



Capillary Action and Adhesion

Subject: Science (Earth Science, Environmental Science, Chemistry)

Grade level: 6-8

Rationale or Purpose: Water can move through the ground not only by the direct influence of gravity and the indirect influence of gravity on overlying water, but by the physical property known as adhesion. Adhesion is why water exists immediately above the water table, and how water travels up a tree.

Materials:

Chalk in a cup (one set per team of students)

- small cup
- water
- food coloring
- stick of chalk

Capillary action underground (one set per class)

- table salt
- fine, dry sand
- aquarium
- glass tube with funnel
- heat lamp
- colored water

Capillary action in plants (one set per team of students)

- two small beakers
- water
- two colors of food coloring
- white carnation with stem

Lesson Duration: Experiment set-up: 50 minutes; experiment must then sit overnight.

Objectives:

Activity:

Day 1

Step 1: Chalk experiment.

1a: Give each team a cup and a piece of chalk.

1b: Teams should label the cup with their names and put about 2 cm of water in.

1c: Have students place a couple drops of food coloring in the water and mix.

- 1d: Put the cup somewhere in the room where it can sit for the duration of the period without being disturbed at all.
- 1e: Instruct students to place a stick of chalk into the water so that part of the chalk sticks above the water.
- Step 2: Adhesion underground. [Because of the space required, this is presented as a single activity done as a class.]
- 2a: In the bottom of the aquarium, place a mixture of salt and sand to a depth of about 4 cm. Cover this layer with about 4 cm of clean sand, no salt.
- 2b: Insert a glass tube with a funnel so that the tip reaches the bottom of the aquarium. Pour water into the funnel so that there is a wet layer about 2-3 cm deep along the bottom.
- 2c: Affix the heat lamp so that it can shine down on the end of the aquarium away from where the glass tube was inserted.
- 2d: Step 4: Light the lamp and let it burn overnight (or at least for several hours). [Below the lamp, water will rise through the sand by capillary action (=adhesion), bringing up dissolved salt with it. The heat will cause the water to evaporate, and the salt will be deposited near and at the surface. This movement can be seen by the food coloring on the sand and tasted by licking some of the sand at the surface.]
- Step 3: Adhesion in plants.
- 3a: Give each group a carnation and two small beakers.
- 3b: Have students fill the beakers with water and add different color food coloring to each.
- 3c: Instruct students to use fingernails to cut the carnation stem in two, along about half the length of the stem. [A knife, scalpel, or razor blade would be easier if allowed in your school.]
- 3d: Have students place one half of the stem in each of the beakers. Place somewhere where the carnation can remain overnight.
- Step 4: Give a brief discussion on capillary action.
- Step 5: At the end of the discussion, have the students check out their chalk experiments visually. Make sure they note that the colored water has traveled up the chalk, above the level of the water.
- Step 6: Have students write a hypothesis about what they expect to see in the other two experiments set up today. Collect the papers.
- Step 7: Review student hypotheses to make sure that all generally understand what will happen.

Modification: None

Student Product: (What do students end up with? notes, a diagram, a map, a group role play, solutions to math problems, completed chemistry equations, an analysis of a political cartoon, a humorous poem, etc.)

Closure: (a brief question or activity to consolidate and synthesize the day's learning. How will you know students have grasped the day's main concepts? How

can they demonstrate this to you in 2-3 minutes? If a product is created, it can also be included as a Student Product and/or daily Assessment.)

Assessment or evaluation: (a brief, quick daily assessment—not a test. Not necessarily graded.)

Extension: [optional] (what is the follow-up activity? This activity can either be done in class by those who finish quickly or outside of class for enrichment. This is NOT the same as homework. Examples of extensions could include related web sites to explore, related reading, or variations on math problems. An extension is not necessary for every lesson.)

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