**Clean Up Your Mess!**

**Student Outcome:** Students will be able to understand the issues of water pollution and the importance of access to clean water through experimenting with filtering various substances from water by making their own simple water filters.

**Brief Description:** This lesson will introduce students to the concepts of water pollution and access to clean water through class discussion and a water filtration experiment. Students will ‘create’ polluted water through a simulated reading activity and then ‘clean’ the water by experimenting with various filtration methods. Engage the students in discussion on how the natural environment filters or does not filter the water.

**Review science safety rules:** The filtration methods used in this activity are a simple demonstration and the water should not be considered safe for drinking.

“Who Polluted the Bay” – Arlington Echo has a few setups that can be borrowed – ingredients not included.

**Materials:**

1 clear gallon jar of water

1 labeled black plastic film canister per student

(*Note: Fill canisters about halfway with dry elements, and almost full with wet elements.*)

See activity for specific canister ingredients--all are safe for students to handle:

Leaves (dry)– broken into small pieces

Soil (dry)

Fishing line or dental floss

Baking soda

Glitter

Litter: assorted paper/plastic – small pieces

Litter, bits of food (egg shell, orange peels, etc)

Instant coffee

Soap

Food coloring: red, blue, green, yellow

Toilet paper pieces

Vinegar

Vegetable Oil

Filtering Activity Materials:

One 2-liter soda bottle for each student or small group of students

These should be pre-cut in half by an adult (see preparation instructions below)

Filtration materials, such as:

Napkins

Gravel

Sand

Cotton Balls

Clay

Mulch

|  |  |
| --- | --- |
| **ENGAGE** | Conduct an investigation to answer the question, “Who polluted the Bay?”  Teacher Note: Read over the story beforehand and make necessary adjustments based on student abilities and time constraints. Save the ‘polluted’ water for lab activity.  Maryland Department of Natural Resources offers a free presentation on the Chesapeake Bay Watershed, which includes the “Watershed Model Lab” mentioned above. <http://www.dnr.state.md.us/education/teamdnr/teacher_classroomprograms.asp> |
| **EXPLORE** | Break students into small groups or have students do experiment individually. Distribute Clean Up Your Mess! Lab Instructions (one for each student, or one for each lab group)and Data Sheets(one for each student). Distribute lab supplies to each station (2-liter soda bottle pre-cut in half, filtration materials, Bay “pollution” water from “Who Polluted the Bay” activity).   1. Have each group follow the procedure outlined in **Water Filter Procedure** and answer the questions in **Clean Up Your Mess Lab Worksheet.**   Procedures:  Create Water Filter:   1. Place the top half of the soda bottle upside-down (like a funnel) inside the bottom half. (Make sure the cap is off). The top half will be the **filter** and the bottom half will hold the **filtered water**. 2. **Layer the filter materials** (sand, gravel, napkins, cotton balls, etc.) inside the top half of the bottle. 3. Record the filter makeup on the Data Sheet. 4. Obtain a cup of polluted ‘Bay’ water, make observations on color, materials in the water and smell. 5. **Predict** what type of “pollution” might be removed by each layer of the filter materials.   Students filter water and make observations:   1. Observe a classmates filtered water and determine if water is ‘cleaner’ than theirs. Observe how their filter is made. 2. **Take apart** your filter and look at each of the different layers. Can you tell what each material filtered from the water?   Students repeat procedure varying the filter materials. Record observations on the Data Sheet. |
| **EXPLAIN** | **Wrap Up: Water Filter Discussion**   1. Have your students imagine again that they have no running water and no water treatment facilities, and they must collect water from sources near their homes. What might this water look like, taste like, smell like, etc. Would they like to use this water for drinking, cleaning, cooking, etc.?   2. Based on the water filter activity, how would they design a water filter to clean the water they would be using?  a. What pollutants would they need to filter out?  b. What materials would they use to filter each kind of pollutant?  c. Are there any pollutants that they were not able to filter out with their hand-made filters?  d. Even if the water looked clean, is it possible that the water was still undrinkable?  e. How might they remove contaminants from the water that cannot be filtered out?  f. Would they feel safe and comfortable using and drinking the water after using a homemade filter? Would they get sick?  3. How does the environment filter these pollutants before they reach the Bay?  4. How might the pollutants be reduced before they reach the Bay? |
| **EXTEND** | Have students design a water filter they would use if they had to, including drawings. How much would a filter like this cost? Would it be hard or easy to make? Do they have access to all of these materials?  Take a field trip to a water treatment facility! Find out more about the filtration process and other steps involved in purification. |
| **EVALUATE** | Develop a scoring tool to measure student performance in any of the above activities. |

