Plastic Entanglements: Ecology, Aesthetics, Materials

Educator's Guide

Post-Visit Activities

Sea Grant University of Wisconsin

Chazen Museum of Art

Wisconsin Water Library

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About the Exhibition

Plastic Entanglements: Ecology, Aesthetics, Materials
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Pleasant T. Rowland Galleries
Chazen Museum of Art
750 University Avenue
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Introduction to Post-Visit Activities

Despite the issues related to disposal and human health, plastics are a central component of modern life. Indeed, it would be difficult to imagine modern life without them. Plastics are being further integrated into products. For example, their light weight makes plastics an attractive raw material for vehicle manufactures that are striving to produce more fuel-efficient models. Emerging technologies, such as 3-D printing, may enable even the general public to create items of their own design.

Generally, we no longer have a utopian view of plastics. We realize that using plastics has associated benefits and costs, just as with any other raw material or product. Many people are working to find ways to maximize the benefits and minimize the costs.

To address the negative aspects of using plastics, scientists are investigating ways to make plastics safer and more sustainable. There has been a return to bioplastics, which are made from plant crops instead of fossil fuels. Some researchers are seeking mechanisms to make recycling more efficient, and "they even hope to perfect a process that converts plastics back into the fossil fuels from which they were derived" (Science History Institute, 2019).[1] Scientists have "created an enzyme that can break down PET (polyethylene terephthalate, the plastic found in water and soda bottles)" (Smithsonian Ocean Team, 2018). [2]

Lawmakers have also influenced the way society uses plastics. Another way to manage the plastic waste stream has been to ban the use of single-use plastics, such as plastic bags and plastic drinking straws. As of August 2019, three states (California, Hawaii and New York) have banned the use of, or established a fee for using, single-use plastic bags. Many cities, although none in Wisconsin, have also passed legislation that restricts the use of plastic bags (Nace, 2018,[3] and American Progressive Bag Association, 2019).[4] As of July 1, 2019, Seattle is the first U.S. city to ban the use of plastic straws for vendors in the city, as well as plastic stir sticks and utensils (Square Resource Library, 2019). [5]

Business and industry, such as those involved in supplying medical devices, have developed more durable and desirable products. Pacemakers, hip and knee replacement parts and even synthetic bandages for wrapping fractures ease the pain and suffering of many.

These post-visit activity suggestions have students reflect on the many benefits and costs of using plastic materials and provide an opportunity for students to consider solutions.

Activities

Many of the activities below build upon concepts learned in the Pre-visit Educator's Guide and the visit to the Chazen Museum exhibit. Please look back to these materials if you need clarification.

Marine Debris Monitoring and Assessment Project

The Marine Debris Toolkit is an excellent resource for developing a marine debris monitoring program in your classroom or with a student group. Successful use of this kit involves a full-circle approach – beginning with education, continuing with monitoring efforts and looping back around to student-driven engagement and outreach. In addition, the toolkit gives educators an excellent overview of issues related to this the topic.

To take the next steps in teaching about marine debris, this selection of lessons from the toolkit provides a good introduction:

Trash Traits
Students perform experiments to examine whether or not trash can float, blow around or wash away. The effects of these characteristics on marine debris in the environment are then discussed.

Waste Inventory
This lesson is designed to increase students' awareness of the waste they and their family produce. Over the span of a week, students keep a log of the types and amounts of trash they generate, and how they dispose of that trash. Students also learn which items were (or could/should have been) recycled and which items could become marine debris.

Marine Animals and Harmful Debris
Students listen to descriptions of marine animals and then identify marine debris items that could harm them.

All Tangled Up
Students perform an experiment in which they wrap a rubber band around their fingers and across the back of their hand and try to disentangle themselves. As a class, students discuss their thoughts and reactions and relate to real animals. Older students will write a short story about an entangled animal.

Nations and Neighbors
Students learn how marine debris has no international boundaries. Students will develop map skills by locating various nations on a globe or map, and by identifying various oceans. As a class, students discuss how an international treaty about marine pollution (MARPOL Annex V) regulates the disposal of garbage at sea.

For older students who may be inspired to take this further, they can get more involved tracking and reporting plastic pollution via the NOAA Marine Debris Tracker app. Look for the GREAT LAKES group that is forming in early 2020.

Plastics in Our Space and in Their (Final Resting) Place

The word “plastic” is used to describe a collection of synthetic or manmade organic compounds (polymers), often derived from petroleum. Plastic polymers can be altered to come in many shapes, sizes, colors and densities. When plastic is no longer considered useful, it becomes waste and can wind up in our waterways as marine debris. Plastic debris is the most abundant type of marine debris in our ocean, waterways and Great Lakes.

This is an area the students can explore as they are introduced to the issue of plastic pollution in water.

Plastics in Our Space

For younger students

Seeking Alternatives to Single-Use Plastics (for younger students)

This full curriculum includes a five-day lesson plan, but consider offering day one that begins on **page 7**. Within this portion of the lesson students engage with the challenges of plastics by making observations of trash collected from the school trash bins over the course of a few days and/or from a walk around the school during a brief clean-up.

