



## Science Unit: **Water Around Us**

### Lesson 2 ***Filtering Water***

School Year: 2015/2016

Developed for: Aboriginal Focus School, Vancouver School District

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Grade level: Presented to grades K and 2-5; appropriate for K-7 with age appropriate modifications

Duration of lesson: 1 hour

### Objectives

1. Understand what a filter does and how it works.
2. Test different materials for their ability to filter muddy water.
3. Learn that filtering is one step in the process of water treatment for safe human consumption.

### Background Information

Municipalities clean our water so that is safe to drink using these steps: aeration, coagulation, sedimentation, filtration, then disinfection. Filtering removes particulate matter including rock particles and microorganisms, and includes filtering through beds of sand. This activity tries filtering with sand as well as other materials to assess their effectiveness at cleaning muddy water.

### Vocabulary

Filtering Separating suspended solid matter from a liquid, by passing the liquid through the tiny holes of a filter material. The small particles become trapped in the filter while the liquid passes through.

### Materials

- 500ml recycled water bottles, cut in half (one per student, or student pair)
- tubs of muddy water: 1 cup soil in 1 litre water (one per table group)
- bucket for collecting used filter contents (do not put sand down a sink)
- panty hose/nylons cut into 5x5cm squares (one per bottle)
- scoops for dispensing muddy water, also sand and gravel
- filter materials e.g. coffee filters, kleenex, cotton balls, washed aquarium sand, washed aquarium gravel, wood shavings, washed moss balls...
- small elastic bands (one per bottle)
- wash bottles of water (one per table group)



## In the Classroom

### Introductory Discussion

1. Discuss with students the need for filtering water by asking whether muddy water is good for drinking. Explain that the City filters our water to make it safe for drinking. Tell students that they will be testing different materials to find out how well they can clean muddy water.
2. **Processes of science** that the students will focus on: exploration, curiosity, mechanical manipulation, close observation, designing experiments, collecting data, classifying and comparing data, recording results, inferring, hypothesis testing, concluding, predicting.

### Science Activity:

#### Activity Title: Filtering Water

Purpose of Activity: To demonstrate what materials are effective at filtering muddy water

Set-up prior to experiment:

Prepare the filter units:

1. Cut the recycled water bottles in half
2. Securing a square of nylon over the spout of the **upper half** of the water bottle with an elastic band. Students will back this half with filter materials.
3. Invert the spout and nest into the bottom half of the water bottle, (as shown in the photo). The bottom half will collect the water after it passes through the filter materials and the nylon-covered spout.)
4. Students will work individually, but can team up to combine their water filter units.



#### Methods and Instructions:

1. Show students how to add materials to a filter unit:
  - Place/pour materials into the top half of the filter unit
  - Make sure that they fill the width of the unit completely (without leaving gaps around the sides) so the water is forced to pass through the filter materials.
  - They will later pour a scoop of muddy water into the top of the filter.





2. Ask student to first test one filter material at a time:
  - give students some choice about which material they choose
  - encourage them to work together to ensure every material is tested
3. Using their worksheet to record and compare the colour of the water after it has been filtered by various filter material.
4. You should also include a “control” in which the filter unit has no material added (to assess how the colour changes when only passing through the nylon).
5. After trying individual materials in a filter, students can combine a number of materials in one filter unit. Alternatively, they can combine filter units to stack several top halves on one bottom (see photo). Free play will happen naturally, but encourage note-taking so that students can later report to the group what they found.
6. Students that need encouragement to explore could be asked “What if you repeat the same kind of filter material” or “What if you use filter materials that are all natural?” etc.

## Discussion

1. Discuss what students discovered.
  - Which filter material worked best on its own?
  - Which filter material worked least well?
  - Was it more effective to combine materials?
  - What other observations did students make?
2. Include information on how filters work: The particles are trapped in the tiny spaces between the filter material. The water flows through, along with anything that can fit through the spaces. Different materials have different sized spaces, so are effective at filtering different sized mud particles.
3. Optional: Connect to how water treatment plants filter our water: Filtration is just one step of many that our water treatment facilities use to clean our water. The sequence of steps are: 1. Aeration to remove gases from water 2. Coagulation to clump dirt particles together (as “floc”) 3. Sedimentation to allow floc to fall to bottom of settling beds 4. Filtration to remove remaining particles (several filters including sand/gravel to remove larger particles, then meshes to remove smaller particles). Finally, 5. Disinfection with chlorine to kill remaining pathogens.