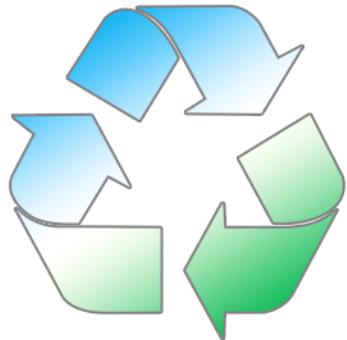


ENGINEERING DESIGN

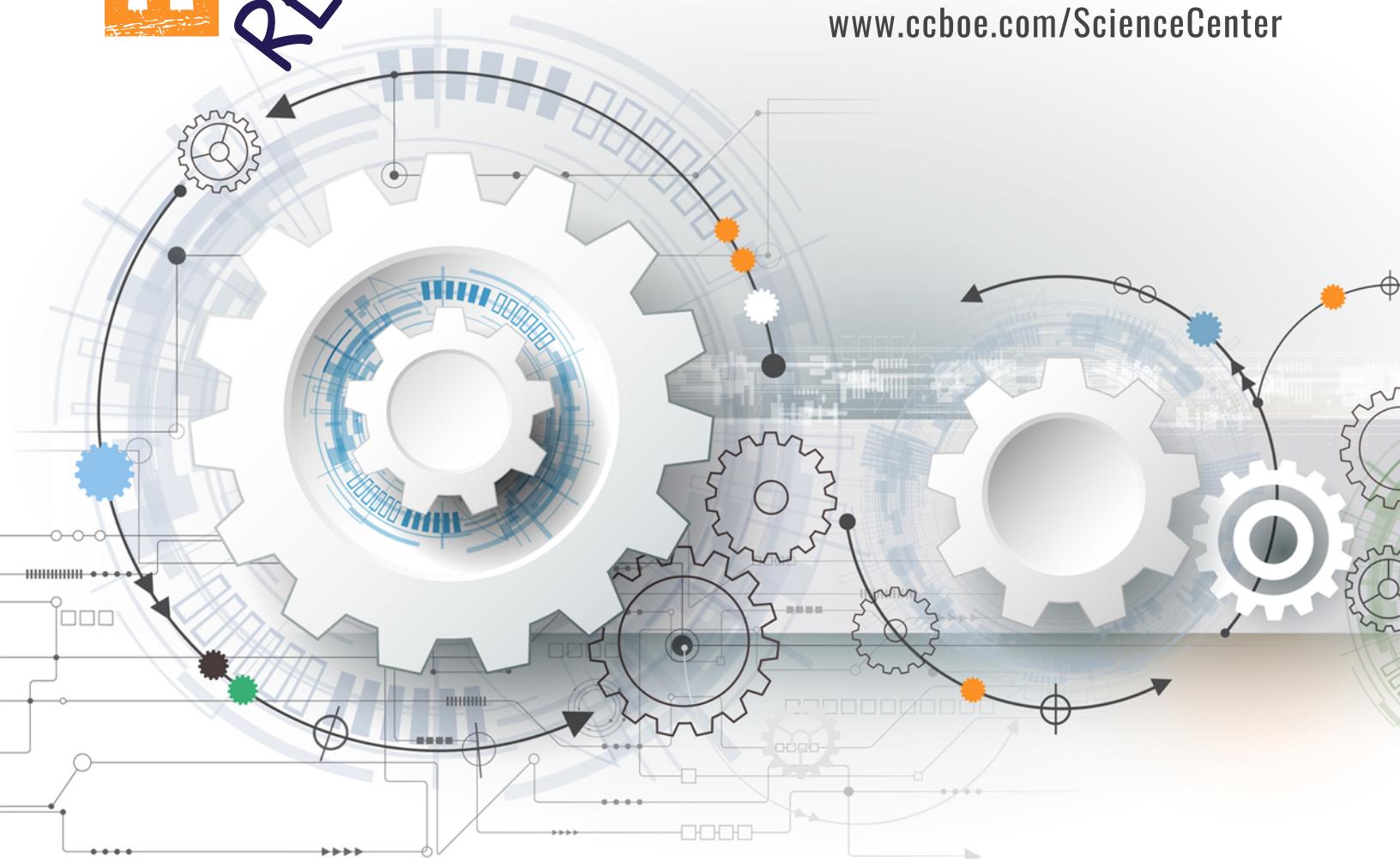
ENGINEERING



REDUCE, REUSE, RECYCLE
A SCIENCE @ HOME ACTIVITY



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LESSON OVERVIEW FOR PARENTS



What can we recycle or repurpose?

