INNOVATION GENERATION
Making an Impact

CLASSROOM ACTIVITY 2

Unexpectedly Upcycled

Can you give common items around your house a "second life" by using them for something unexpected?

Key Learning Topics

- Materials science
- Ecology
- Production

Overview

In this activity, students will see how many common household items can be "upcycled" and used for something else. They will learn about the materials that many household goods are made from (i.e. aluminum, plastic, cardboard) and how long it takes these materials to biodegrade when we throw them away. Then, they will choose to participate in one of two "upcycling" projects:

1. Creating a hallway organizer out of paper tubes.
2. Creating herb planters from lotion bottles.

Key Learning Topics

- Materials science
- Ecology
- Production

Target Audience

Grades 5–9 // Engineering, Science

Activity Duration

One 45–60 minute class period

Essential Question

Can we prevent items from ending up in landfills by finding creative ways to reuse them in our homes?

Materials

- Plastic jug
- Aluminum can
- Cardboard box
- **Upcycling** student capture sheet (1 per student)

Project 1: Hallway organizer

- Wrapping paper tubes/toilet paper/paper towel rolls/different sized cardboard tubes
- Sandpaper
- Craft paint (various colors)
- Utility knife
- Hot glue/hot glue gun
- Paint brush

Project 2: Herb planter

- Empty plastic lotion or body wash bottles that have been cleaned
- Strong scissors/utility knife
- Adhesive vinyl (variety of different patterns; you can use washi tape as well)
- Soil
- Herb seeds

Background Information/Links

According to the Environmental Protection Agency, in 2017, the average person generated over 4.5 pounds of waste per day.[1] Paper, plastics, and metals accounted for nearly half of the overall waste recorded.[2] In 2017 alone, 44.2 million tons of paper and cardboard were recycled. This reduced CO2 emissions at a rate equivalent to removing 31 million cars on the road for a year.[3] By reusing metals, plastics, and paper products, we conserve the energy that goes into processing them again for re-use, and we prevent the harmful effects that come from these products sitting in landfills.

[1] https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials

[2] Ibid.

[3] Ibid.

Teachers' Note

This activity can be modified for virtual learning by taking the following steps:

1. Distribute virtual examples of the recyclable materials, or have students source them from home. Instruct students to find all of the needed materials for their chosen project within their homes.
2. If technology allows, use the polling function to conduct the "engage" activity at the beginning of the exercise.
3. Consider filming brief videos of yourself completing each project before the lesson to share with students ahead of time. This will help students as they work at their own pace.

Procedure

Teacher prep:

1. Complete one of each of the projects ahead of time to show students as examples.
2. Ahead of the lesson, source one example each of a cardboard, plastic, and aluminum recyclable item. If you can't find physical examples, you can show students photos of common household recyclables, like a milk jug, cardboard box, aluminum can, etc.
3. Before students arrive for class, have the materials for each project divided into separate sections of the classroom.

Introduction | 5 Minutes

- Instruct students that they are about to participate in a pop quiz! Their job is to guess how long it takes each of the following three items to decompose[4]:
    - Cardboard box (answer: 2–6 weeks)
    - Plastic container (answer: 450 years)
    - Aluminum can (up to 200 years)
- Explain that one way to prevent items like these from ending up in landfills is to "upcycle" them, or creatively reuse them for other purposes.
- Ask students to provide some examples of things they could do to "upcycle," or reuse, each of the items, instead of throwing them away. For instance, aluminum cans can be upcycled into utensil holders.
- Inform students that they have the option to participate in one of two different upcycling activities:

[4] http://storage.neic.org/event/docs/1129/how_long_does_it_take_garbage_to_decompose.pdf

creating a hallway organizer from paper tubes or creating herb planters from plastic bottles.

Classroom Activity | 30 Minutes

- Divide the class into two groups, one for each of the two projects. Direct each of the groups to go to the area of the classroom preset for their project. In each project area, have a completed project available as an example.
- Take turns providing quick instruction to each group. While you are with one group, the students in the other group should work individually to complete the half of the **Upcycling** student capture sheet that corresponds to their chosen project.

  Project 1: Hallway Organizer[5]

  - **Step 1**: Carefully cut the paper tubes into 4" thick sections. (*Note: you may also choose to do this ahead of the lesson to save time.*)
  - **Step 2**: Sand down the edges of the cardboard segments until they are smooth.
  - **Step 3**: Paint the inside and outside of the tubes and let them dry.
  - **Step 4**: Arrange the tube segments in your chosen alignment.
  - **Step 5**: Hot glue the segments together, and your project is complete!

  Project 2: Herb Planter[6]

  - **Step 1**: Carefully cut the bottles in half using the utility knife.
  - **Step 2**: Make sure to remove any labels or stickers from the bottles.
  - **Step 3**: Cut a piece of adhesive vinyl big enough to wrap around the bottle and affix it, being careful to smooth out any air bubbles. (If using washi tape, wrap it around the bottle in your desired pattern.)
  - **Step 4**: Trim away any excess vinyl.
  - **Step 5**: Fill the planter with soil and seeds, and your project is complete!
- Give students 20–25 minutes to work on their projects. They may need to take their projects home to complete them.

Lesson Summary | 10 Minutes

- Conclude the lesson by having each student pair up with another student from the opposite project group. If there are an uneven number of students in each group, you can double up if needed.
- Have students share their responses to the **Upcycling** student capture sheet with their partner(s). As their partner speaks, the other student(s) should record their findings on the corresponding half of their capture sheet.

---

[5] Adapted from https://akailochiclife.com/2019/08/diy-recycled-cardboard-tube-wall-organizer.html

[6] Adapted from https://lovelyindeed.com/diy-upcycled-indoor-herb-garden/

- Allow 5 minutes for partners to discuss. When they have each shared their findings, ask a few pairs to share their learnings with the class.

National Standards

Next Generation Science Standards (NGSS)

- MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- MS-ESS-3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

International Society for Technology in Education (ISTE) Standards

- **7d**: Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.

Common Core Standards for ELA

- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)
- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)

Upcycling

Use the sources provided to answer the questions related to the upcycling project you selected. Once you've completed your project, connect with a student who completed the other project to learn about their findings.

Project 1: Cardboard Hallway Organizer Source: EPA Facts and Figures About Materials, Waste and Recycling: Paper and Paperboard	**Project 2: Plastic Bottle Herb Planter** Source: EPA Facts and Figures About Materials, Waste and Recycling: Plastics
Question 1: What percentage of MSW did paper products account for in 2017?	**Question 1:** What percentage of MSW did plastic products account for in 2017?
Question 2: What was the recycling rate for paper and paperboard in 2017?	**Question 2:** What was the recycling rate for plastics in 2017?
Question 3: Since 2000, has the amount of paper products in landfills gone up, down, or stayed the same? By how much?	**Question 3:** Since 2000, has the amount of plastic products in landfills gone up, down, or stayed the same? By how much?
Question 4: What are some ways you can reuse paper products at home?	**Question 4:** What are some ways you can reuse plastic products at home?
Question 5: What are some steps you can take to reduce your use of paper products?	**Question 5:** What are some steps you can take to reduce your use of plastic products?