

Using a Sponge to Model Soil and Water Concepts **By Anne Skinner, Cowan Museum of History and Science**

Materials needed: sponge, plastic tub, pitcher of water, paper towels

See images of “The Sponge Model” from Dr. Dirt at <https://www.doctordirt.org/teachingresources/sponge>.

Lesson Plan: Model and explain the concepts below for students using the materials listed above. The sponge will represent the soil. Holding it at a tilt will represent a slope. Pouring water on the sponge represents precipitation. Afterwards, you may want to divide students into groups and give each group a set of the materials and a handout of the terms and definitions. Have students take turns demonstrating and explaining the concepts.

If you want the lesson to be at a higher thinking level, don't do a whole-class demo before giving the groups the materials. Have groups figure out how to demonstrate each concept. [You may want to demonstrate #1 yourself.] Check each group on just the concept or concepts you want them to demonstrate to the class later. Then have students observe while each group demonstrates their concept(s) to the rest of the class.

Concepts to demonstrate:

1. Dry soil on a slope
2. Porosity
3. Permeability
4. Infiltration
5. Percolation
6. Saturation
7. Water-holding capacity
8. Drainage
9. Runoff
10. Bearing capacity

Questions to ask:

1. If you had a sponge with lots of big holes, but the holes were not connected,
 - a) Would it have high or low porosity?
 - b) Would it have high or low permeability?
 - c) Would water flow through it easily?
2. Would it be better to put a septic tank in soil with a higher percolation rate or a lower percolation rate?
3. What happens if it keeps raining after the ground is already saturated?
4. Grapes and blueberries grow best in well-drained soil. Which kind of soil do you think would have better drainage: sandy soil or clayey soil?
5. Which soil do you think would have higher bearing capacity and support a tall building better: wet soil or dry soil?

Terms:

1. **(Dry soil on a slope)**
2. **Porosity** – a measure of the openings, voids, or spaces in soil or rock that may be filled by water, air, oil, or gas. It's usually given as a percentage of the volume of pore space to the total volume of the soil or rock.
3. **Permeability** – a measure of how easily fluids (water, oil) can flow through a soil or rock; it depends on how interconnected the pores are
4. **Infiltration** – occurs when water seeps into (enters into) soil; the movement of water into soil, sediment, or porous rock
5. **Percolation** – the slow movement of water through pores in soil or rock. Percolation is sometimes used as a synonym for infiltration, but in general, infiltration occurs at the ground surface and percolation occurs underground.
6. **Saturation** – being completely soaked; the degree to which pores in a rock contain oil, gas, or water; expressed as a percent of total pore space
7. **Water-holding capacity** – capacity of soil or water to hold water
8. **Drainage** – occurs when liquid flows off (or out) gradually; the manner in which the waters of an area flow off in surface streams or groundwater
9. **Runoff** – the part of precipitation that flows (above or below ground) into streams. Surface runoff is the part of runoff that travels over the ground surface to the nearest stream. "Runoff" and "surface runoff" are sometimes used to mean the same thing.
10. **Bearing capacity** – the capacity of soil to support loads applied to the ground; the maximum load per unit area the soil can support without failure