

UPCYCLING

Keep Single-Use Plastics Out of the Waste Stream and the Environment

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Adapted from Sara Bella *Upcycled* by Oregon Sea Grant for the [Marine Debris STEAMSS Curriculum](#)



Summary

Turn discarded plastic bags into sturdy, artistic, useful products that hold value and are unlikely to be thrown away.

Audience

This activity is appropriate for all ages, but younger students will need adult supervision.



Introduction

We use plastics every day - a *lot* of plastic. After a plastic item has been used for its original intended purpose, what do we do with it? Certainly, if the plastic ends up discarded in the environment, it can cause problems for wildlife and ecosystem health. If we throw a plastic item into the trash, then it adds to the mounting garbage problem. We can keep the plastic useful and out of the waste stream if we re-use it, re-purpose it, and/or recycle it. We can also “upcycle” plastics, which can keep plastics useful for a longer time.

Upcycling is a way of reusing discarded objects or material in such a way as to create a product of a higher quality or value than the original. In this activity, students work to upcycle plastic bags into sturdy, useful, attractive items that are unlikely to be discarded any time soon.

Goals

- Recognize that we use a lot of plastic in our daily lives;
- Learn that upcycling is a way to reduce the amount of plastics discarded in the trash and in the environment;
- Appreciate that plastics can be engineered to accomplish many tasks.

Next Generation Science Standards

ETS – Engineering Technology and Applications of Science

ESS3.C – Human Impacts on Earth Systems

Specific Objectives

Students will:

1. Melt flimsy plastics together to make sturdier plastic material
2. Design and engineer a product made from the stronger plastic material
3. Gain awareness of amounts and types of plastics they encounter in their daily lives
4. Brainstorm ways to reduce, reuse, repurpose, recycle and upcycle plastics

Materials

For this project, collect a variety of discarded clean plastic bags and other thin plastic materials, including:

- Plastic bags that once contained the daily newspaper, bread, bagels, tortillas, produce, frozen vegetables, etc.
- Clear plastic film
- Plastics with colors and pictures on them, such as from pet food bags, the bag that came from the dentist, frozen vegetable bags, mall shopping bags, etc. (Once you start looking, you will find colors everywhere)
- Discarded bubble wrap, plastic air pillows

Plastics to AVOID:

- Most single use grocery store and produce bags (they are too thin)
- Materials that are dirty, greasy, or smelly
- Plastics that still have another useful purpose and do not need to be discarded yet

Materials List

- Pre-made sheets of sturdy base plastic material (optional)
- Roll of parchment paper
- Scissors
- Iron (thrift store quality)
- Ironing board or towel
- Sewing machine (if desired)
- Accessory materials such as dowels, straps, etc.
- Glue gun (optional)

Work area

Plan the activity in a well-ventilated large room. Because of the use of irons, this activity is ideal for family groups, older students or younger students who have several adult helpers that can be in charge of irons and sewing machines.

Set up ironing and sewing stations around the room and assign an adult to staff each station at all times. Depending on the age of the students, the adult may do the actual ironing, or may supervise the student as s/he irons.

Background and Related Material

See the [Marine Debris STEAMSS Curriculum](#) for information about plastic pollution composition and abundance, sources and transports, impacts and solutions:

<https://oregoncoaststem.oregonstate.edu/marine-debris-steamss/>

Lesson Procedure

Talk with the students about the types of plastics they use in their daily lives, and what they do with the plastics when they are done with them. Focus on plastic bags, or even a particular type of plastic bag such as a bread bag. Does your family rinse out the bag and use it again to hold food? Is it used to collect and discard pet waste? Is there a place to keep the bag in your house in case you need it in the future? Is it thrown into the recycling bin? Is it thrown in the trash?

Demonstrate how to make flimsy plastic bags into strong plastic material:

1. Place a large piece of parchment paper on the ironing board.
2. Obtain three newspaper bags (or similar) and layer them on top of each other on the parchment paper. This gives you 6 layers of thin plastic.
3. Cover the bags with another large sheet of parchment paper. Now all the plastic is between parchment paper. The iron will only touch the parchment paper, not the plastic directly.
4. Apply a constantly-moving medium-hot iron to the top of the parchment paper to melt the plastic together. The plastic may shrink somewhat. If the plastic does not melt, increase the heat setting on the iron.

The result is a sturdy piece of plastic in the size of one of the original bags. This is the base plastic panel that the students can use to make their projects. Panels can be ironed together to make larger panels, or cut down to smaller sizes.

