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trashshouldntsplash@gmail.com





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K-12 OUTREACH MATERIALS

Template for Classroom Visits | Presentation and Activities | Designing an Art Contest | "Call for Ocean Art" Flyer | Classroom Waste Audit & Sorting Activity



Artwork created by Falmouth High School student Evan Isenhour



@trashshouldntsplash

trashshouldntsplash.org

trashshouldntsplash@gmail.com





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TEMPLATE FOR CLASSROOM VISITS & ACTIVITIES

I. Introduce the problem with a photo slide show (10-15 min):

Ask the class for their input along the way using engagement questions shown in italics.

- Introduce the problem using photos of contaminated beaches or waterways, including floating plastics; use local examples, if possible.

Q: Has anyone ever seen trash at our local beach/river/park? What kind of trash was it?

- Describe impacts on wildlife using photos of ingestion, entanglement, invasive species transport.

Q: Why do we care about trash in the ocean? What are some of its possible impacts on wildlife?

- Dispel misconceptions and get into the details: Explain that there is no enormous floating island of trash in the Pacific Ocean (or in any ocean). There are recognizable large items floating out in the open ocean, but the most numerous type of floating plastic debris consists of small particles commonly called microplastics. Most microplastics are smaller than a pencil eraser, and started out as larger items that broke apart into smaller pieces over time when exposed to sunlight. Floating microplastics collect in specific parts of the ocean (subtropical gyres) where they are carried by surface ocean currents. Discuss how you could measure plastics floating in the ocean by towing a plankton net and counting the plastic particles that are collected together with the plankton and other floating material (such as natural debris, algae, or even tiny fish and fish larvae). This section can be more or less detailed based upon the age group and the topics of interest (e.g., marine life, ocean currents, ocean exploration, etc.). It is important to dispel the misconceptions and introduce microplastics with any audience.

Q: Where does plastic accumulate in the ocean? Why? How could you measure this?

An important note on sourcing material for your presentation: There are many resources available that describe the problem of marine debris, or ocean plastics. Before using any material, please ensure that your source is reputable and scientifically accurate, and do not use any photos without information about where the photo was taken and by whom. Please properly attribute the sources of all material that you use.

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A few recommended sources:

NOAA Marine Debris Program: <https://marinedebris.noaa.gov/>

- *Discover the Issue* (<https://marinedebris.noaa.gov/discover-issue/>): for background information
- *Resources* (<https://marinedebris.noaa.gov/resources/>): for activities, curricula, fact sheets
- *Multimedia* (<https://marinedebris.noaa.gov/multimedia/>): for artwork, images, infographics

STEM Pre-Academy: <https://stempreacademy.hawaii.edu/c-more/marine-debris>

- Science kits with three lessons for students in grades 8-12

Duke University Marine Lab Community Science Program on Marine Debris:

<https://sites.duke.edu/communityscience/marine-debris/marine-debris-classroom-resources/>

- Activities for the classroom, on the beach, at home and in the community for students in grades 4-5

II. Engage the students with activities at several stations (20-30 min):

If possible, divide into small groups of students for each activity. Each station should take 5-10 minutes. The details for each activity are on following pages.

- **Station 1: How can we keep plastic out of the ocean?** Observe debris items collected on a beach (bring items, or use a photo). List items in the data table. Brainstorm possible sources of these items and enter students' ideas to keep these items out of the ocean.
- **Station 2: Bird beak feeding simulation.** Students use a variety of "beaks" to attempt to pick out grains of rice from a bin containing rice mixed with plastic beads.

Q: What do you think a seabird will do when it is feeding at the surface of the ocean? Will it pick out its natural food? Will it pick up and eat plastics?

- **Station 3: Sink or float: A density experiment.** Students place different types of plastics in jars of water and compare sinking and floating tendencies.

Q: What types of plastics would you expect to find floating in the ocean? Where might other, denser materials be found if they entered the ocean?

III. Reconvene the entire class for a group discussion (5-10 min):

- Brainstorm solutions: The goal is for students to think about the trash they produce and what they can do about the problem of ocean plastics.

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Where does all this trash come from? What should you do with these items if you have them in your house [bring common household items to sort into recycling vs. trash]?

What's even better than recycling [i.e., use less/make less trash, avoid single-use plastics]?

