Giving Water the Treatment

Objective:
Participants will be able to filter contaminated water using a variety of materials.

Materials:
- Foam Cup
- Clear Plastic Cups
- Paper Towel
- Alum (Available From Drugstore)
- Yellow Food Coloring to Simulate Chlorine
- Dirt
- Control Cup
- Access to Water
- Sand
- Gravel
- Bowl

Procedures:
1. In a plastic cup, mix 5 mL dirt and then 200 mL of tap water. Stir well. Label cup 1
2. Repeat step 1 with a second plastic cup. Label this cup “control” and set it aside.
3. Using an empty cup, aerate the water in cup 1 by pouring it back and forth into the empty cup several times to release trapped gases. See diagram 1.
4. Note the result.
5. Add 2.5 mL alum to the water.
6. Let the mixture stand for 10–15 minutes. Note the result.
7. To create a “filter,” use a sharp pencil to poke ten small holes in the bottom of the foam cup.
8. Put a layer of gravel in the bottom of the foam cup.
9. Add a layer of sand on top of the gravel.
10. Hold the filter cup above a clean bowl.
11. Carefully pour the water from cup 1 into the filter cup, leaving behind the sediment at the bottom.
12. Observe what happens to the particles as they pass through the sand and gravel.
13. A small amount of disinfectant is added at this final stage to kill remaining bacteria and other microorganisms. Add 2 drops of food coloring to the water to represent this step.

POSSIBLE INTERACTIVE QUESTIONS:
• Why do we need water treatment plants?
• What is the purpose of adding the alum to the water?
• Why should chlorine be added to the water at the end of the process?
• What can you learn about the water cycle from this activity?

WHAT HAPPENED?
A water company goes through several steps to ensure safe and pure drinking water for the community. The water that has been processed typically goes through the following steps:
1. Aeration – water is sprayed into the air to release trapped gases and to absorb additional oxygen.
2. Coagulation – powdered alum is dissolved in the water, forming sticky particles called floc, which attach to suspended dirt particles in the water.
3. Sedimentation – the heavy particles of floc settle to the bottom of the tank, and the clear water above is skimmed from the top and sent on to the next step.
4. Filtration – as the clear water passes through layers of sand, gravel, and charcoal, small particles are removed.
5. Chlorination – a small amount of chlorine gas is added to kill any bacteria or microorganisms that may be in the water.