

Interactive Notes-“Conserving Land, Water, And Air”

Materials (per group of 4 students):

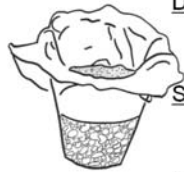
Demo 1	1-3 oz. plastic cup with holes punched in the bottom 1-100-mL beaker 1-sandwich bag with a handful of sand 1-sandwich bag with a handful of aquarium gravel 1-plastic spoon 1-6” x 6” square of cloth or paper towel 1-vial or container with 25-mL of “dirty” water (with glitter)
Demo 2	1-large beaker (or bowl) with 50-mL vinegar; put “vinegar” masking tape label on it 1-baggie with ~60 grams of baking soda Bubble solution (see demo 2 notes for instructions) Bubble wand
Demo 3	1-beaker with ~100 mL of 10% bleach water (see demo 3 notes) ; put “beaker” tape label on it 1-dropper with food coloring in it; place in sandwich bag to contain the mess
Demo 4	1- standard weight (100g, 200g, etc.), or equivalent, like the metal cubes in the density block kits Rocks in a sandwich bag that weigh 10 grams more than the weight or cube
...and	4-note sheets (see p. 7)

Additionally- PowerPoint (see p. 7)

Beforehand:

- Make your “dirty water” sample ready for demo #1: fill a large flask with tap water and add some glitter. Pour 25-mL of that into the vials for students.
- Set out all materials *the day before*. Leave yourself time to realize you’re missing something, and to practice a new demonstration, research something or even make a change. In the morning read through the slides and notes one last time. Relax and have fun along with your students. Remember- you’re only as effective as your plan.
- Keep an extra set of materials up front so you can demonstrate how to do the demos. It’s only about 100 times easier to show how to do something than it is to explain.
- Insert page and paragraph numbers from relevant pages in your textbook at the bottom of slides 1 and 2 if you choose to have the class read together. This is a good way to connect with your textbook as well as transition into the next demo. You can also delete these page inserts, or Copy and Paste them onto later slides if needed.
- As with any other demonstration, try these out ahead of time for yourself so you know how they work best and so you know what to expect.
- Print extra copies of the notes pages on paper for yourself, students that are slow writers or can’t see well, and for absentees. Click “File” “Print” then where it says “Print what：“ select “Handouts” and then “OK”.
- Did you notice all the baggies being used today? There is a reason for them- they allow you to fit all that stuff into the materials box. And they help control the mess! Put a demo number on each bag and you will all but eliminate confusion about what bag goes with what demo.

Interactive Notes: Conserving Land, Water, and Air



Do: Filtered dirty water using gravel, sand, and cloth.

See: The filter removed some of the impurities.

What's Happening: Every living thing on earth depends on clean water. The Clean Water Act of 1972 protects our water so we can drink, bathe, fish, and swim safely.

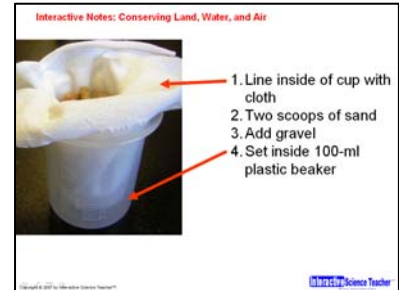
1.

Read p. 1 together
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Ask student #1 (of the 4) to assemble the water filter as shown in the steps on slide #1 of the PowerPoint. First, line the inside of the cup with a piece of cloth or paper towel, then add two scoops of sand and then the gravel. Don't forget to set it on top of a "catch" beaker so all the water coming out of the bottom is contained.

After the filter is assembled, have student #1 pour their "dirty" water (full of glitter) into it, noticing the glitter is removed.



Interactive Notes: Conserving Land, Water, and Air

1. Line inside of cup with cloth
2. Two scoops of sand
3. Add gravel
4. Set inside 100-ml plastic beaker

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This is not the world's most sophisticated water filter, but it illustrates the basic steps that wastewater treatment facilities do use when they purify water. More importantly, it gives you the occasion to talk about the need for clean water.