What can we do if we see trash on the beach? On the street? On the playground?

How can we let more people in the community know about this problem and help to solve it [i.e., tell parents, relatives, teachers; organize beach cleanups].

- Talk about *Trash Shouldn't Splash* and/or any ongoing local initiatives (e.g., Call for Ocean Art; local plastic bag or packaging ordinances; skip-the-straw efforts, etc.).
- Leave students copies of one of the NOAA Marine Debris Program activities (e.g., word scramble, crossword, coloring activity) from the *Understanding Marine Debris: Games and Activities for Kids of All Ages* publication (https://marinedebris.noaa.gov/sites/default/files/publications-files/MDP_ActivityBook.pdf)

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Activity: Bird Beak Feeding Simulation

To demonstrate how difficult it is for seabirds to avoid plastic when feeding, ask participants to use different “beaks” (tongs, spoons, chopsticks, clothes pins, etc.) to retrieve only pieces of rice from a mixture of dry rice and plastic beads in a variety of sizes, shapes and colors. You may make the activity more exciting by timing the participants, or by making it a friendly competition to see who can get the most food or least plastic in a set amount of time.

Source: Ocean Conservancy and NOAA Marine Debris Program



Photo: *Trash Shouldn't Splash* middle school students leading the bird beak feeding activity at a public outreach event.

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Activity: Sink or float: a density experiment

Objective: To learn about different plastic materials (polymers) and how they relate to recycling codes, and to test the density of these materials relative to water. Relate this to marine debris by determining which materials would float in the ocean and which would sink to the seafloor, if disposed of improperly.

Materials needed:

- Containers full of water – individual cups/jars at each table so students can work in groups. In a small group you can use one jar and pass it around.
- An object made from each plastic material (recycling codes #1-6), cut up into small pieces using scissors or a hole punch. It is helpful to choose objects that are distinct colors, or to color objects with a permanent marker if they are the same color. This helps keep track of different plastics once they are in small pieces.

Plastic material associated with each recycling code, and common items made of each material:

#1: PETE (Polyethylene terephthalate) – water bottles, soda bottles, berry containers

#2: HDPE (High Density Polyethylene) – milk jugs, detergent bottles, some grocery bags

#3: PVC (Polyvinyl Chloride) – old credit or debit cards, white PVC pipe (difficult to cut up)

#4: LDPE (Low Density Polyethylene) – dairy container lids, bread bags

#5: PP (Polypropylene) – sour cream or yogurt containers, some iced coffee cups

#6: PS (Polystyrene) – there are two forms of this plastic, it is a good comparison to have both:

- PS foam, commonly referred to as “Styrofoam”: take out containers, insulated coffee cups, some egg cartons
- Solid PS: some hot drink cup lids, some clear, hard, brittle take out containers (sometimes used for baked goods)

#7: “All other plastic” – there are too many types to include here, but you can add additional examples, if they are of interest.

Experiment:

Fill each container with water. Tap water is fine if you don't have seawater; you can discuss the density difference between the two during the question/discussion section.

As you pass out a few pieces of each plastic type to each group or student, show the recycling code number and polymer type and talk about some common items that are made of that material.

Have group define the “density” of a material.

After each group has some pieces of each polymer, have them hypothesize which polymers will float and which will sink based on the pieces in their hand and what they know about the items made of each plastic.

Have the students work together to test which types float and sink. You can summarize the results from each group on the board.

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Discussion: As a class or group, discuss the questions below:

- Did some groups have a polymer that sank, while it floated for other groups? What could cause this? [Sometimes a bubble may form on a plastic piece, or the surface tension of the water may make a piece float when it would otherwise sink (this is especially true of some solid PS). Students may have to gently mix or submerge each piece for accurate results.]
- Were their hypotheses correct? Which one is the densest? The least dense? Did they notice a difference in how quickly the densest materials sank (e.g., PVS vs. solid PS)? Were some polymers easier to predict than others?
- Does the size of the piece matter? Does the shape of the piece matter?
- What happens to the density if you add air to the material? (e.g., PS solid vs. PS foam)
- Would the results change if the experiment were done in seawater/fresh water?