This past Wednesday, April 22, 2020 was the 50th anniversary of Earth Day. This week's lessons will focus on activities designed to generate interest and understanding of household waste that can either be recycled or repurposed.

Lesson objectives

- To demonstrate that students understand the difference between recycling and repurposing.
- To demonstrate that students understand that not all items can be recycled.
- To demonstrate that students understand why recycling is important.
- To successfully develop a recycling plan for your home.

Outcomes

- Students should demonstrate an understanding of the importance of recycling.
- Students should demonstrate an understanding that each person has a responsibility to reduce the amount of household waste sent to landfills.
- Students will gain an understanding of what a landfill is, how waste ends up there, and its effects on our environment.
- Students should be able to repurpose materials for a project of their design.
- Students will make recycled paper.
- Student will develop and implement a recycling plan for the family.
- Student will repurpose a used item for themselves.

Resources

Why You Can't Recycle Grocery Bags

<https://www.youtube.com/watch?v=OBzBSM00Kig>

The Great Pacific Garbage Patch

<https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/>

<https://theoceancleanup.com/great-pacific-garbage-patch/>

Recycled, Reduced, and Reused

<https://clever.discoveryeducation.com/learn/videos/4a23da20-1f02-4cc2-ae87-73b902bdaf93/>

<https://clever.discoveryeducation.com/learn/videos/ecf6ad9b-fdb4-467c-965d-3b0053324718/>

Recycling and Reusing

<https://clever.discoveryeducation.com/learn/videos/f1d0ef96-9140-413b-bc79-1d9697980d79/>

Reduce, Reuse, Recycle Resources for Students and Educators

<https://www.epa.gov/recycle/reduce-reuse-recycle-resources-students-and-educators>

30 Earth Day Crafts and Activities Using Recycled Materials

<https://www.weareteachers.com/earth-day-crafts-classroom-activities/>

If you do not have the materials that are suggested on the materials list, your student can experiment with other substitute materials. Please make sure that you are monitoring the selection and use of any materials.

Please post pictures of your child's projects by tagging us at James E. Richmond Science Center on Facebook and Twitter.

ENGINEERING CHALLENGE DIRECTIONS

Why should you Reduce, Reuse or Recycle?



