

Filtering Water

LESSON SUMMARY

In this activity students will engineer a water filter from given materials.

LESSON OBJECTIVE(S)

- Students will describe the effects humans have on drinking water.
- Students will use the engineering design process to design water filter prototypes.
- Students will build and evaluate multiple water filters.

FOCUS QUESTION

How do people clean water to make it drinkable?

LEARNING TARGET (I CAN STATEMENT)

I can engineer a filter to clean water.

STANDARDS ADDRESSED

AR: 6-ESS3-3

MS: L.7.3.5

TN: 6.LS4.2/6.ETS1.2

MATERIALS

- 2-liter plastic bottle (ask students to bring empty bottles from home or get from local recycling center near you)
- 3-inch square of mesh, such as nylon screen or cheesecloth
- 1 rubber band
- Filter materials:
 - Coffee Filters
 - Cotton Balls
 - Paper Towels
 - Sand
 - Gravel
 - Activated Charcoal
 - Soil
- Measuring cup or cup to hold polluted water
- Test tubes or clear cups for each trial cleaned water
- 2 large jugs/jars, ~1 gallon size "Polluted Water"
- Student Worksheet

PROCEDURES

1. Prepare "polluted water" This can be a mixture of your discretion. Suggestions include green food coloring, grass clippings, soil, dish soap, vinegar, pepper, bits of paper.
2. Prepare 2-liter plastic bottles by cut in half horizontally. Place a square of mesh over the bottle opening and secure it with the rubber band.
3. Divide class into groups (3 -4 max)
4. Each group should have a prepared 2-liter bottle, a supply of filter materials, test tubes or clear cups, measuring cup with polluted water.



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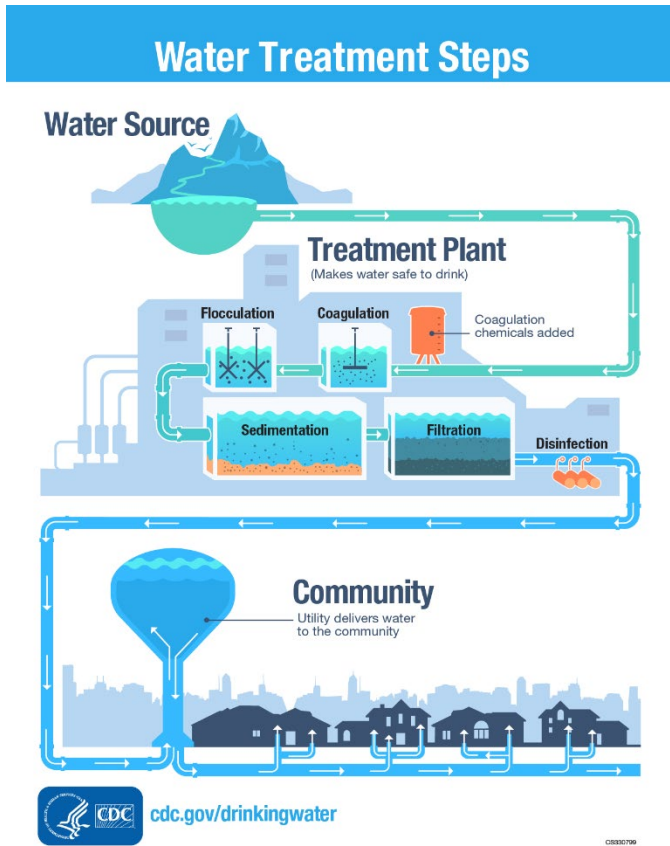
Filtering Water

5. Tell students though the Metro Memphis area gets their water from an aquifer, not everyone gets their water from the ground. Many places get their water from rivers or lakes like St. Louis, New Orleans, Atlanta, Los Angeles for example. Think about how the Mississippi River looks. Would you want to drink water like that? Neither do the people who live in St Louis or New Orleans. When you get your water from the surface you must filter it as part of the process to cleaning it to make it drinkable. Today you are going to engineer a water filter. This link can help you when describing the steps in water treatment plants
https://www.cdc.gov/healthywater/drinking/public/water_treatment.html
6. Hand out supplies to groups. This is an activity where students are not following steps but trying to engineer a solution. The teacher's role is to help facilitate. The first part students are testing each filter type individually. Once they have observed each material's abilities, they will work together to develop their prototype.

CLOSURE

Have students discuss which of their prototypes worked best. Have them discuss each group's best prototype (similarities/differences)

Water Filters



Background

Some places use waters from the ground called an aquifer, but 70% of drinking water in the United States comes from surface water sources like rivers and lakes (USGS). Before the water from lakes and rivers can be used as drinking water, it needs to be treated. Public water systems (PWS) often use a series of water treatment steps that include coagulation, flocculation, sedimentation, filtration, and disinfection. In this activity you will build water filter prototypes to discover the best water filter.