Final discussion:

- Bring the topic back to marine debris.
- Based on what you know now, what polymers and objects could end up floating in the ocean if disposed of improperly? Where might the others end up?
- What are some impacts of these plastics ending up floating in the ocean or sitting on the sea floor? (Note: wildlife live in both locations)
- What can individuals do to help prevent marine debris? Are there items that could be avoided or replaced? [Think about reducing single-use plastics by avoiding them or switching to reusable items; talk about how every individual can make small changes that will add up]

Key:

Mass – the amount of matter in an object

Density – the mass per unit volume of a substance (how compact or concentrated something is)

Density of each plastic material (to share or display following the experiment):

- PETE 1.38 - 1.39 g/ml
- PVC 1.30 - 1.45 g/ml
- PS (solid) 1.04 - 1.07 g/ml
- HDPE 0.95 - 0.97 g/ml
- LDPE 0.92 - 0.94 g/ml
- PP 0.89 - 0.91 g/ml
- PS (foam) <0.05 g/ml

Density of fresh water 1.0 g/ml

Density of seawater ~1.03 g/ml

Source: Jessica Donohue, Sea Education Association



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DESIGNING A STUDENT ART CONTEST

People are often more likely to listen to children with a cause than adults with a cause, but sometimes adults might have to do the talking. A great way to bridge this gap is with student-designed artwork featured on campaign materials. In addition, art contests are a great way to engage students and teachers in local schools, who may then be further inspired to reduce unnecessary single-use plastics at school or at home.

In designing our “Call for Ocean Art”, we first reached out to art teachers at our local elementary, middle and high schools, who were extremely helpful in the design of the contest and who promoted it to their students. To encourage participation we solicited local businesses for small prizes (e.g., gift cards or small gift items) that we awarded to winners in designated grade categories. The contest announcement clearly stated that submitted art could be used, in part or in whole, in *Trash Shouldn't Splash* print and electronic materials.

To promote the contest we designed a one-page flyer (*Call for Ocean Art flyer*, included as a separate file in this toolkit) for distribution in both electronic (PDF file) and printed format. To coordinate distribution within schools, we contacted the school district and individual school administrators to ask for permission and for the best method to reach students. We learned that most communication in our local schools occurs by sending printed flyers home with each individual student. We chose not to print hundreds of copies of the flyer, and instead delivered 25-50 printed copies for school-wide posting to a designated contact person at each school (typically an administrative assistant to the principal). We also posted the flyer at town locations where students (and parents) were likely to see it, such as at the public library, post office, markets, coffee shops, sports facilities, etc.

Examples of *Trash Shouldn't Splash* printed materials designed using student art.



Student artist: Abe Lineweaver



Student artist: Sophia Adelstein

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Step-by-step guide to designing a student art contest:

- Choose a deadline for the contest, allowing a minimum of 4 to 6 weeks for students to create their entries.
- Decide who will serve as judges. Our middle school student *Trash Shouldn't Splash* collaborators served as judges. You could reach out to a school environmental club, or other group of engaged older students to help.
- If the contest spans a large age group, you may wish to create age- or grade-based categories for judging. Our contest solicited entries from students in grades K-12, which we divided into the following groups: Grades K-2, 3-5, 6-8, 9-12, and one group for entries from a high school design class.
- Decide upon requirements for entries, such as size specifications and type of artwork (e.g., two-dimensional only vs. sculpture). If you plan to use artwork for campaign materials, it is best to require that artwork contain no text, which may be difficult to read when resized. It is also important to state that artwork must be original and should not contain images or graphics from other sources such as movies, TV, books, or internet image searches.
- If you plan to award prizes, which might include having winning art displayed in the school or community, or gift cards (< \$15) or small items donated by local businesses, arrange these before announcing the contest.
- If you plan to display submitted artwork (all entries, or winners of each category) in schools or local venues (e.g., library or businesses), decide how many pieces you plan to display, the area required, when and for how long the art will be displayed, etc., and then reach out to local venues before announcing the contest. Seeing their art displayed is exciting for the student artists, and will help spread your message in the community.
- Determine how students will submit their art entries. We included the campaign email address for electronic submissions, and school art teachers were willing to collect artwork for us to pick up.
- Once you have decided all the logistical details, design flyers to get the word out. Be sure to include all important contest details on your flyer. Included in this toolkit is the *Call for Ocean Art flyer* that we used, as an example. A PowerPoint file with our flyer is also included if you wish to simply fill in the specifics of your Call for Ocean Art (school name, due date, submission details etc.). Feel free to change the look of the flyer, or make your own entirely.
- To announce the contest, first contact school district and/or individual school administrators for permission and to determine the best method to advertise the contest to students. This may include posting or distributing printed flyers, emailing an announcement, and mentioning the contest in school announcements or in art classes.
- Hang printed flyers in town locations where students (or their parents) are likely to see them, such as at the public library, post office, markets, coffee shops, sports facilities, etc.

