

Engineering Clean Water Challenge

STANDARD(S) & INDICATOR(S):

- 5.1.12.B.1. Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.
- 5.2.8.A.5. Identify unknown substances based on data regarding their physical and chemical properties.
- 5.2.12.A.5 Describe the process by which solutes dissolve in solvents.
- 8,2,8.B.3. Identify a technological problem and use the design process to create an appropriate solution.

OBJECTIVE(S): SWBAT

1. Develop and implement a separation process that purifies samples of water using only household items.
2. Determine the efficiency of the separation process.

Scenario: A recent freak storm has shut down power to your neighborhood and it's not expected to be restored for several days. A small generator turns your lights back on, but, the town water works has been flooded so the pressure at your tap is way below par and the water that does come out is very dirty. To add to the irony, a nearby stream has overrun its banks and turned part of your backyard into a foot deep swamp. You need water, but you're surrounded by it. With your engineering skills you know a way to purify the excess rain and brook water that has collected in your yard, using only household items, so it can be used in your house for washing and bathing. Using the properties of water and the principles of mass balance you can determine how well your separation method works. You should be able to do this after this exercise. To devise a separation scheme based on mass balance you must know the masses of all substances in the mixture. Your mixture will have an insoluble, a partially soluble, and a soluble substance added to the water. You will receive random samples of water, vegetable oil, potting soil and a salt, either NaCl, MgSO₄ or Na₂CO₃.

Recording information

Materials required: Plastic storage containers (1-2L). kitchen sieves and strainers, plastic funnels, plastic spoons, coffee filters, water, potting soil, salts and/or baking soda, vegetable oil, mass balances.

Notebooks: Start a new page. Record all mass measurements, before and after mixing and separation trials. Record all ideas for separation and predict how each will work. Evaluate your results.

Team written Report: One page, summarize your methods and best results. Give a short justification for your results.

This material is based upon work supported by the National Science Foundation under Grant Nos. EEC-0908889

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