For older students

What Is the Impact of Beach Litter? (for older students)

In this activity, students will construct a web of things that may increase or decrease as a result of beach litter. After completing this activity, students will be able to 1) List and explain many potential impacts of beach litter and 2) Discuss various interpretations of the possible debris impacts.

Plastics in Their (Final Resting) Place

For all ages

Students may be surprised by the amount of plastics that are found in our world – in clothing, shoes, furniture, cars, adhesive bandages and more. Plastic has become the very fabric of their lives. Much of this becomes waste, and without proper handling, it can make its way into our water systems. Understanding the resin codes for plastics is the first step in understanding how to handle it as a waste.

STEP ONE

Using the following chart, students can inventory plastics in their classroom or at home to see what the plastic footprint is of that space. Use your imagination in collecting and graphing the data.

Common Types of Plastic

Resin Code	Name	Product Examples
	Polyethylene Terephthalate **(PETE, PET)**	Plastic bottles, food jars, ovenable and microwavable food trays, textiles (polyester), monofilament, carpet, and films.
	High-Density Polyethylene **(HDPE)**	Bottles (beverage, detergent, shampoo), bags, cereal box liners, extruded pipe, and wire and cable covering.
	Polyvinyl Chloride **(PVC)**	Packaging (clamshells, shrink wrap), pipes, siding, window frames, fencing, flooring, and medical products (blood bags, tubing).
	Low Density Polyethylene **(LDPE)**	Bags (produce, dry cleaning, newspaper, and garbage bags), squeeze bottles, container lids, shrink wrap, toys, coatings for milk cartons and beverage cups, and wire and cable coverings.
	Polypropylene **(PP)**	Yogurt and other food containers, medicine bottles, straws, bottle caps, fibers, appliances, and carpeting.
	Extruded and Expanded Polystyrene **(PS)**	CD cases, yogurt containers, cups, plates, bowls, cutlery, hinged takeout containers (clamshells), electronic housings, building insulation, coat hangers, medical products, packing peanuts and other packaging foam, foamed coolers, and egg cartons.
	Other is a resin different than the six listed above, or made from a combination of resins.	Three- and five-gallon reusable water bottles, glasses (lenses), some citrus juice and ketchup bottles, oven-baking bags, and custom packaging.

Source: Marine Debris Fact Sheet, NOAA
https://marinedebris.noaa.gov/fact-sheets/marine-debris-fact-sheet

STEP TWO
Research what resin codes are recyclable in your city. City public works department are usually in charge of waste management. In Madison, the city Streets and Recycling Department handles this. They have a very complete recycling guide that includes everything you need to know about plastic recycling.

Be sure students investigate tricky-to-recycle plastic waste including coffee pods like K-cups, plastic shopping bags and Styrofoam. Discuss whether they might consider using less of these items or if there are reusable alternatives.

Find Solutions

FOR THE YOUNGER STUDENTS
For younger students, introduce ways to reduce their plastic footprint so that plastic waste doesn't wind up in our waterways. Experts say we should follow the four Rs:

REFUSE
REDUCE
REUSE
RECYCLE

… in that order!

Refuse to choose plastic – choose natural fibers, use a refillable water bottle, etc.
Reduce usage – find ways to reduce what is used
Reuse – if there are usages that are necessary, find ways to reuse the plastic
Finally, recycle your plastics according to your community's rules

Add in another R – Retell! Share what you are learning about marine debris with parents, friends and relatives.

FOR THE OLDER STUDENTS
Have students brainstorm mechanisms for mitigating the negative consequences of using plastics. Divide students into teams that are interested in working on a similar solution. For example, some students may be interested in investigating biodegradable materials that can be used as replacements, and others may be interested in awareness campaigns designed to alter behavior. Students should document their solution by creating a chart showing how it works, advantages, disadvantages and expected outcomes.

Completed charts can be displayed and a gallery walk technique employed so that each group can explain how their solution will work. Members of other groups can offer feedback and comments that may be used to refine the original solution.

Students could also produce a communication tool (e.g., public service announcement, brochure or video) designed to raise community awareness about the consequences of using plastics (in general or a particular plastic) and their proposed solution for mitigating these negative consequences.

References Cited

[1] Science History Institute. (2019). Conflicts in Chemistry: The Case of Plastics—The History and Future of Plastics.

[2] Smithsonian Ocean Portal Team (2018). Marine Plastics.

[3] Nace, Trevor. (2018, September 20, 1:20 pm) Here's a List of Every City in the U.S. to Ban Plastic Bags, Will Your City Be Next?

[4] American Progressive Bag Association. (2019) Ban the Bag Interactive Map.

[5] Square Resource Library. (2019). Why Plastic Straws Are Being Banned.

All educator materials related to teaching about the art and science of plastics through the *Plastic Entanglements* exhibition can be found http://go.wisc.edu/artscienceplastic

For any questions about these activities, please feel free to contact Anne Moser at the UW Madison, Wisconsin Water Library. She can be reach at akmoser@aqua.wisc.edu or (608) 262-3069.