

September 2020

## Science: Fabulous Water Filter!

**Ages: 7 - 13**

Hello everyone. This is Bill from the Okanagan Regional Library System. Welcome to the fun and inventive world of making STEAM projects in your own home. Each month, I will share a fun and interesting project that you can make using materials commonly found in your own home.

Even though we can't be together right now, we can still learn how to make exciting projects each week!

This month's project: How to Make Clean Water using Your Fabulous Water Filter.

### Water Filter



Imagine having a drink of water from rivers, lakes or ponds – like lots of people in the world do – instead of turning on a faucet or opening a bottle to get pure clean water. You would have to find a way of removing mud and other unpleasant substances mixed in the water before quenching your thirst. In this experiment, you will make a simple water-filtering device using a plastic bottle. Watch dirty water become cleaner before your very eyes.

Water coming straight from natural sources often carries impurities that can make you ill if you drink them. You can easily remove leaves and twigs, and dead bugs floating on the surface. Yet, mixed up in dirty water there are millions of smaller particles, some of which carry bacteria and viruses that you simply can't see. How do you get rid of those? The answer is, you have to make a trap to catch them.

## Materials Needed:

- Charcoal
- Sand
- Small, clean stones
- Small gravel
- Medium sized gravel
- Garden Soil
- Plastic bottle
- Pitcher of Water
- Scissors
- Spoon
- Cotton Balls
- Leaves and grass



**Time:** 30 minutes

Making a water filter is just the first part of this experiment. You will also be making your own dirty water to test it. The materials you need are not hard to get, but you might need help to find some of them. Even though the completed filter does a pretty good job, the water that passes through it still will not be clean enough to drink. So just pour it away afterwards.

## Steps:

1. First, cut all around the bottle with scissors, just about half way up. If you find this tricky, ask an adult to do it for you. The top part is going to be the filter. The bottom part makes a holder for the top and collects the filtered water.



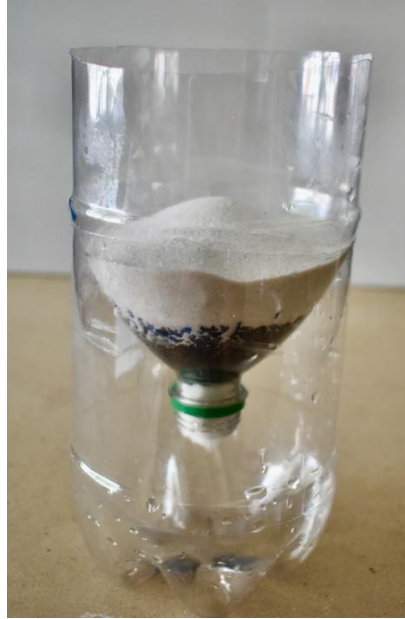
2. If your bottle has a cap, remove it. Tightly pack the cotton balls into the mouth of the bottle. These will trap very small pieces of dirt floating in the water.



3. Put the top part of the bottle upside down into the bottom part of the bottle. Add a layer of charcoal on top of the cotton balls. If your charcoal is in bigger chunks, crush it first to break it into smaller pieces.



4. Add sand about 2 cm deep. Press it hard with your fingertips to push down the sand and the charcoal beneath it. These packed layers will slow down the water flow, trapping lots of dirt.



5. Next, add a 1 cm layer of the small gravel. On top of that, add a 2 cm layer of medium-sized gravel. You must pack these two layers as firmly as you can, just as you did with the sand and the charcoal.



6. Finally, add the small pebbles. Make sure you completely cover the top of the gravel. See how the gaps between the particles of each layer have grown bigger and bigger toward the top. Now that your water filter is ready to put to work, you need to make some dirty water.



7. Fill the pitcher with water and add as much of the soil as you would like. Stir it up with a spoon so that the soil mixes in thoroughly. The smallest pieces of soil will be “suspended” – left floating – in the water. Some parts will dissolve.



8. Drop in a few leaves and blades of grass. Your water is now well and truly dirty. It contains particles of many different sizes and various dissolved substances. Many of these might make you ill if you drink the water.



9. Slowly pour some dirty water onto the pebbles at the top of your filter. Hold the filter steady to make sure it does not topple over. Watch as the water trickles through the layers, and emerges much cleaner as the bottom.



## The Science behind your Water Filter

Water always finds a path through the pieces of stone, gravel, sand, charcoal and cotton balls. But the gaps or pores, trap particles that are suspended in the water. As the pores get smaller in each layer, particles are trapped throughout the filter, rather than all in one layer, which would quickly get clogged up. The charcoal removes some of the dissolved substances from the water, purifying the water in a process called adsorption.

## Real World Science – Life-Saving Water Filtration Straw



After a disaster like an earthquake or flood, it may be impossible to find clean water. The LifeStraw is a filter that allows people to drink, directly from any source of water, however dirty. Packed with tiny fibers, the straw's pores trap tiny organisms that could otherwise cause illness.

## STEAM

This activity includes everything you need for a comprehensive STEAM project.

**Science:** Understanding how water filtration works.

**Technology:** Understanding how water filtration systems can be built to save lives.

**Engineering and Art:** Construction of the water filter.

**Math:** Measuring and cutting out the parts needed to construct your water filter.