

**Topic Design (Upcycling)**

- Design a useful product from recyclable materials.
- Construct a prototype of the upcycled product.
- Compare and contrast upcycling and recycling.

Duration 2-3 class periods**Assessment Type** Summative

Recycling is a key component of modern waste reduction; however, students may not realize that it does not provide a long-term solution. In contrast to the third component of the "Reduce, Reuse, Recycle" waste hierarchy, upcycling is a process that can be repeated in perpetuity of returning materials back to a pliable, usable form without degradation to their latent value - moving resources back up the supply chain. Upcycling requires innovative design and is likely critical to maintaining a balance between consumption and availability in our current system.

Set-up

Explore current recycling programs in the local area.

Define upcycling and give a simple example.

Students should work in groups of 4-5 on this project.

Materials

- Variety of tools (scissors, shears, hammers, pliers, etc.)
- Variety of fastening materials (glue, tape, staples, etc.)
- Access to recyclable materials (plastic bottles, paper, aluminum cans, etc.)

Instructions

As a team,

1. Decide on a material to upcycle.
2. Collect as much of that material as possible.
3. Use the engineering cycle to create a useful item from those materials.
 - a. Design
 - b. Prototype
 - c. Test
 - d. Evaluate
4. Report on your product results.



Notes

If you explain the difference between upcycling and recycling then the students really don't have to think about how to compare/contrast. So it's better to simply give the definition of upcycling and an example of a material that has been upcycled (using a soup can for a pencil holder, for example). Once the students have actually developed a product, then in their evaluation of that product will determine if they have actually upcycled or recycled. At that point they can compare/contrast

Our current handling of aluminum cans is close to a true upcycling model in that the aluminum can be melted down and turned into brand new cans, thus saving more than 90% of the energy needed to make new cans from the raw materials.

Timesaver! Ensure that teams can acquire sufficient recyclable materials or that you give students strict limits of the amounts of materials they may use.

Address technology standards in the reporting step by having students produce an infomercial or take a digital picture of their upcycled product and describe it for publication!



Discussion Questions

- How did your team come to consensus on what to create?
- Why is your upcycled product better than commonly recycled products made of the same material?
- What other non-recycled materials did you need? Could they be replaced?
- What did you need to alter from your original design to create a prototype?
- How did the changes you made from your original design impact your anticipated results?
- When should upcycling always be chosen over recycling?

Reality Check! Evaluation

- Students designed a practical product from recyclable materials.
 - At least 80% of the product is made from recyclable materials.
 - The new product is useful (justified from the team's perspective).
 - All stages of the design process were fully executed.
- Students constructed a prototype of the product.
 - The prototype is functional - or a reasonable 'fix' is provided for the next generation product.
 - The prototype provides useful information about the product design.
 - The team worked together to make a final presentation of their project.
- Students can compare and contrast recycling and upcycling.
 - Relevant examples of upcycled are noted.
 - Relevant examples of recycled items are noted.
 - Each member of the team can explain the difference between recycling and upcycling.