



## Activity for All Grades

### Science skills

- Analyzing
- Problem solving

### Concepts

- A specific problem definition will facilitate the development of effective solutions.
- Brainstorming is an effective approach to begin the problem solving process. It can be used to explore marine debris issues and solutions.

### Objectives

- Students will be able to utilize a cooperative problem solving process designed to reduce marine debris.
- Students will implement their solution.

### Time to complete

One hour

### Mode of instruction

Students develop ideas to reduce marine pollution, analyze and evaluate the best ideas, and select the best one for actual implementation.

### Materials

Overhead transparency of brainstorming tips

### Preparation

Prepare overhead transparency.

### Outline

#### Before class

Prepare overhead transparency.

#### During class

1. Divide students into small groups.
2. Assign or have students choose roles.
3. Display brainstorming tips overhead transparency. Students hold small group discussions. Each group reports on their solutions to the class.



## Activity CA4 Preventing Pollution at the Source

From taking part in previous activities in this chapter, students now are familiar with how debris can pile up on the beaches. Now they will develop solutions to the problem of marine pollution.

### Background

Students will learn how research and data collection can be used to develop solutions to environmental problems. Students will develop and try to implement solutions to the marine debris problem. No matter how young or old we are, we can all make a difference!

### Activity

#### The Problem Solving Process

1. Hold a class discussion on the problem solving process (see page 140).
2. Tell students that they are now going to use the problem solving process to address the issue of marine debris. Write on the board the different steps and explain them:
  - a. Understand and define the problem(s)
  - b. Brainstorm solutions
  - c. Analyze the solution suggestions
  - d. Evaluate which solutions would be most effective and select the best solution.
3. Divide students into small groups (3-4 students). In the groups, assign roles or have students choose a role: recorder, discussion leader, spokesperson.
4. Display “Brainstorming Tips” on the overhead projector for students to refer to in their groups. Tell students they will now use the problem solving process discussed earlier to create solutions to problems associated with marine debris.

### Results and reflection

1. Each group presents their problem definition and solution plan to the class. Ask for questions and comments. Ask that students note the ways their proposal could be improved.
2. The class selects the best plan by voting.
3. Elaborate on the best solution—describe it clearly. Would graphs, charts, or time lines help? Help the students design a graphic presentation of the classes’ chosen solution. Then, have students create an action plan with timeline for implementation of their class solution.
4. Help students implement the action plan or send the recommendation to the appropriate city, county, or state agency. Consider the following for implementation: Which groups need to know about the proposal? Which groups will initially oppose it and how can their concerns be satisfied? What persuasive and educational techniques will be needed? Who will perform each task? Depending upon the age of your class, you may need to have suggestions ready for them to choose (e.g., local

Department of Public Works, EPA, California Coastal Commission, Harbormaster, etc.). Assist students in defining tasks and draw up a plan of action with names, tasks, and dates. Refer to Appendix D, *Make Your Views Known*, for ideas on effective letter writing techniques.

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### Conclusions

Humans are the source of marine debris, and we are also the solution. There are many ways we can work to reduce the marine debris polluting our oceans.

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### Extensions and applications

Invite someone from the school administration or community to class to help evaluate the class's proposed solutions.

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### Adapted from

*Save Our Seas*, A Curriculum for Kindergarten through Twelfth grades. The Ocean Conservancy (formerly known as Center for Marine Conservation) and California Coastal Commission, 1993.

## WHAT IS THE GOVERNMENT DOING?

For centuries it was common practice for ships to dump their garbage at sea. The United Nations administers a treaty that provides a comprehensive approach to dealing with ocean dumping. The International Convention for the Prevention of Pollution from Ships is known as MARPOL 73/78 (MARine POLLution) and contains Annexes that deal with specific discharges: Annex I oil, Annex II hazardous liquids, Annex III packaged hazardous materials, Annex IV sewage, and Annex V garbage (including plastics). In order to implement MARPOL Annex V, the U.S. Congress passed the Marine Plastic Pollution Research and Control Act of 1987, which applies to both U.S. vessels and foreign vessels in U.S. waters.

Recently, it has become more and more evident that marine debris is also coming from land-based sources. Among these sources are combined sewer overflows. Usually found in older cities, these sewer systems are combined with stormwater drainage systems. When it rains, and too much water goes into the system, overflows of raw sewage and untreated pollutants from the streets are discharge *directly* into waterways. Discharges from land-based sources are subject to regulation under a federal law called the Clean Water Act.

Land-based sources also include urban runoff from storm drains. It is a common misconception that the pollutants and debris washed down storm drains are removed at a treatment plant. In most cases, this runoff is discharged directly into local streams, rivers, and bays with no treatment whatsoever. The U.S. Environmental Protection Agency (EPA) requires cities with separate storm sewer systems to obtain a National Pollutant Discharge Elimination System (NPDES) permit. Cities must apply for this permit to ensure that their stormwater systems are operating as efficiently and cleanly as possible and that they are educating their citizens about the hazards of dumping debris and other substances down storm drains.

Other laws protecting coastal water quality include the federal Coastal Zone Management Act of 1972, the Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH Act), and the California Coastal Act of 1976, which guides the actions of the California Coastal Commission.

From: *Pocket Guide to Marine Debris*,  
The Ocean Conservancy

## Brainstorming Tips

### 1. Don't Criticize Others' Ideas

They will lose their train of thought and stop generating ideas.

### 2. More is Better

Write down as many ideas as you can. At this stage, don't worry about spelling, repetition, etc.

### 3. Connect Ideas When Possible

If something someone says sparks a thought, say your idea. Connect parts of your ideas with theirs when possible.

### 4. Be Free Wheeling and Don't Be Afraid to Express Crazy Ideas

A crazy idea now may seem plausible and original after more thought and research.



## The Problem Solving Process

(Format for a class discussion)

Why is it important to understand and define the problem(s) before beginning to explore solutions? The more accurately and specifically a problem is defined, the easier it is to come up with effective solutions.

What are some examples of how different problem definitions might lead to different solutions? One problem definition might focus on the large numbers of cigarette butts found on beaches; another might focus on a lack of trash receptacles at a beach. If your students have participated in a shoreline cleanup, remind them about the data they gathered and analyzed during the cleanup, and the problems they identified. Is there anything else you observed at the shoreline that could help define the problems? If your students did not do a shoreline cleanup, discuss the problems they identified and learned about in CA1: *Marine Debris—It's Everywhere*, and CA2: *Searching Out Nonpoint Sources of Pollution*.

**As a group, identify some examples of problem definitions for which the students will explore solutions.** Discuss some possible solutions. The solutions could be as simple as initiating a letter writing campaign or as complex as working to get a law passed. For example, students in Massachusetts helped pass a law banning mass balloon releases.