

ACTIVITY 2: BUILD A WATER FILTER

This activity introduces students to the basic process of water filtration—using gravity filtration—to help them develop a model for what happens at the municipal level with water treatment. They will construct a simple filter in a plastic water bottle and use it to filter two kinds of "polluted" water: water with **insoluble** "pollutants" and water with **soluble** "pollutants." A discussion of soluble/insoluble may be of benefit prior to beginning this lab, especially if those terms are unfamiliar.

Materials*:

- plastic bottle (20oz) - rinsed, empty
- gravel
- sand (coarse grain and fine grain)
- 6-8 cotton balls
- 1 rubber band
- 1 coffee filter paper
- Scissors
- Plastic spoon
- "polluted" water (dirt, food dye, etc.)

Procedure:

1. Students should cut the water bottle about $\frac{1}{3}$ of the way up from the bottom to yield two pieces. The longer piece should have the neck of the bottle and be able to sit nested inside of the shorter piece, which will be the collection container.
2. Remove the cap of the water bottle and secure the coffee filter over the cap using the rubber band. Cut the filter paper, if necessary, to fit best.
3. Then proceed to add the filtering materials in order from finest to coarsest: first cotton swabs, then fine sand, next course sand, and last gravel.
4. Place the mouth-end of the water bottle into the smaller cut section to hold the filtered water when it drips out the end of the filter.
5. Pour some of the "polluted" water into the filter and observe what happens as it runs through. Repeat for both the soluble and insoluble types.
6. Observe differences in the **filtrate** (what comes out of the filter) in each run through of your filter between the soluble and insoluble "pollutants."

**Materials can be pre-made into kits by measuring 4-5 spoonfuls of each material into separate sandwich bags, and putting those with the other materials into a brown paper bag.*

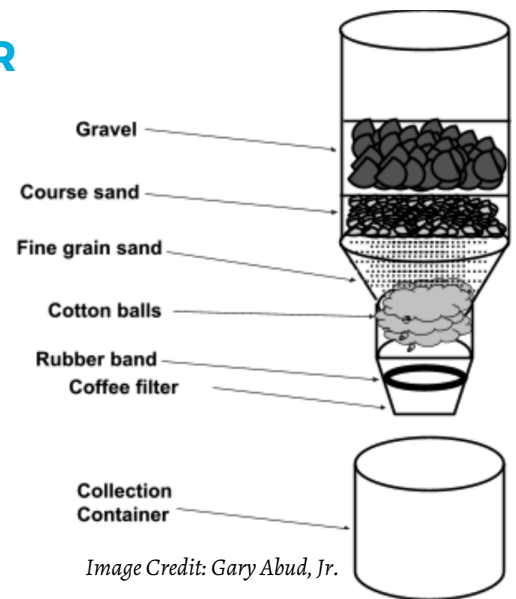


Image Credit: Gary Abud, Jr.

Optional Variation to This Lab:

This lab can also be done as a design challenge to help students appreciate the economic factors involved with water filtration. To do so, the teacher would assign an arbitrary value to a unit amount of each filtration material (e.g., 1oz of coarse gravel = \$500) and give students either a) a budget to work within to produce their water filter, or b) the challenge to build the best filter for the lowest cost. Students would keep track of the amounts of each material, and might even test some of the materials first to determine which of the—and how much of each of the—materials they want to use in designing their filter. Then, when they test their filters, they should present their budgets alongside their design and report the results connected to the cost.

Debrief the Water Filter Lab:

After students finish filtering their water, have the class share some observations from the lab aloud and then engage the class in a post-lab discussion using the following prompts to get the discussion started:

- Which type of water filtered better?
- How did filtration differ with each pollutant?
- How does our model water filter compare to the water filtration that a city has to do with source water?
- What considerations do you think cities need to take into account as they design and build water treatment facilities to clean the water that goes to residents?