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- In a timely fashion after the deadline passes, decide winners, distribute prizes and display artwork (if applicable).
- If you wish to incorporate student artwork into campaign materials, use a digital scanner to scan the art and then use graphic design software to add text or logos. Always remember to credit the student artist!



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CALL FOR OCEAN ART: KEEP OUR OCEANS FREE OF PLASTIC DEBRIS

(FILL IN school name) STUDENTS:

Trash Shouldn't Splash needs your help to spread the word about the threat plastic trash poses to our oceans! Help raise awareness by participating in this Call for Ocean Art, and inspire people to use fewer single-use ("disposable") plastics.

Deadline: (FILL IN Date and Time)

Why Care About Ocean Plastics? Each day in the U.S., tens of millions of single-use plastic straws, cups, bottles, wrappers, and bags are used for a few moments and then thrown away. Many of these plastics end up in landfills, a small percentage are recycled, and some may end up in the environment, potentially making their way to beaches and the sea. Plastics do not biodegrade, but instead persist for years to decades or longer. In the ocean, single-use plastics may cause harm when they break into smaller and smaller pieces that can be eaten by a wide variety of marine animals. Choosing to use fewer single-use plastic items will reduce plastic waste on land, and in the ocean.

Submission Details: We invite you to create a visual work that explores the relationship between our use of single-use plastics and the health of our oceans, coasts, and marine animals. This art may inspire others to use fewer single-use plastic items!

- ✧ Your work may be in any medium that can be rendered into 2D posters and prints: painting, drawing, collage, printmaking, digital art, photography, or a combination.
- ✧ Your work should be a minimum size of 8" x 10" and a maximum of 18" x 24".
- ✧ Your work should contain minimal text.
- ✧ PLEASE DO NOT TAKE OTHER PEOPLE'S WORK AND SUBMIT IT AS YOUR OWN.
- ✧ You may submit your work either to (FILL IN), or electronically as a high resolution .jpg, .png, .gif or .pdf file to (FILL IN).
- ✧ Most of all have **fun** and let your **creativity** soar!!

Selected entries will be chosen from each school (including home schooling students) for display in (FILL IN). Top entries will earn prizes including reusable items and gift certificates. Ocean Art may be used, in part or in whole, in *Trash Shouldn't Splash* print and electronic education and outreach materials.

(THIS PARAGRAPH IS AN EXAMPLE, EDIT THIS TO FIT YOUR CONTEST)



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CLASSROOM WASTE AUDIT & SORTING ACTIVITY

Purpose

The purpose of this classroom waste audit is threefold:

1. To make students aware of the kinds of waste they typically produce in school, largely from snacks and lunches brought from home;
2. To teach students how to properly sort waste into trash, recycling and compost bins; and
3. To engage students in a discussion about ways to reduce plastic waste by replacing single-use items and packaging with reusable alternatives.

This protocol is designed as a short classroom activity requiring minimal preparation. Simply take a few minutes to skim the following pages and grab the supplies listed, then gather your students for a hands-on waste analysis activity.

The goal is to get the conversation about waste started using real data that reveal how we are actually behaving on a typical day when it comes to trash. Your students will learn about data collection as you take steps together to set new habits that will help reduce waste.

Supplies

- Tongs
- Garbage can
- Recycling bin
- Compost bucket
- White board and at least 3 white board markers

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Activity: Let's Talk Trash

Our classroom has recycling bins and garbage cans. Today we're going to see how well our class is doing getting waste into the correct bins. We'll see how well we're doing now and then we'll check again in the future to see if we have improved.

We have two goals. One goal is to produce as little waste as possible. The second goal is to make sure we know what items belong in the recycling or compost bins so that they don't end up in the trash can. We also want to make sure that trash doesn't end up in the compost or recycling bins. By doing these things we will ultimately use fewer resources, have less trash to deal with (for example, by burying in landfills), and reduce litter. Working on these goals will help make the Earth a more sustainable place to live for people and for wildlife.

