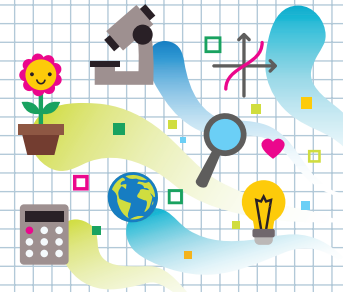




HEADS IN, HEARTS IN

Filter Fun

Instructions for Set-Up



Supplies

- “Guide for Families” handout
- Clear plastic standup display (optional)
- “Engineering Process” handout (1 per participant or family)
- 3–5 clear 2-liter plastic bottles, empty and clean, bottle caps removed
- Utility knife
- Large bucket of dirty water (create your own using leaves, dirt, cooking oil or other things or get dirty water from a ditch, puddle, pond, brightly colored flavored drink mix or other sources)
- Pitcher or measuring cup with a spout
- 3–5 different filtering materials, such as sand, gravel, potting soil, wood chips, shredded paper, kitty litter, paper towel, and other materials
- Coffee filters (1 per filtering bottle)
- 5-gallon bucket
- Paper
- Pencils
- Display table

Activity Preparation

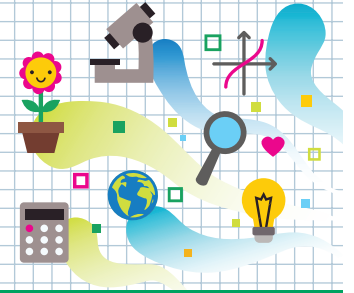
- ▶ Purchase or locate items on supply list.
- ▶ Print one copy of the “Guide for Families” handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- ▶ Print one “Engineering Process” handout per participant or family. Optionally, print and laminate a few to leave on the table.
- ▶ Using a utility knife, prepare the 2-liter bottles by cutting 1/3 of the bottle off of the top. Flip the cut top over and place it inside of the bottom of the bottle. This “filter bottle” should look like a funnel.
- ▶ Set up the display table and arrange needed supplies. (Participants will use the pitcher or measuring cup with a spout to pour the dirty water. The 5-gallon bucket will be used for discarded water and filtering materials.)





HEADS IN, HEARTS IN

Filter Fun Guide for Families



Learning Objectives

What you need to know:

Engineering is a process used to solve problems by designing, building and testing things. An engineer is a person who uses math and science to create new things, solve problems or make things better.

If water is clear, it doesn't mean it's safe to drink. Many **pollutants** (something that makes it unclean) in water are dissolved and are invisible, such as harmful bacteria or certain poisons. When water looks dirty, it is usually because **particulates**, or tiny bits of soil or other material, are **suspended** (hanging, not sinking) in the water. Filters can remove these particulates, even though removing them does not make the water safe to drink.

What you will do and learn:

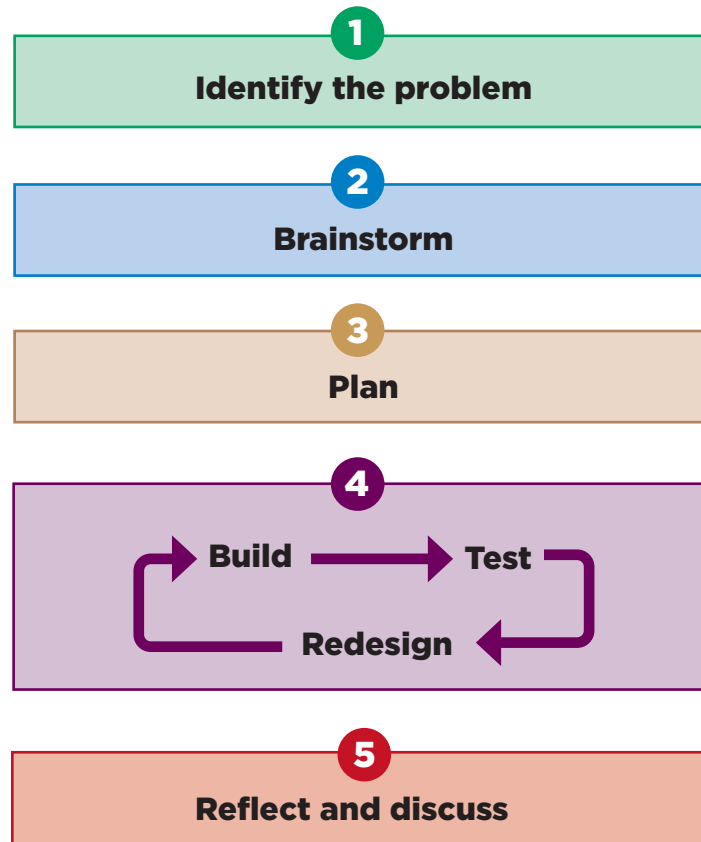
In this activity, you will practice using the engineering process to discover which filtering materials help make water clear. The goal of this activity is to build a filter, which will make the water clear.

Instructions

1. Using the "Engineering Process" handout, start to consider which materials will work best to filter the dirty water.
2. Identify the problem: How do you create a filter that will make the water clear?
3. Brainstorm: How can you use common materials to filter water? What kind of materials will allow water through but not the particulates that make the water look dirty? Should you use one filtering material at a time? Should you combine filtering materials? What happens if you layer the filtering materials?
4. Plan: Make a drawing or sketch of your design. Gather your filter bottle, coffee filters (one for each filter bottle) and filtering materials. Place your chosen filtering materials inside the top of each filter bottle.
5. Test: Using the pitcher or measuring cup with a spout, pour the dirty water over the filtering material of the first filtering bottle. Did the filter make the water clear?
6. Redesign: Build another filter bottle, making some changes to your design to improve your ability to filter water. Try some of the ideas you came up with during your brainstorming.
7. Repeat steps 5 and 6 as many times as needed.
8. Use the 5-gallon bucket for gathering water and filtering materials for disposal. *Do not discard water and materials in a sink.*
9. Reflect and Discuss: What might happen if you pick a different material or use a different way to filter water? Were you able to make the water clearer? What filtering materials worked best? Although this doesn't make water safe to drink, what do you think might be used to make water safe for drinking? What filtering materials could you use instead of the materials provided today? How would it have been different with different materials? How does this process happen in nature?

Engineering Process Handout

Engineering Process



- 1. Identify the problem:** Engineering is about identifying problems and designing solutions. As you go through these activities, think of the goal you are trying to achieve.
- 2. Brainstorm:** What are the many different ways I could solve this problem? What are the potential advantages and disadvantages of different ideas? What things do I need to think about to make that solution successful?
- 3. Plan:** What are the different ways I can solve this problem or make the build? What steps can I take to try out my solution? What do I need to do to prepare my build? What might happen if I choose that solution? During your design phase, you might discover new problems that you need to brainstorm.
- 4. Build:** Construct and carry out the design. As you build your design, you might come up with more problems that you need to brainstorm and design new ideas for.
Test: How does my solution work? Does it solve the problem? Is it effective? Are there additional problems?
Redesign: How can I improve my design? What can I try to make my solution work better?
- 5. Reflect and Discuss:** How did the solution turn out? What could I do differently next time? How would my design be different if I had different materials?