Materials

Filter Frame

Filter materials:

- Coffee Filters
- Cotton Balls
- Paper Towels
- Sand
- Gravel
- Activated Charcoal
- Soil

Measuring cup or cup of polluted water

Test tubes or clear cups for each trials cleaned water

Procedure

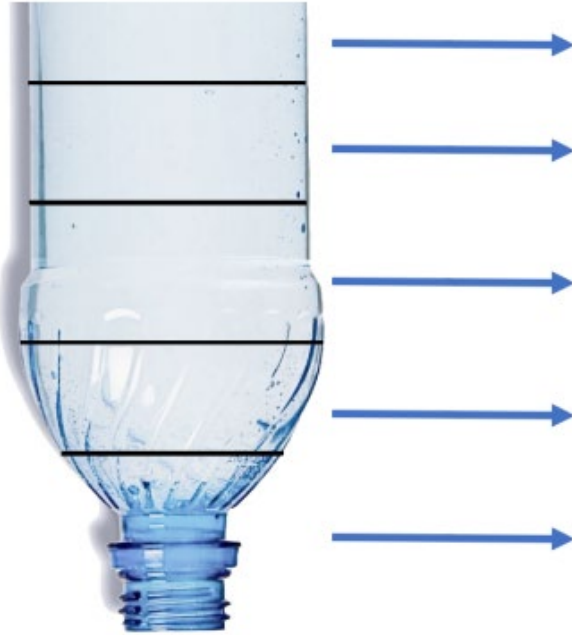
1. Before you can build a prototype, you need to see the filtering capabilities of each material. Decide how much water you will use for the test and test each material individually in filter frame. Use the table to record your observations, such as how long it took to filter, how the water looked after filtered.

Material	Observations
Coffee Filter	
Cotton Balls	
Paper Towels	
Sand	
Gravel	
Activated Coal	
Soil	

Name: _____ Period: _____

2. Now that you have each material's filtering abilities, discuss in your group which materials you want to use and what order. Draw and label your first prototype below.

