Clean It Up!

OBJECT

Students explore how filtration systems work.

GRADE LEVEL

Elementary through middle school

MATERIALS *(for each team):*

- 2 cups of gravel
- 2 cups of sand
- ½ cup of activated charcoal, rinsed
- Sponge
- Coffee filter
- Paper clip
- Drinking straw
- Cotton balls
- 2-liter plastic soft drink bottle, cut in half
- Rubber band
- Tape (electrical or duct)
- Pantyhose
- Modeling clay or plumber's putty
- Scissors
- Yarn, 12" long

For the group: One large bucket filled with water and small amounts of these **Contamination Materials:** food coloring, soy sauce, raisins or dry beans, potting soil, baking soda, paper plate torn into small pieces

DISCUSSION

Each team will need one 2-liter soft drink bottle, cut in half. Remove the screw-on cap and discard it. Take the top portion of the bottle and turn it upside down and place it in the bottom portion. The filter will be built inside the inverted, top portion of the bottle. The base portion will act as a reservoir and collect the water that runs out of the filter.

Ask one or two students to help you mix the contamination liquid that will be poured through the students' filters. Add the "contamination materials" to the water in the bucket. The food coloring represents chemicals, the raisins represent animal and human waste, the potting soil represents earth, the baking soda represents road salt, the soy sauce represents motor oil, and the torn paper plate represents litter.

ACTIVITY

Divide the class into small teams of 2-3 students per group. Provide each team with the filter materials and explain to them that they have been charged with the mission to design the most efficient water filtration system possible with the materials supplied. The teams may only use eight items, not counting the soft drink bottle, to construct their filtration device. Grant them fifteen minutes to discuss, design and construct their filter.

At the end of the fifteen minutes, have each team share with the group which materials they chose to use and why they decided to use each item. Then pour the "contaminated" water on to the top of each of the filtration systems. This part can be messy, so it's best to move outside. The team that has the clearest, most debris-free water in its collection base is declared the winner.

Compare and contrast the outcomes of each team's filtration system. Ask each team what they would change if they could re-build their filtration system.

CONNECT TO ENGINEERING

It takes a lot of work to make that clean, clear drinking water that comes out of the tap. Imagine what it takes to bring clean water to a remote village. Every day, people in developing or remote areas struggle to gain access to clean water. Engineers for a Sustainable World, Engineers without Borders, and similar organizations engage engineers and engineering students in projects around the world to make a difference in people's lives.

Water purification activity, courtesy Craig Just, University of Iowa, is from the DVD Discover Engineering. *See www.discoverengineering.org,* a project of the National Engineers Week Foundation.