

Ground Water Modeling
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Objectives

1. Students will gain an understanding the ground water does not come from underground 'pipes' or 'storage tanks' but fills spaces in the ground.
 2. Students will determine factors that affect the amount of water the ground will hold.
 3. High school students should look at this as permeability and use this to determine how different combinations of materials can affect how water flows through the system.
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Material List

1. two clear plastic cups per person, one with holes in base
 2. coffee filters cut to fit into bottom of cup with holes
 3. clear plastic straw cut to fit in cups (top to bottom)
 4. scotch tape
 5. pipette
 6. graduated cylinder
 7. sand (any will work but students seem to prefer the white sand they sell at swimming supply stores for filtering systems because it doesn't get dirt and foam floating on it)
 8. gravel (washed)
 9. clay
 10. soil(s)
 11. water
 12. spritzer OR small wide mouth bottle with lid with holes melted in it to *sprinkle* rain (I ask students to save these from meals or sporting events and use a hot nail to melt the holes - 4 or 5 will work well)
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Procedure

Start by construct a model:

- The holey cup goes inside the undamaged cup.
- The cut coffee filter fits inside the holey cup
- The straw gets cut to fit, then is taped to the inside of the cup to act as a *well*
- The pipette is the *pump* to draw the water from the well.
- Fill the holey container 2/3 full of sand.
- Add water so that the *water table* is about 1 cm from the surface.
- Use the pipette to draw water from the *well*. This can be squirted back onto the surface.
- Model how to make it *rain* using either spritzers or the rain bottles.

Discuss where the water is located and if they think this adequately represents where water comes from. Some may mention that the soils in the area are not sand (if that is true).

Discuss what types of materials may be under the surface where the water is located.

Have student draw 5 and 10 pipettes of water from the model and squirt the water into the graduated cylinder. They should record this information as the control. These can be averaged for the class or left to the individual groups to average between the students (if each student in the group has their own model).

Provide students with the materials listed above (clay, gravel, soils) and ask them to dump out their controls and design something they think might represent what is below the ground and ask them to draw 5 and 10 pipettes from their model and compare the results to that of the control. Which system allowed more ground water to be harvested?

High school students should each do a model but in each group one student should keep a control, one should do the above model, and a third student should change theirs to a system that has a combination of sand, gravel, and clay. Teachers with younger students may choose to do this in a follow-up lesson.

Finally, have the students *rain* on their model with a set amount of rain, say 10 mL and then immediately draw 10 pipettes of water. Then it can *rain* again and this time they should wait 30 seconds and then draw 10 pipettes.

The time it takes for water to filter down in a system is called *recharge*. Depending on how their model is designed, some may have a longer recharge, and therefore there should be differences between groups.