water and the environment around water to improve the quality and amount of water available.[4]

Wildlife Biologist—Wildlife biologists often work in the field studying animals and their natural habitats to determine how humans impact them.[5]

Environmental Scientist—Environmental scientists often work out in the field studying the effects that pollutants have on an ecosystem and find ways to protect or improve the health of the environment.[6]

Mechanical Engineer—Mechanical Engineers design, build and test new devices including tools and machines to solve problems.[7]

How does this connect to our world?

Everyone on Planet Earth depends on the ocean, or other waterways, in one way or another. Oceans produce oxygen and absorb carbon while also providing food, entertainment, jobs, and a method of transporting materials. In this activity, you will develop a tool to remove trash in waterways. By removing trash, you are positively impacting the overall health of oceans and other marine ecosystems that people rely on.[8]

Blueprint for Discovery

Prior to the Class Arriving:

- Set up a testing station by filling a large mixing tub with water and placing the trash pieces inside of it
- Print out or post digitally "What's the Big Picture" document for each group
- Copy the "Peer Review" document for each student materials above (items should be labeled so students can easily make selections)

During Class:

1. Start by displaying the following picture of trash on a beach.

2. Ask students to pair up with the person next to them to discuss:

- A time when they have seen trash in a stream, creek, lake, pond, or even someone littering on the street.
- How did it made them feel when they saw it?
- Where do they think the trash came from?

3. Show the short video "Trash Talk: Where does Marine Debris Come From". After, ask the students to discuss with their partner:

- Who and or what do you think the trash impacts?

4. Show the short video "Trash Talk: How Does Marine Debris Impact, Ocean, Animals and Me". After ask students to compare their responses to what was in the video clip. Were there similarities? Invite the pairs of students to share with the class.

5. Read the quote below to students

> *"In 2010, a California grey whale washed up dead on the shores of the Puget Sound. Autopsies indicated that its stomach contained a pair of pants and a golf ball, more than 20 plastic bags, small towels, duct tape and surgical glove."* [3]

6. Then explain that they will be working in teams to build a tool that will allow people to fish trash out of local waterways from the shoreline. Group students in teams of 3 or 4 and ask them to complete the "What's the Big Picture" document together so they can understand the importance of producing this tool.

7. Provide students with a general overview of the materials they have available to produce their tool, and the location of the materials and location of the testing station. Some suggestions and

reminders to address with the students:

- The amount of time they will have to build their tool.
- Before attempting to build their tool, the value of brainstorming and drawing out their ideas (with measurements indicated).
- Show the students the following pictures so they can see various fishing methods to generate some ideas
  - Fishing Picture 1
  - Fishing Picture 2
  - Fishing Picture 3
- The value of testing their tool throughout the process and making changes as necessary.

8. Provide students with updates indicating how much time they have left throughout the design and building process.

9. At the end of the time allotted for building the tools, pass out the "Peer Review" document to each student and gather the class around one of the testing stations. Each group will demonstrate their tool in action for the class. As each group presents, students should be completing the "Peer Review" independently.

Take Action

Possible Extension Activities:

1. Get the word out about the importance of keeping the waterways trash free, and how the new products produced can help. This can be done by creating a short documentary, podcast, commercial etc. and made into an interdisciplinary project.

2. Organize and participate in a local river clean up. http://createthegood.org/toolkit/clean-river

National Standards

Science

Next Generation Science Standards

MS-ESS3-3
Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

MS-ETS1-4 Engineering Design
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Technology Education

Next Generation Science Standards

Students will develop an understanding of Design. This includes knowing about:

- Attributes of design.
- Engineering design.
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Students will develop abilities for a technological world. This includes becoming able to:

- Apply the design process.
- Use and maintain technological products and systems.
- Assess the impact of products and systems.

Mathematical Practice

Common Core

CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

CCSS.Math.Practice.MP4 Model with mathematics.

CCSS.Math.Practice.MP5 Use appropriate tools strategically.

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7. U.S. Bureau of Labor Statistics. Occupational Outlook Handbook: Mechanical Engineers. June 2, 2017. https://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm#tab-2

8. Protect Planet Ocean. Why are Oceans Important? 2010. http://www.protectplanetocean.org/collections/introduction/introbox/oceans/introduction-item.html

What's the Big Picture?

Group #: _____ **Members:** _____

_____

What is the problem your group is trying to solve?

Who and/or what would benefit from a solution to the problem?

What impact could your product have on people and/or the world?

Peer Review

Name: _____

As you watch each group demonstrate their newly created tool, rate each group based on the information below and decided how your tool could be improved based on what you see.

Group #: _____ **Members:** _____

Design Elements	Yes	Somewhat	No
Was the tool able to collect the trash?			
Did the tool appear easy to use?			
Does it seem like this tool will be durable (sturdy enough to be used over and over again without breaking)?			
What features of this design did you find most effective? Why?			
What features of this design do you think could be a problem or not effective? Why?			
If you had an opportunity to redesign your tool, what features of this design do you think you could incorporate to improve your tool?			

Group #: _____ **Members:** _____

Design Elements	Yes	Somewhat	No
Was the tool able to collect the trash?			
Did the tool appear easy to use?			
Does it seem like this tool will be durable (sturdy enough to be used over and over again without breaking)?			
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