Activity: Water Filtration

GRADE LEVELS: 3-5

SUMMARY: One of our most valuable and often over looked resources is water. We can survive for a couple of weeks without food but only a few days without water. Having clean water to drink is a luxury. The water that comes out of our faucets does not always start off safe to drink. Most often it has visited a treatment plant prior to reaching our glass. Students will learn about the importance of water and the role it plays in our lives. Students will be exposed to what occurs each day so that they will have clean water.

LEVEL OF DIFFICULTY: [1 = Least Difficult: 5 = Most Difficult]
3

TIME REQUIRED: 1 hr

COST: $10 per class.

STANDARDS:

1.1 - Identify materials used to accomplish a design task based on a specific property, i.e., weight, strength, hardness, and flexibility.
2.1 – Identify a problem that reflects the need for shelter, storage, or convenience.
2.2 – Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.
2.3 – Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.

WHAT WILL THE STUDENTS LEARN?

Understanding of how filtration works
Creative design methods
Problem solving
Mathematics (multiplication) reinforcement
Teamwork to solve a challenge

BACKGROUND INFORMATION:

This is a great activity in regards to "real-life" engineering. Any materials you have in your classroom can be adapted as filtration materials.

Water from lakes and rivers often has contaminants that make it unfit for drinking. The water may contain dirt, rocks, and other objects that can be easily identified. Water may also contain bacteria and other microscopic organisms that cannot be seen easily. For these reasons, water that is delivered to one's home

must go through a water treatment process. This is a five-part process that consists of aeration, coagulation, sedimentation, filtration, and disinfection. This activity is only concerned with filtration, which will remove most but not all of the impurities from the water. Students should be advised that the filtered water is still unfit to drink.

Resources:

www.epa.gov/safewater - for more information on the water treatment process and drinking water standards.

www.cleanwaterservices.org – provides information on the water treatment process and has an interactive game

www.osmonics.com/library/library.htm - technology library with information on different types of filters and filtration processes

MATERIALS:

One liter of water with soil and sand in it until it is thin but relatively opaque
3 test tubes prepared with the water standards "A", "B", and "C" (C is only filtered through some grass, B is filtered though coffee filter, and A is filtered though 2 coffee filters with a paper towel in the middle)
Cotton Balls
Gauze squares
Tulle/Netting
Tissue
Paper Towels
Coffee Filters
Gravel (aquarium gravel works great)
Sand
3 test tubes per student
Test tube racks
Graduated cylinders

PREPARATION:

Make the liter of dirty water and the "A", "B", and "C" tubes beforehand.

DIRECTIONS:

1. Tell the students they have been hired by (Your last name) Water Supply. There has been a drought and there is little water for all the things you supply – people, animals, and plants. Tell them that they will each be given a sample of the dirty water they have remaining, and show them the tubes "A", "B", and "C". A is nearly ready for human use, B is nearly ready for animal use, and C is nearly ready to feed the plants. Remind them that no one must taste anything in the lab. They will be paid for their supply of filtered water: A gets $10 per ml, B gets $5 per ml, and C gets $1 per ml.
2. Put trays of materials in front of the students. Let them decide in teams what materials they would like to use to filter their water. Have them draw schematics

of the layers. Once completed, they can receive 25 ml of the dirty water and begin filtering into their test tubes.

3. Once filtering is complete, have them bring the test tubes to you for observation. You will decide if the water is A, B, or C grade and help them measure their sample in a graduated cylinder. They must return to their desks and do the math to come up with their $ value. Have the students put their $ values on the board.

INVESTIGATING QUESTIONS:

1) What was the best filtering agent and why?
2) What are other ways we purify our water?
3) Design a package for your "clean" water.

REFERENCES:

Erin Santini
Erik Rushton

RUBRIC:

Rubric for Water Filtering				
Activity Title: Grade Level:	Water Filtering			Grade leve
	1	2	3	
Criteria	Beginning	Developing	Proficient	Advance
Filtering System	Water looks no different than when handed out.	Filtered water suitable for plants, matches beaker C	Filtered water suitable for animals, matches beaker B	Filtered water s for humans, ma beaker A
TEAMWORK	Did nothing	Contributed little to the group	Worked well with the group	Worked well wi group, offered i comments and suggestions
Teacher Comments:				

PreK-12 ENGINEERING

Activity Evaluation Form **www.k12engineering.org**

Activity Name: _____

Grade Level the Activity was implemented at:_____

Was this Activity effective at this grade level (if so, why, and if not, why not)**?**

What were the Activity's strong points?

What were its weak points?

Was the suggested Time Required sufficient (if not, which aspects of the Activity took shorter or longer than expected)**?**

Was the supposed Cost accurate (if not, what were some factors that contributed to either lower or higher costs)**?**

Do you think that the Activity sufficiently represented the listed MA Framework Standards (if not, do you have suggestions that might improve the Activity's relevance)**?**

Was the suggested Preparation sufficient in raising the students' initial familiarity with the Activity's topic (if not, do you have suggestions of steps that might be added here)**?**

If there were any attached Rubrics or Worksheets, were they effective (if not, do you have suggestions for their improvement)**?**

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