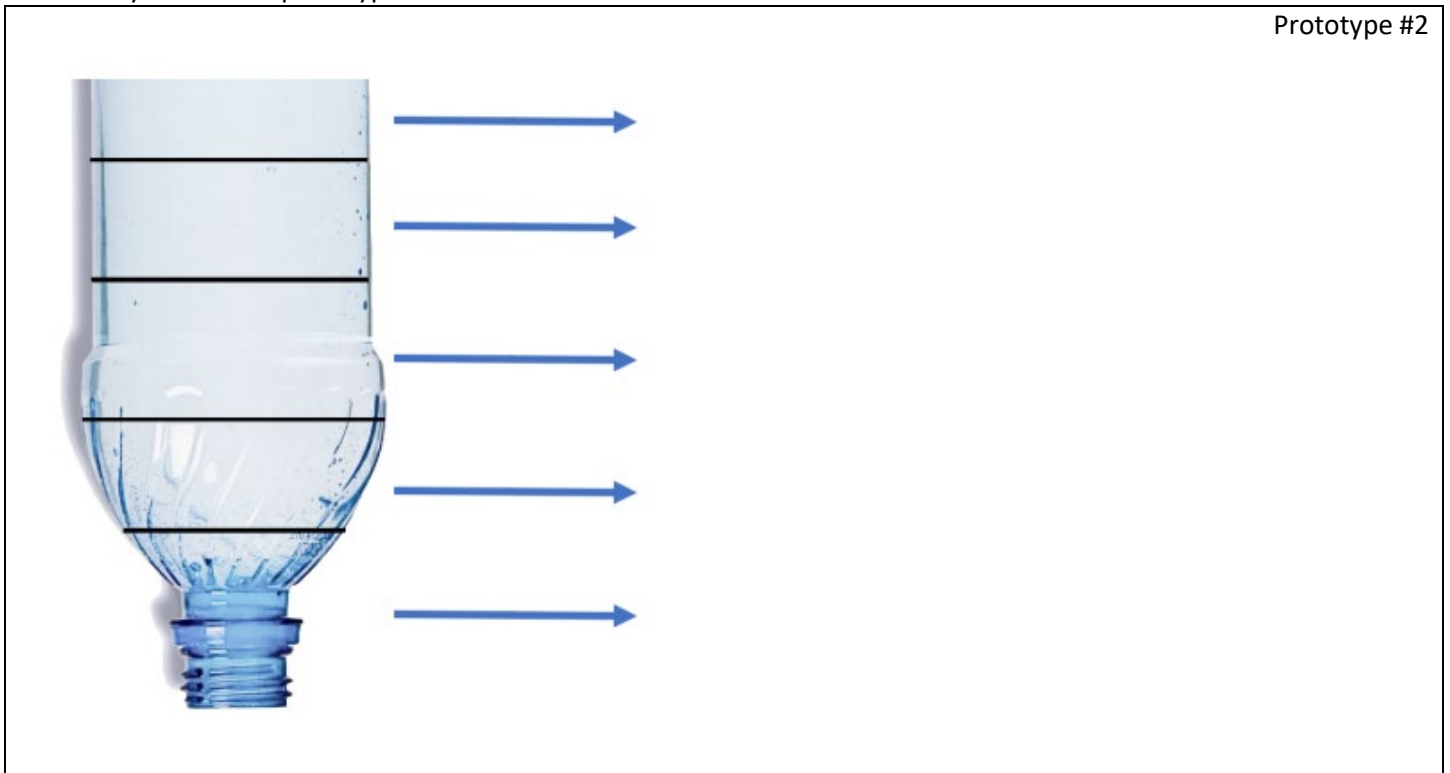
Prototype #1



3. Decide the amount of water you will use for each prototype. Test your prototype and record your observations below.

Name: _____ Period: _____

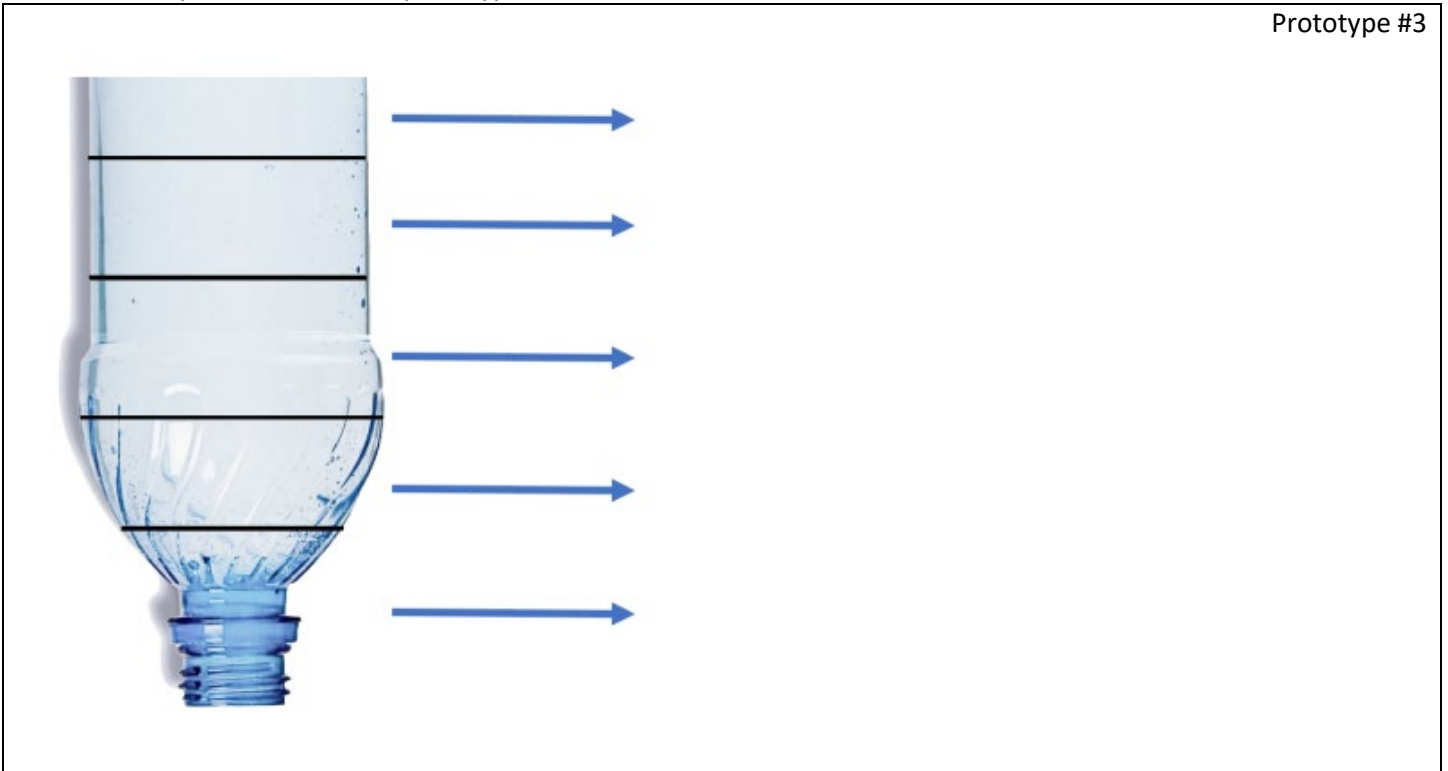
4. Discuss your observations in your group. Decide which material and what order for your next prototype. Draw and label your second prototype below.



5. Test your prototype and record your observations below.

Name: _____ Period: _____

6. Discuss your observations with your group. Decide which material and what order for your next prototype. Draw and label your third and last prototype below.



7. Test your prototype and record your observations below.

Name: _____ Period: _____

Questions

Which of your prototypes worked best?

Why do you think it performed the best?

Is your best prototype's water cleaned enough to drink? Defend your answer.