Adapted from: http://www.eeweek.org/assets/files/EDN%20Water%20Lessons/Filtering\_Water\_5-8.pdf

**Water Filter Procedure**

Create Water Filter:

1. Place the top half of the soda bottle upside-down (like a funnel) inside the bottom half. (Make sure the cap is off). The top half will be the **filter** and the bottom half will hold the **filtered water**.
2. **Layer the filter materials** (sand, gravel, napkins, cotton balls, etc.) inside the top half of the bottle.
3. Record the filter makeup on the Data Sheet.
4. Obtain a cup of polluted ‘Bay’ water, make observations on color, materials in the water and smell.
5. **Predict** what type of “pollution” might be removed by each layer of the filter materials.

Filter Your Water and Make Observations:

1. **Pour** the polluted water through the filter.
2. **Observe** what the filtered water looks like.
3. Observe a classmates filtered water and determine if your water is ‘cleaner’ than theirs. Observe how their filter is made.
4. **Take apart** your filter and look at each of the different layers. Can you tell what each material filtered from the water?

Try it Again:

1. Empty the bottle, throw out the filter materials, and wipe out the bottle.
2. Try it again! See if you can make the filtered water even cleaner! Try putting materials in different layers or try using different amounts of each material based on what you learned from your own and your classmates filter.
3. Record your observations on the Data Sheet.

**Clean Up Your Mess Lab Worksheet**

Make Your Water Filter:

1. Draw and label the layers

in your filter on the image:

Write your predictions of what type of “pollution” might be removed by each layer of the filter materials:

|  |  |  |  |
| --- | --- | --- | --- |
| **Layers** | **Material** | **Predict which Pollution gets Filtered Out** | **Observe Pollutants in Filter. *Were You Correct?*** |
| **Filter Layer 1** |  |  |  |
| **Filter Layer 2** |  |  |  |
| **Filter Layer 3** |  |  |  |
| **Filter Layer 4** |  |  |  |

Filter Your Water and Make Observations:

Write your observations of the filtered water here:

It looks: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Color: \_\_\_\_\_\_\_\_\_\_\_\_\_ How Clear is the Water?: \_\_\_\_\_\_\_\_\_\_\_\_\_ Smell: \_\_\_\_\_\_\_\_\_\_\_\_\_

Does this water seem like it could be drinkable?:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Look at another classmate’s water and filter.

Repeat the experiment based on your observations and record.

**Clean Up Your Mess Lab Worksheet**

2nd Experiment

Make Your Water Filter:

Draw and label the layers

in your filter on the image:

Write your predictions of what type of “pollution” might be removed by each layer of the filter materials:

|  |  |  |  |
| --- | --- | --- | --- |
| **Layers** | **Material** | **Predict which Pollution gets Filtered Out** | **Observe Pollutants in Filter. *Were You Correct?*** |
| **Filter Layer 1** |  |  |  |
| **Filter Layer 2** |  |  |  |
| **Filter Layer 3** |  |  |  |
| **Filter Layer 4** |  |  |  |

Filter Your Water and Make Observations: Write your observations of the filtered water here: It looks: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Color: \_\_\_\_\_\_\_\_\_\_\_\_\_ How Clear is the Water?: \_\_\_\_\_\_\_\_\_\_\_\_\_ Smell: \_\_\_\_\_\_\_\_\_\_\_\_

Does this water seem like it could be drinkable?: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which of the two filters worked the best?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_