



The Messy Meter

Recommended Ages:
6-12

Estimated Time:
45 minutes

Subject:
Polluted Water Cleanup

WHAT YOU'LL NEED

PANTRY STAPLES:

- 3 clear plastic 16 ounce cups or Mason jars
- Paper scraps
- Dirt/soil (to represent erosion)
- Food coloring (to represent chemical pollution)
- Vinegar (to represent acid rain)
- Dish detergent (to represent phosphates/fertilizers)
- 1 mesh strainer
- 4 coffee filters
- 3 sheets of paper towel
- 1 spoon
- 1 small pan or tray in which you can place pollution

SPECIALTY SUPPLIES:

- 1 funnel
- Eye dropper (optional, instead of a straw)
- Supplies for optional add-on exercises:
- 1 small box of activated charcoal (found in pet stores); rinsed to remove dust
- Vegetable Oil (to represent petroleum/fuel/gas/oil pollution)

Water Pollution Cleanup

In this activity, participants will learn about various sources of pollution found in water, and will learn through experimentation and hands-on learning the challenges in removing pollutants from water.



STEPS

1. Label the cups or mason jars 1, 2, and 3.
2. Fill #1 and #2 half full of clean water, leaving cup #3 aside for now.
3. Ask essential observation questions about the clean water in cups 1 and 2: What do they look like? What does the water smell like? Do you notice anything specific about the water in either cup?
4. Add each pollutant to Cup #1, one by one (asking the essential observation questions from above after each one); add the liquid pollutants very slowly:
 - food coloring (6 drops)
 - vinegar (6 drops, using straw or eye dropper)
 - dish detergent
 - paper scraps
 - dirt/soil
5. Begin the cleanup by using the spoon to fish out as much of the contaminants as possible.
6. Next, use the mesh strainer, pouring contents from Cup #1 through the strainer into Cup #3. Notice the remaining evidence of pollutants, including color, remaining dirt/sediment and smell.
7. Next, wipe out Cup #1, and place a coffee filter into the funnel, then pour the contaminants from Cup #3 through coffee filter/funnel into Cup #1.
8. Ask the essential observation questions again — what does the remaining mixture look and smell like? And what do you observe about it? (By now, nearly all physical debris like soil should be removed, but food coloring and dish soap are probably still visible, as are the dish soap and vinegar by smell).



BONUS ACTIVITY NO. 1:

1. Place two coffee filters into the funnel.
2. Rinse your activated charcoal, then pack it into the coffee filters in the funnel.
3. Using an eyedropper or a straw, drip the remaining mixture from Cup #1 through the activated charcoal into a clean jar or cup.

NOTE: If this goes properly, you should notice reduced smell and perhaps a lighter color. But you'll still see some color, and will understand that even though charcoal filtering is a very effective water purifier, it isn't an ironclad solution for cleaning polluted water.

BONUS ACTIVITY NO. 2:

1. Repeat step 2 from original instructions.
2. Pour $\frac{1}{4}$ cup of vegetable oil into the clean water of Cup #1.
3. Repeat cleaning and observation steps 7 and 8.
4. Optional: Repeat the optional activity above with activated charcoal filtering.

EXPERIENTIAL LEARNING NOTES:

1. Kids should easily be able to remove the litter/trash and soil pollution with the screen and paper towels.
2. If the liquid pollutants are added slowly enough, kids will be able to observe the reaction of the oil when the dish soap is added to the cup, in that the oil will bind with the food coloring and then the dish soap acts as a surfactant breaking the bonds of the oil.
3. The carbon filtration of the optional add-on activity requires the carbon be packed very tightly, and the liquid dropped in patiently. If the polluted water is dropped one drop at a time in a variety of places over the top of the funnel, it will allow the filter to extract the vinegar and food coloring. Any remaining oil will also be removed from the contaminated water as well. If visual and scent pollution still appears in the bottom of Cup #3, you could put the filtered water back through the charcoal filter and it should remove the remaining pollutants. However, because these steps require such time and deliberation and it's not guaranteed to work every time, this step is a suggested as an add-on, ideal for older students.

QUESTIONS TO ENGAGE YOUTH

1. What was the easiest pollutant to remove?
2. What was the most difficult pollutant to remove?
3. Do you have the same amount of water you began with?
4. What can you conclude from this experience about cleaning water for humans to drink?
5. Where does your water come from? How would you keep your water clean for you to drink it?
6. Find a local "city water supply." How do you think the water providers clean the water so that people can drink it in their homes?



EXPLANATION

About the activity: Water is a precious resource on earth, and the earth's waters are increasingly polluted. That means finding and creating drinkable water for humans is becoming more difficult, too. Common types of water pollution include erosion and run-off; litter/trash; pesticides; discarded medications; oil or gasoline; phosphates/fertilizers; and acid rain from airborne pollutants from industry. The concept of the activity is to have the youth observe what clean water looks like and be able to see through observation what polluted water looks like in comparison.

By discussing where water is found on the earth (surface water and groundwater) could create understanding of sources for clean water. The small percentage of water available for drinking water should lead the youth to the understanding of the need to keep our drinking water clean.

Following the water clean up activity, the youth should be able to identify that it is easier to keep the water clean than it is to clean it up from pollution. They should also be able to identify that things like chemical, oil, phosphates and acid rain are more difficult to correct.

To learn more about the importance of sustaining clean, unpolluted water and the difficulties involved in cleaning polluted water, visit: safewater.org/fact-sheets-1/2017/1/23/cleaning-up-after-pollution

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