Sparkling Clean Water

Image from NatureNorth.com

Specific Learning Outcomes

8-4-15: Explain how and why water may need to be treated for use by humans.
8-4-16: Compare the waste-water disposal system within their community to ones used elsewhere.
8-4-17: Identify substances that may pollute water, related environmental and societal impacts of pollution, and ways to reduce or eliminate effects of pollution.

General Learning Outcomes

8-0-1a: Formulate specific questions that lead to investigations.
8-0-4c: Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise.
8-0-4d: Assume various roles to achieve group goals.
8-0-5a: Make observations that are relevant to a specific question.
8-0-7g: Communicate methods, results, conclusions, and new knowledge in a variety of ways.
8-0-9c: Demonstrate confidence in their ability to carry out investigations.

Vocabulary

wetland, filtration, settling, chlorination, fluoridation, pollution

Summary

Students explore how our drinking water is treated and how difficult it is to get clean water. Students will conduct an experiment to filter water to get it clean.

Materials

- *Building a Water Filter Experiment*
- *Projector and computer to present slideshow*

Procedure

Warm Up

Filtration systems are important for providing safe drinking water. The simplest way to "filter" is to pass a mixture or solution (such as water and dirt or mud) through a porous material or system so that the solids are trapped and the fluid passes through. The size of the openings in the filtering materials -- even microscopic -- will determine how much of the particles will make it through.

Begin with the "Building a Water Filter Experiment". This will give students a better appreciation of the difficulty in cleaning water and then you can explore how cities do it.

A wetland is an area of land that holds shallow water, with a maximum depth of two metres. The water makes the soil very moist, so plants who need moist soils will grow in and around the water; this is why a wetland can not be deeper then two metres, because otherwise these kinds of plants drown and do not receive enough sunlight. The water moves slowly because there are so many plants that slow the water down, absorbing some of the water like a sponge and filtering it as it moves through.

Water treatment is any process that improves the quality of water to make it more acceptable for a specific end-use. The end use may be drinking, industrial water supply, irrigation, river flow maintenance, water recreation or many other uses, including being safely returned to the environment.

Wastewater treatment is a process used to remove contaminants from wastewater or sewage and convert it into an effluent that can be returned to the water cycle with minimum impact on the environment, or directly reused.

Activity

The slideshow discusses where the city of Winnipeg gets its drinking water and how it is treated. It also discusses how Winnipeg's wastewater is treated. And finally, it discusses the role of wetlands in cleaning water and treating wastewater.

Wrap Up

Discuss with your class how what they observed during their experiment is similar to certain stages of how Winnipeg's water is treated. Discuss what additional steps were taken. Were any of these steps suggested by the students as part of the discussion after their experiment?

Conclude by reflecting on your visit to Oak Hammock Marsh Interpretive Centre and what role wetlands take in cleaning drinking water and wastewater.

Extension:

- *Could graph the results of the experiment. Filtration attempt 1, 2, etc. as students try different techniques.*
- *Explore how another community gets drinking water (e.g. groundwater).*
- *Explore a wastewater disposal system found in another community (e.g. lagoon system).*
- *Explore pollutant effects on aquatic ecosystems* (see page 18 of http://www.lsf-lst.ca/media/LSF_-_FLOW_-_ON_Grade_8_Water_Unit_Sample.pdf).

Building a Water Filter Experiment

Note: Stress that the "filtered" water, no matter how clear, is not suitable for drinking.

Materials

- Bowls or small basins
- Supply of "muddied water" which can be made by taking a quart of drinking water and adding two tablespoons of dirt. Can also add other pollutants (hole punched paper pieces, vegetable oil, sand, food colouring, etc.)

For each group of students:

- two cups of "muddied water"
- plastic or paper cups
- straws
- cardboard
- cotton balls
- sand
- aluminum foil
- rubber bands
- tape
- toothpicks
- paper towels
- plastic wrap
- aquarium or other small rocks
- cornmeal
- flour
- grass or charcoal, if available

Students work as a team to design and build a filtration system to remove as much dirt or sediment from the provided water sample, as possible. Suggest to teams that commercial filters often use many filtration stages or different layers of filters to achieve the desired results.

Student teams draw their plan for the filtration system, including a list of all materials they require. When construction is complete, students test their device using the muddy water sample provided. They record their observations.

Filtered water can be collected in small bowls or basins, and assessed on a scale such as:
Completely clear, about 25% of the "dirt" remains, about 50% of the "dirt" remains, about 75% of the "dirt" remains, no change from the original water.

Students should be encouraged to come up with their own criteria for assessing how clean the water is.

Discussion

Ask the students what they found. How easy was it to clean the water? Is the water drinkable? What other pollutants might be in the water? What else should be done to make it drinkable?

This investigation is adapted from pages 3-4 on this web site: Meredith Cargill, **Water Across The Curriculum**. *Teaching Green: The Middle Years*. pp. 102-106.