If you want, you can add other materials to make it work even better. But keep in mind, the more you add, the more there is to do and the more complicated things get. They include: kitty litter, vermiculite, gauze, cotton balls, and [activated charcoal](#) (charcoal that's been subjected to steam, which creates little holes and pockets for the particulates to settle into). Arrange so the materials get more and more fine the further down you go.

Yes, it is a lot of work and mess to do this 4 times with 4 science classes. One way around that is to have the first class make and use the filter, and then leave it assembled for the next class coming in. Go through the steps with those next classes so they know how it was made, and let them pour their sample of "dirty" water onto it. For the sake of simplicity, the clean up slide (#5) was written that way.

2.



Do: Blew bubbles into a beaker with vinegar and baking soda.

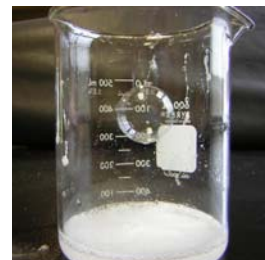
See: The bubbles floated in mid-air!

What's Happening: Carbon dioxide, an invisible greenhouse gas, was produced in this chemical reaction. Some pollution we can see, like dust and smog. Some we cannot. CO₂ also is a contributor to acid rain.

$$\text{NaHCO}_3 + \text{HC}_2\text{H}_3\text{O}_2 \rightarrow \text{Na} + \text{C}_2\text{H}_3\text{O}_2 + \text{CO}_2 + \text{H}_2\text{O}$$

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Have student #2 slowly sprinkle one spoonful of baking soda in to the beaker with 50-mL of vinegar. As it mixes, have them get their bubble solution and wand and play “bubble basketball”- get as many bubbles as possible inside the large beaker. One they start falling in, they’ll be shocked to see the bubbles levitate in mid-air.



This one is not easy to do, but it’s amazing sight to see! When explaining how to do this, talk through what will happen, and why. Don’t be secretive. Show the picture on PowerPoint of this happening so they understand what they’re supposed to look for.



If you have 4 science classes, you’ll go through most of a box of baking soda today. The easiest way to set this up is to put about 60 grams of baking soda into baggies marked “baking soda”. This is enough to last 4 class periods.

To make sure the CO₂ stays in the beaker, make sure students don’t blow bubbles directly down into the beaker from above- that will “wash out” the CO₂, causing this demo not to work.

The most important product here is the CO₂, which is heavier than O₂ because of that extra carbon stuck on the molecule. And because we did this in a confined place- the beaker- that “heavy” CO₂ stays put. But we can’t see it!


How to make a bubble solution: 2 parts Dawn/Joy dish soap to 4 parts glycerin. Pour 20-mL of glycerin and 10-mL of dish detergent into a small beaker and stir. Pour just enough of this mixture to cover the bottom of the 50-mL beakers. This should last all day.

If it doesn’t seem to be working right, do an internet search for “how to make bubbles” and try a different recipe.

How to make bubble wands: Bend a piece of soft metal around a AA-sized battery. Jumbo paper clips, coat hangers, and even twist ties will work, but our favorite is bare copper wire (14-16 gauge).



3.



Do: Put coloring in a beaker with bleach water.

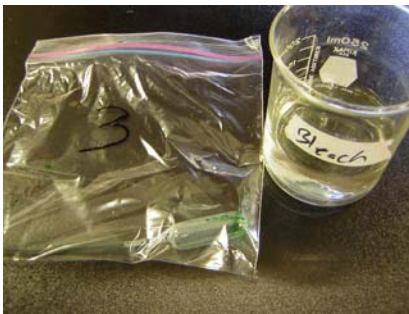
See: It faded and eventually went clear again.

What's Happening: The atmosphere and oceans have a limited capacity to absorb wastes and recycle materials naturally. Earth is very big and old, but it does not have an endless supply of clean land, water, and air.

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After reminding everyone what bleach does to clothes, have student #3 put a drop of food coloring (which we'll call "pollution") into the beaker with 100-mL of 10% bleach water. After a few minutes it will fade and finally disappear.




You can make it through 4 sets of science classes using the same beaker, but by the 3rd class it will be turning yellow. You can change it out every couple of classes, or even use that to your advantage by tying it in with the notes- it's just like earth- it's reaching its capacity.