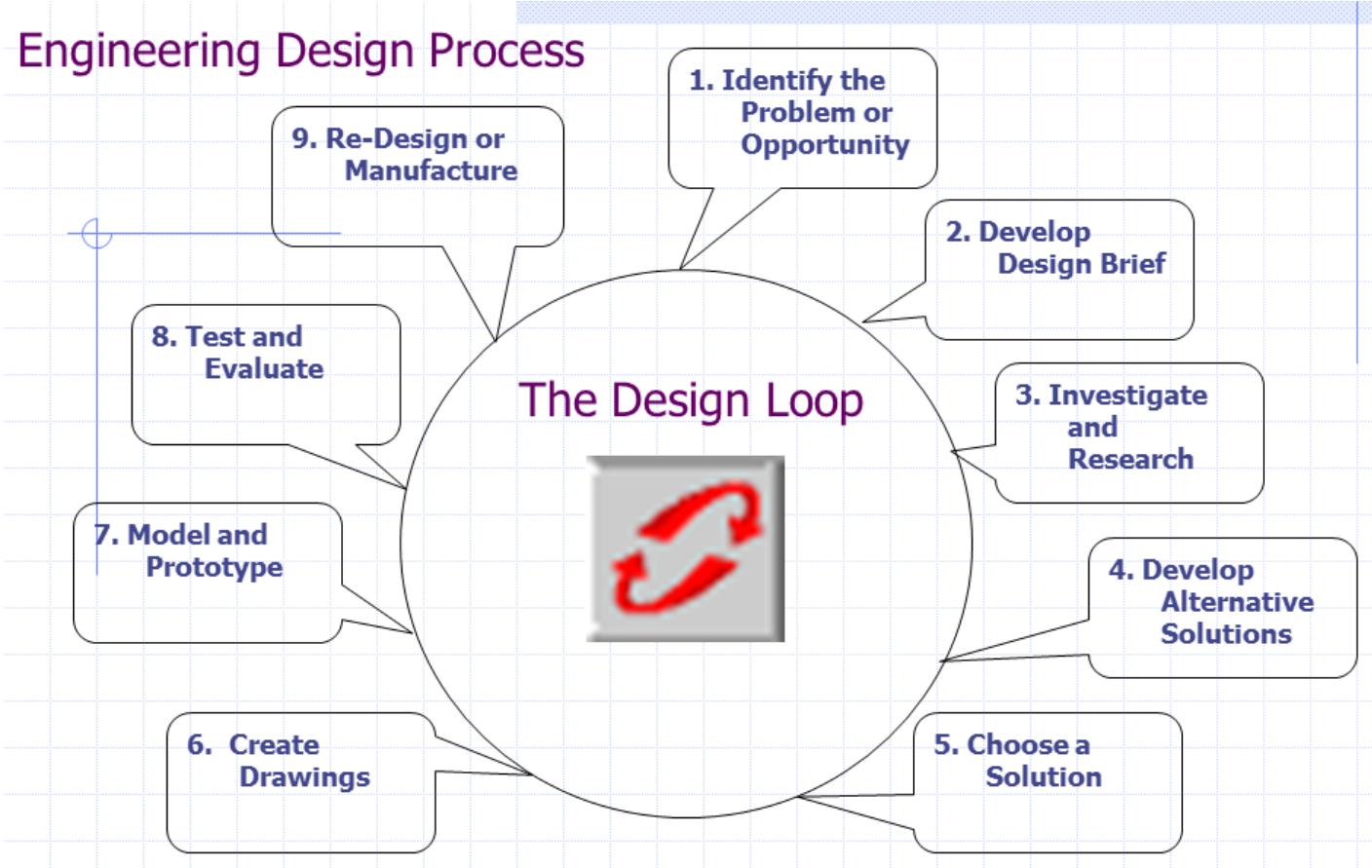
PURPOSE

Engineering challenges are a fun and educational activity to solve a stated task. There is not a single solution or one correct answer for each specific challenge. Try alternative solutions and use the Engineering Design process to meet each mini-lab or challenge for the optimal result.

ENGINEERING DESIGN PROCESS

The **engineering design process** is a series of **steps** that engineers follow to come up with one possible solution to a problem. Often the solution involves **designing** a solution that accomplishes a certain task and/or meets certain criteria. However, one very important aspect of the design process, is the feedback loop. This is used to look at outcomes and then make adjustments to develop a solution that is more successful at meeting the task.

Engineering Design Process



Why should you Reduce, Reuse or Recycle?

REDUCING

Reducing means you stop waste before it starts. Reducing is the most preferred method of waste management and it protects the environment. The absolutely best way to reduce waste is to stop using products that are not durable, reusable, or repairable. A waste-free lunch packed in a reusable container is a way. Consider the environmental impact of each product before you buy it.



Avoid disposables. It's wasteful to only use something once and throw it away. Instead, use cloth diapers, cloth napkins, real towels and handkerchiefs; rechargeable batteries, reusable plates, glasses and cutlery silverware instead of one-time use products.

The environmental benefits of reducing waste include:

- Conserving space in our landfills and **reducing** the need to build more landfills which take up valuable space and are a source of air and water pollution.
- less use of natural resources.
- lower CO₂ emissions from producing, transporting and using materials and recycling or disposing of the waste materials.

REUSE (REPURPOSING)

Reusing or repurposing an item involves using it multiple times without changing its form. It may be put to its original use or a creative reuse, in which the items are utilized to serve a different function.

Benefits of repurposing or reusing

- Allows products to be used to their fullest extent
- Reduces the amount of waste that will need to be recycled or sent to landfills and incinerators
- Prevents pollution caused by reducing the need to harvest new raw materials
- Saves money by reducing the need for you to purchase additional items.
- It is an eco-friendly technique of saving money, time, energy and resources. Further, when we reuse something, it adds to its function and also lengthens the product's life.



