Water Filtration and Appropriate Technology

**Overview**
This lesson is an excellent complement to the lesson on Water Treatment. Students review the multi-barrier approach from the water treatment lesson, and then learn how to build their own water filter.

**Background Knowledge:**
Prior to this lesson students should also have participated in the lessons: *Tikho’s Story Parts 1, 2 and 3* and *Water Treatment*.

They should also have a basic understanding of the following concepts:
- Safe water
- Water contamination
- What happens when people drink unsafe water
- The multi-barrier approach (taught in the lesson on Water Treatment)

Educators may want to review the multi-barrier approach info sheet (taught in the lesson on Water Treatment).

**Time Required:** 2 hours

**Grade Level:** Grades 5 and 6

**Subject Area:** Science, Language Arts, Social Studies

**Key Words:** Source Water Protection, Sedimentation, Filtration, Disinfection, Safe Storage

**Alberta Curriculum Links:** See curriculum connections table
Lesson Plan: Water Filtration & Appropriate Technology

**Learning Expectations**

1. Review the five barriers of the multi-barrier approach and how they work to make water safe to drink.
2. Build a basic water filter.
3. Discuss how appropriate technologies can be used to meet people’s basic needs.

**Materials**

- Multi-barrier approach pictures (see end of lesson plan for pictures)
- Optional: LCD Projector to project pictures
- Filter Materials (you will need one set of filter materials for each team)
  - 2 cups of gravel
  - 2 cups of sand
  - ½ cup of activated charcoal, rinsed (available at aquarium supply stores)
  - Sponge
  - Coffee filter
  - Paper clip
  - Drinking straw
  - Cotton ball
  - 2-liter pop bottle, cut in half
  - Rubber band
  - Tape (electrical or duct)
  - Panty-hose
  - Modeling clay or plumbers putty
  - Scissors
  - Yarn, 12” long

- Contamination Materials
  - Large bucket filled with water and the following items:
    - Food coloring, about 6-8 drops
    - Raisins or dried beans, about 1/2 cup
    - Soil, about 1/2 cup
    - Baking soda, about 3 tablespoons
    - A paper plate, torn into small pieces
    - A handful of natural items like sticks, twigs, leaves, grass, pinecones, etc.

**Preparation**

- Review the multi-barrier info sheet from the water treatment lesson.
- Download and print the lesson Take the Filter Challenge from the Ground Water Foundation.
Print and laminate pictures of multi-barrier approach (see below) or prepare LCD projector to project them.

Cut 1 pop bottle in half for each group of 3 to 4 students.

Set out filter construction materials.

Prepare contaminated water with contamination materials.

Create a clear space in room or find a space outside where student can run around safely without knocking into things.

Introduction 20 minutes

1. Bring out the pictures of the multi-barrier approach that students used during the lesson on Water Treatment.
2. Ask student to name what barriers go with which picture, and to put the pictures in order.
3. Review the purpose and importance of each step in the multi-barrier approach.
4. Explain that today students are going to look closely at one step of the multi-barrier approach: filtration, and learn how to design their own filters.

Constructing a Filter 40 min

1. Divide students into teams of three or four.
2. Each team will need one 2-liter pop bottle, cut in half. The top portion of the bottle should be turned upside, and fit inside the bottom portion. The inverted side of the bottle will hold the filter materials, and the base will act as a reservoir for the water running from the filter.
3. Explain that each team has 30 minutes to construct a filter using the materials provided. They can use up to 8 materials not including the pop bottle. At the end of this time there will be a competition to see what groups filter works best.

   Note: Follow the lesson plan Take the Filter Challenge from the Ground Water Foundation, for more details on how the filter can be built.
4. At the end of 30 minutes pour the contaminated water through each filter to see which one cleans the water most effectively. The team with the clearest filtered water wins.

Analyze the Results 15 min

1. Ask the winning group to share their filter design.
2. In their groups ask students to consider what about the other groups design made their filter more effective.
3. Ask them to discuss how they would adjust their design to improve it.
4. **Optional:** if you have time, ask students to adjust their designs accordingly and retest to see if they can improve their results.

**Consider applications**

25 min

1. As a whole group, discuss what applications students could see for the filter in Canada or communities that they have studied overseas.

2. Ask students for examples of simple technologies that have improved people’s lives.

3. Provide example of appropriate technologies. You can use the Biosand Filter as an option.

4. Discuss what role science and engineering could take in innovating appropriate technologies.

**Review**

20 min

1. Ask students to make a drawing of their filter in their journal and write an entry on what they could do differently if they could build it again.

**Extension**

Have students to research on simple technologies that have had an enormous impact on people’s lives.

**Reference**

The filter activity from this lesson is taken from: The Ground Water Foundation:  