Demonstrate how to decorate the sturdy panels:

1. Obtain a sturdy panel and bring it to the workspace.
2. Cut out colorful pieces of plastic material and arrange them on top of the base panel as desired.
3. Cover the entire panel with a piece of clear plastic. This step is not always necessary, but this extra layer of clear plastic serves three functions: a) it keeps the little pieces of plastic in place as you move your materials from your work space to the ironing board, b) some colorful plastics are actually painted and smear when heated, and the extra plastic helps minimize that smearing, and c) the extra layer of plastic adds strength to the material.
4. Bring the project to an ironing board and place it on top of a piece of large parchment paper.
5. Cover the project with another piece of large parchment paper. Now all the plastic is between parchment paper. The iron will only touch the parchment paper, not the plastic directly.

5. Apply a constantly-moving medium-hot iron to the top of the parchment paper to melt the plastic together. The plastic may shrink somewhat.
6. Repeat as necessary if you want to add more decoration. You may not need more clear plastic (step #3) if you are only adding a few new details.
7. To keep the project flat, place the warm project from the ironing board between two flat boards to cool.

Once the material has been decorated, it is ready to be engineered into an upcycled product. Depending on the age of the students, the time available, and the number of sewing machines, projects can vary from very simple to very complicated.

Very Simple Projects

- Placemats, coasters or other waterproof flat piece. Decorate a panel and cut out the desired shape with scissors.
- Each student decorates a panel and makes a “flag” which can be quickly sewn or glue-gunned by an adult onto a dowel, or an entire class set of flags can be sewn and strung on a line (in the style of Tibetan prayer flags).

Intermediate Projects (which are still simple if an adult is the person actually doing the sewing for the student)

- Small bag – Fold a panel in half and sew the edges to make a pouch. Provide straps that can be cut to length and sewn on each edge, or have the students make a strap out of strips of sturdy base material.
- Card or coupon holder – See photos for construction ideas.



More Complicated Projects

- Hanging art – Cut out two large pieces of plastic in the shape of a fish or other design, sew the edges together and stuff (with plastic) to give three dimensions. Hang from the ceiling. If you use clear plastic to make the object, you will be able to see the stuffing inside. Students may contribute decorated panels to make one large piece of art.
- Shopping bag - Examine a reusable shopping bag to see how it is engineered and then create your own version. This can take a long time, especially if the student is not familiar with using a sewing machine.



If time allows, challenge students to engineer their own useful product!

NOTE: Remember, the goal of this project should be to create a product that will NOT be thrown away very soon.

Hands-on Activity

Once the demonstrations are complete, share the rules with the group (for example, only adults may be authorized to use the irons), describe what you would like them to accomplish in the time remaining (structured or not) and then let the creativity begin. Tables will soon be messy with plastics being sorted, analyzed and cut into shape. Students begin to look at and value discarded plastics in a new way when they are searching for a particular color, size, or thickness.

Students may discover that different plastic materials have different qualities, and that not all plastics melt in the way they might expect. Some plastics shrink funny and distorted or get rough and bubbly. Experimentation is the best way to find materials that work best.

Clean up

Collect all the little pieces of unused plastic again at the end of the work session and save them for the next work session. You never know when someone will really want that little piece of purple for a project!

Reflection

Display the upcycled projects in a “museum” for classmates to appreciate.

Did all plastics “behave” in the way that was expected when heated? What types of plastic worked best? Which did not work well? Categorize plastics according to the characteristics that make them ideal for this type of upcycling project. Share recommendations with other upcycling engineers.

A few days after the project, talk to students again about the plastics they use around their homes. Are they looking at plastics differently now than before the project? Are they hesitating to throw out certain materials?

Can we upcycle ALL the discarded plastics in our households? How else can we minimize discarded plastics? Discuss ways to reduce the use of single-use plastics.

Observations from Past Participants

“I told my dad not to throw away the tortilla bag because it had so many great colors on it. We are going to save it and do a project together to make holiday presents for my aunts.”

“After our family participated in the upcycling session, my 11-year-old son started sorting through our collection of plastic bags at home with the idea that he could make a more complicated project on his own. When mounds and mounds of sorted plastic bags surrounded him, he suddenly stopped and looked up at me with horror and said “MOM... we have SO MUCH PLASTIC here!” He never really “saw” all the plastic before.”

“Every time I pull out my coupon holder someone compliments me on it. I tell them, “Look, it’s made from a bag that once held frozen peas!” They all think it is cool.”

Extension

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. Collect and analyze data to identify similarities and differences among several design solutions, identify the best, and apply those characteristics to new designs.

For example, how much weight is supported by different thicknesses of plastic, bag or strap design, etc.? How waterproof is the wallet design?