RECYCLING

Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products.

Benefits of Recycling

- Reduces the amount of waste sent to landfills which reduces emissions of methane, a powerful greenhouse gas.
- Reduces the amount of waste sent to incinerators
- Conserves natural resources such as timber, water and minerals, reducing the need to consume natural resources which will help to protect natural habitats for the future.
- Reduces the need for extracting, refining and processing raw materials all of which create air and water pollution.
- Prevents pollution by reducing the need to collect new raw materials



COMPOSTING

Compost is organic material (food scraps and yard waste) that can be added to soil to help plants grow.

Benefits of Composting

- Enriches soil, helping retain moisture and suppress plant diseases and pests.
- Reduces the need for chemical fertilizers.
- Encourages the production of beneficial bacteria and fungi that break down organic matter to create humus, a rich nutrient-filled material.
- Reduces methane emissions from landfills and lowers your carbon footprint.
- Saves energy -Using recycled materials in the manufacturing process uses considerably less energy.



Mini Lab -Recycled paper

Materials:

- Scrap paper (notebook paper, printer paper, construction paper, newspaper, etc.)
- Container— Large bowl or bucket of warm water.
- Blender (If one is not available, a fork may be used instead)
- Paper towels
- Cake pan or cookie sheet
- Screen
- Scissors (not required—Used to cut up scrap paper)
- Hole Punch (not required—Used to punch scrap paper into small pieces)

Procedure:

1. Tear, cut or punch the scrap paper into small pieces (Fig 1 & 2—the smaller the better) and place them in the container.



Figure 1



Figure 2

2. Fill the container with warm water (Fig 3—as hot as safe to use). You should eventually have about two-parts paper, one-part water.



Figure 3

3. Mix with your hands, a blender or a fork until the paper break down into fibers and forms a pulp (Fig 4 & 5).



Figure 4



Figure 5

4. Place the screen into the cake pan.
5. Pour the pulp into the screen on top of the cake pan.
6. Lift the screen straight up over the pan and allow the screen to drip.
7. When it stops dripping, the screen should be covered in paper pulp.

8. Now place the screen horizontally on a flat surface.
9. Fold paper towels and place them on top of the screen. Carefully blot the pulp with the paper towels so excess water is absorbed.
10. Remove the paper towels and place the screen in a safe place so the paper fibers have a chance to dry overnight (Fig 6).

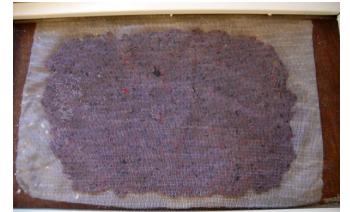


Figure 6

8. After the pulp has dried carefully lift it off the screen and observe what you have made. (Fig 7, You may want to cut it so can observe its properties.)



Figure 7

Try This:

- Use cookie cutters to make unique shapes with the pulp.
- Shape the pulp like clay to make art.
- Decorate the pulp as it is drying so the finished product is fancy paper.



Observation:

- Did the paper break down very easy into pulp?
- Did the material left behind on the screen look like paper?
- Did the material act like paper?

Conclusion:

- Would it be possible for your school to reduce the amount of new paper it uses every day?
- What other uses could recycled paper be used for?
- How could you refine the procedure to produce a greater amount of recycled paper?

Mini Lab - Reclaimed Art

Materials:

- Any clean materials that would have been thrown away.
- Scissors
- Glue
- Pencil
- String

Procedure:

Recycled paper beaded necklace

- Use colorful gloss printed paper from magazines



Figure 1

- Cut into triangle shapes as long as the page is tall (FIG 1) The width of the bottom of your triangle determines the size of your bead.
- Put glue in the last half of the triangle toward the point
- Place a pencil on the bottom flat edge of the triangle
- Begin rolling the triangle around the pencil until you have run out of triangle (you have just made your first bead)
- Make as many beads as you wish the size you prefer.
- String the beads to create the necklace or a bracelet.

Other Art projects

- Combine the recycled materials to create an art project of your design

Result:

- Display your artwork proudly
- Post a picture of your creation
- Give your artwork to someone to cheer them up

What did you Make?

Post a picture of your artwork by tagging us at James E. Richmond Science Center on Facebook and Twitter.

