Wastewater Treatment

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Title:
Wastewater Treatment
Grade Level:
6,7,8,9
Subject:
Science
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Time:
60-120 min for lab, more for extensions

Lesson Plan Type:
Inquiry
Keywords:
water, waste, sewage, treatment, environment
Brief Description:
This inquiry activity allows students to design and test a method for treating "wastewater". Students use common household materials and compete to create the cleanest possible water from their sample.

California State Standards Addressed:
Science/6/Investigation and Experimentation)7.0
Science/7/Investigation and Experimentation)7.0
Science/8/Investigation and Experimentation)9.0

Goal(s):
Students will use lab skills and inquiry to solve the environmental problem of wastewater treatment.

Specific Objectives:
Students will select and use a variety of lab skills, equipment, teamwork, and exploration to create a filtration device to treat a "wastewater" sample. They will practice science investigation and experimentation techniques while getting a little dirty and gaining a better understanding of the complex problem of water use in an urban setting.

Required Materials:
Variety of substances to create "wastewater" (powdered drink mix, rock sallt, gravel, cornstarch, baking soda, food coloring, etc.)
Plastic cups or beakers to hold "wastewater"
Variety of sand, rocks, coffee filters, funnels (2L bottles with the bottoms cut off work well as giant funnels), cotton balls, rags, mesh screen
Paper towels, broom, and possibly a mop for clean-up
Copies of lab handout (attached)

Anticipatory Set (Lead-in):
Show students a diagram or short video about how wastewater is treated on a large scale. If available also show a clip from a "survival" type show where a water filtration or treatment system is created from found objects. Discuss the various types of filtration techniques

prior to returning dirty water to the environment, or prior to use by people. You can also set this lab up as a competition between groups.

Lesson Plan Procedure:

Prior to lesson: Prepare wastwater by combining a variety of ingredients you have on hand. Having something that gives the wastwater an unattractive color is a bonus but not necessary. Be sure to add some substances that are not water soluble. Just keep adding stuff until you get a gloppy brown/green mess. Create one cup of this mess for each lab group - they don't have to be perfectly equal. It is recommended that you keep the "wastewater" fairly fluid. Some liquid will be lost in the process. You may also wish to have students run clear water through their filter several times to make sure it doesn't make their sample any worse (dirty gravel or sand can be a problem) and this can reduce liquid loss of their samples.

Show students the variety of equipment available for creating their filters.
Set up expectations about end of lab clean-up, especially if you have another class coming in shortly after this one.
Pass out their cups (you can make a big show out of how gross the wastewater is)
Let the kids get to work (see attached handout for detailed procedure, and related lab sections. Multiple filtrations may be necessary - but that is part of the fun!

Extension: For higher level students you can use vinegar or another weak acid as one of your substances. The students could then incorporate pH testing into their analysis to determine what issues their "clean" water still has. This could initiate a discussion on the environmental impacts of certain pollutants. You could also provide baking soda and allow them to neutralize and further treat their water sample. Additionally there are many articles and movies dealing with the issue of widespread health issues due to water pollution (Erin Brockovich, A Civil Action) that could be used as an introduction or extension to this activity.

Closure (Reflect Anticipatory Set):

Students write a short reflection about their own water usage/pollution habits and discuss small changes they could make to off-set both of these impacts. Students also asked to discuss which methods were most effective at "treating" the water and any unexpected challenges they faced.

Plan for Independent Practice:

Individual lab report, personal reflection.

Assessment Based on Objectives:

Student lab worksheet asks for reflection on laboratory practices and equipment use.

Possible Connections to Other Subjects:

Social Studies, Language Arts

Adaptations and Extensions:

See Lesson Plan

Additional Notes: