	LESSON PLAN: Exploring Water Movement **Estimated time ~ 45 minutes**
Standard	MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. Common Core State Standards - Math - Find a percent of quantity as rate per 100.
Vocabulary	Runoff: Unrestricted flow of water over land Infiltration: surface water seeps into the ground and is stored in the spaces within soil and rock Porosity: The amount of empty space in a material Permeability: The degree to which water or another liquid is able to flow through a material Sediment: material deposited by water, wind, and glaciers
Objective	Students will be able to: ● identify the impact of the porosity of a substance on the infiltration rate of water. ● Identify different materials based on their level of permeability. ● Identify and Explain which materials (permeable vs. impermeable) are better for development or agriculture in various settings and why.

Supplies	Each group needs: ● graduated cylinder ● 4 see-through plastic cups ● gravel (enough to fill one cup 3/4 of the way up) ● sand (enough to fill one cup 3/4 of the way up) ● soil (enough to fill one cup 3/4 of the way up) ● marbles (enough to fill one cup 3/4 of the way up) ● medium size mixing bowl or small bucket to catch water ● Lab worksheet DOC FORM Data Chart to be uploaded to Form To share with the entire class: ● water and sink/drain
Bell Ringer	Journal prompt: What types of materials does water sink into? What types of materials does water run off of?
Experiment	Question - How does water act on different substances? Prediction: If we pour water on different substances, which substances will water run off of and which substances will it sink into? Procedures - 1. Students will gather materials. 2. Students will poke a few small holes in the bottom of each cup and label the cups A, B, C, and D. 3. Students will fill cup A ¾ of the way up with gravel. 4. Students will fill cup B ¾ of the way up with sand. 5. Students will fill cup C ¾ of the way up with soil. 6. Students will fill cup D ¾ of the way up with marbles. 7. Students will pour 50 mL of water into each cup and record observations about permeability and how the water traveled. The cups should be held over another cup or bowl when water is poured in. 8. Students should measure the amount of water that comes through the bottom of the cup. 9. Calculate and record the percentage of the water permeated in milliliters (ml). 10. Have students collect trial 2 and trial 3 data from two other groups due to time constraints. If no time constraints exist and enough materials are available for 3 fresh set-ups then have each group complete their own set of three trials. Analysis -

	Look at the data table you created. Have the students list the materials used in order of most to least permeable. What other materials are permeable? What materials are impermeable? What are some concerns in your everyday life that involve impermeable materials?
Closing Question	How does the surface of the earth impact where rain water goes?
Notes	This lesson can be extended if you want to discuss if the groundcover would help with pollution or not by repeating the above experiment but adding food coloring to the water. When the what comes through the material the students can observe if there is any dye left in the water.

Modified from Hydrogeology Experiment from AustinTexis.gov