To make the 10% solution, combine 100-mL of bleach with 1,000 of water (tap works fine). That will make enough for 8 student groups to get 100-mL each, with a little left over for "whatever comes up".

After the first class, the inside of the bag holding the dropper will be covered with coloring. To keep their hands clean, have students hold the dropper by holding it through the bag while it's still inside, with the tip sticking out of the top of the bag.

4.



Do: Guessed which of two things weighed the most.

See: Lots of little things can surpass one large thing.

What's Happening: Factories may be responsible for some of the world's pollution, but every person in the world needs to be responsible in how they use earth's resources.

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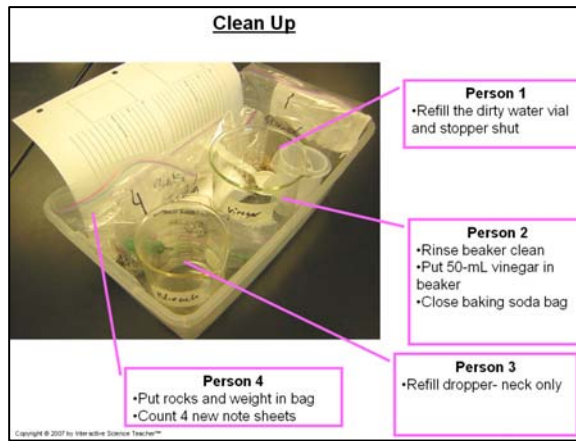
Tell student #4 you have a riddle for them- hold the weight/metal cube in one hand and all the rocks in the other and decide which is heavier. Tell them that you carefully weighed the rocks so that one of the two weighs more than the other. Which is it? (*the rocks*)

This demo is a great reminder that taking care of Earth is everyone's job. It's easy to point a finger at a group or an industry and assign all blame to them, and leave yourself out of it. But what if *everyone* was less wasteful? The effect of that would be greater than any other single change.



Inside the #4 baggie should be the rocks and the weight or metal cube. When you get things ready, use a balance to help you put 10 grams more rock in than weight.

If you've got a class you can joke around with, you can announce that the name of the game we're playing is "Are You Smarter Than A Bag Of Rocks?"



Use this slide to direct students how to clean up and reset everything for the next class. Try to leave yourself 10 minutes to reset everything for the next class. When groups think they're done, you'll want to double-check.

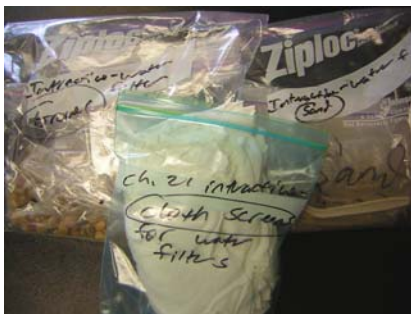
Refills to have in various places around your room:

- Note sheets
- Food coloring
- “Dirty” glitter water
- Vinegar and graduated cylinders
- (if you're re-doing the water filter every class, add:
 - Cloth or paper squares
 - New sand)

Put out a few wet cloths/towels for students to wipe the bubbles off their table with.

If you choose not to use this slide, you can right-click on it to the left and select “Hide Slide”.

To help you with clean up, have your last science class take everything out of the boxes and put them in like piles in the back of your room.




If you carefully bag everything up and mark it clearly, you'll cut your set up time by more than half next year, and feel really smart too!

Come back and visit InteractiveScienceTeacher.com to upgrade this lesson with:

PowerPoint- lead your students through the lesson click-by-click

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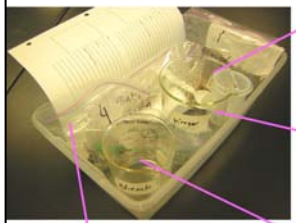


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Clean Up



Person 1
•Refill the dirty water vial and stopper shut

Person 2
•Rinse beaker clean
•Put 50-ml. vinegar in beaker
•Close baking soda bag

Person 3
•Refill dropper- neck only

Person 4
•Put rocks and weight in bag
•Count 4 new note sheets

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Student Handout

Title _____ Date ____/____/____

Do: _____

See: _____

What's happening: _____

Do: _____

See: _____

What's happening: _____