One of the types of waste we will keep track of today is single-use plastic. When people talk about single-use plastics they are talking about plastic items that just get used one time before they are thrown in the trash or recycling. Kind of wasteful, right? Fifty years ago most things were made of paper, cloth, leather or metal. More and more things are now made of plastic. Plastics last a very long time, and if they end up in the environment they can cause problems for animals that might eat or get tangled up in plastic trash.

Raise your hand if you can think of an example of a single-use plastic item. *Or quickly list some of the following if the students don't come up with them.*

- straws
- ziplock bags
- plastic spoons and forks
- single-serve water bottles
- juice pouches
- snack wrappers
- yogurt and apple sauce containers
- plastic bags
- cling wrap
- ketchup/mustard/mayonnaise packets
- coffee stir sticks

Waste tally and sorting activity

Now we are ready to see how our recycling program is going. We are going to describe and count all the items I found in the classroom recycling bin.

I need three volunteers. *(Choose three students and hand them each a white board marker.)*

1. One person will tally the number of single-use plastic items.
2. One person will tally the number of things that should have gone in the trash can instead of the recycling.
3. The third person will tally the number of items that should have gone in the compost bin instead of the recycling.

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Draw a quick data table on the white board with headers for single-use plastics, trash and compost.

Everyone else has a job too. Each time I use the tongs to hold up an item I found in our recycling bin, you tell us whether it is a single-use plastic and whether it is recyclable, trash, or compost. Ready?

Start pulling things out of the recycling. Give your volunteers time to tally when needed. Stop and discuss any questions that come up about where to put things. Drop any items that should not have gone into the recycling into the trash can or compost bucket. You might need an area to put things you have questions about if you're not sure what can be recycled in your area.

How's the Recycling Bin?

Single-Use Plastics (# of single-use plastic items)	Trash (# of items that should have gone in trash can)	Compost (# of items that should have gone in compost bin)

Now that we've checked the recycling bins we're going to see if what we put in our trash can is really trash. We need three new volunteers to help us tally the things in our trash can.

Draw another data table on the board and assign each of your volunteers a category to tally.

What's in the Trash?

Single-Use Plastics (# of single-use plastic items)	Recyclable (# of items that should have gone in recycling)	Compost (# of items that should have gone in compost bin)

Discuss the data: How did we do? Were the majority of items made of plastics? Are most of the single-use plastic items we found recyclable? Did they end up in the correct bin?

Questions for discussion

What are some problems with single-use plastics?

- Many of them are not recyclable.
- If they get into the environment they can hurt animals that try to eat them or that get tangled up in them.
- Most plastics are made from fossil fuels, which are a non-renewable resource.

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- Even if they go in the recycling bin, the process of recycling plastics requires energy.
- People in the United States use much more plastic than we recycle. A lot of recyclable plastic is ending up buried in landfills, where it will sit for years to decades or longer.

How can we reduce the amount of single-use items we use and reduce waste?

Single-use item	Alternative (to reduce overall waste)
Plastic wrappers from granola bars, snacks, etc.	Pack a snack of mixed nuts, dried fruit, or fresh fruit or veggies in a reusable container. This may help you eat healthier foods too.
Single-serve plastic containers from yogurt, applesauce, etc.	Buy a large container of yogurt or applesauce and put small amounts in reusable containers each day to reduce packaging waste.
Plastic forks and spoons	Pack reusable utensils (metal, plastic, bamboo) and wash them at home.
Plastic drink containers	Bring a reusable water bottle.
Plastic bags and plastic cling wrap	Use a reusable container (a glass jar, plastic snap-top bowl, beeswax sandwich wrapper, paper wrapper, etc.).
Paper napkins	Bring a cloth napkin.

Each of you is now a Garbage Guardian! It is your job to help your friends, teachers, and parents put things in the right bin and avoid making unnecessary trash whenever possible. We'll surprise you with another check of our recycling and trash bins sometime soon to measure our progress. We're all going to work together to keep the Earth healthy and a sustainable place for us to live. Thank you!

Follow the same protocol in the same location at a future date and compare results.

This activity was adapted from an original version developed and generously shared by Dr. Sarah Bryant.



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