2 - Aqua Bodies

What is the difference between a raisin and a grape? Water!

Grade Level:
Ages 8 - 12

Subject Areas:
Life Science, Health, Mathematics

Duration:
Preparation time:
Part I: 15 minutes
Part II: 5 minutes
Part III: 5 minutes
Activity time:
Part I: 30 minutes
Part II: 20 minutes
Part III: 20 minutes

Setting:
Large, open room

Skills:
Organizing (estimating, calculating, categorizing)
Analyzing (comparing, identifying patterns)

Vocabulary
Percentage, organs, vital

Summary

Students demonstrate how much of their bodies are composed of water, where water is found within their bodies, and the functions of water in their bodies.

Objectives

Students will:

- Identify the percentage of water in the human body.
- List places within the human body where water is found.
- Describe roles that water plays in the human body.

Materials

- *Dried fruit (i.e., raisin)*
- *Ripe fruit (same fruit—i.e., grape)*
- *Butcher paper* (about 36m for a class of 30) or 2-3 sheets of newspaper taped together for each student (if you choose to do the first activity in chalk, the paper is not necessary)
- *Crayons or markers*
- *Chalk (optional)*
- *Knife (to cut carrot)*
- *Carrot*
- *Scissors*
- *Copies of Water Drop Student Copy Page*

Making Connections

We all drink water when we become thirsty, but we rarely think about the importance of water in our bodies. By focusing on the amount of water in our bodies, where it is found and the role it plays in keeping our bodies functioning properly, students learn to appreciate our dependence on water and the necessity of consuming adequate amounts of water.

Background

The Role of Water in the Human Body

Water is the major constituent of the human body since about 60% of adult body weight is due to water. This water content varies depending on age, gender and body composition. In infants and children the percentage of water is higher than in adults. Given the large percentage of water in the human body, it is not surprising that water plays an extremely important role in many of the body's critical functions. Water, a vital nutrient to the life of every cell, acts first as a building material. It also regulates our internal body temperature by sweating; helps make nutrients and other essential elements accessible by transporting them to our cells; assists in flushing waste mainly through urination; lubricates joints; forms saliva; and acts as a shock absorber for brain, spinal cord, and fetus.

Without water intake, humans cannot live for more than three to five days.

BODY WATER PERCENTAGES AT DIFFERENT PERIOD OF LIFE	
Fetus	~94%
Infants	~75%
Adults	~60%
Elderly	~50%

(Source: Panel on Dietary Reference Intakes for Electrolytes and Water, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board; and Institute of Medicine of the National Academies. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. The National Academies Press, Washington, D.C. February 11, 2004. Adapted from Altman PL. 1961. Blood and Other Body Fluids. Washington, DC: Federation of American Societies for Experimental Biology.)

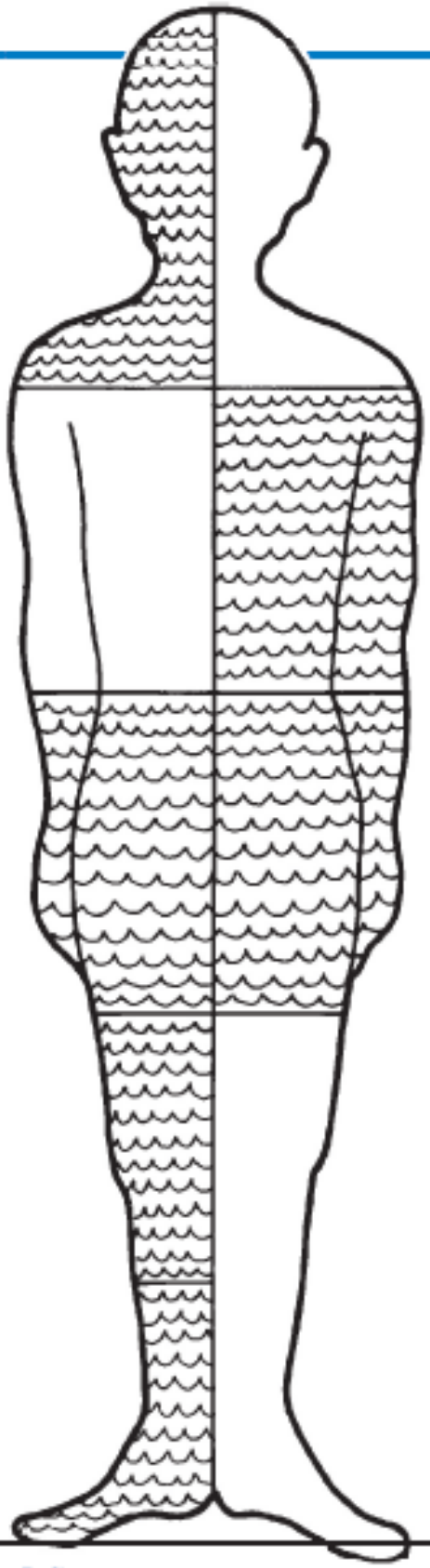
Location of Water in the Human Body

Where is water located within the body? Water is found throughout our bodies, in all of our cells, tissues and organs. Body parts also vary in their water content. The Water in Human Organs chart displays how specific body parts contain different amounts of water.

WATER IN HUMAN ORGANS

Organ	Percentage Water
Skin	64
Skeleton (bones)	31
Muscle	79
Brain	73
Liver	71
Heart	73
Lungs	83
Kidneys	79

(Source: Mitchell, H.H. et al. 1945. The chemical composition of the adult human body and its bearing on the biochemistry of growth. The Journal of Biological Chemistry. 158: 625-637.)



Procedure

▼ *Warm Up*

Ask two students to volunteer to stand in the front of the room. Tell one of them that he/she has a basket of food—enough to last one month (props work well for this such as an empty basket with imaginary food or a piece of paper that says "food"). The other student has one month's supply of water (a prop could be a bottle of water or a piece of paper that says "water". If no props are available ask students to pretend they are eating food and drinking water). Ask the class which student will survive longer. Take a vote. Compare how long we can go without food (between 2 and 4 months depending on fat stores) to how long

we can go without water (3-5 days). Tell the student with food to sit down as he/she did not survive past three days. The student with water won the survival contest. Have the "winner" return to his/her seat.

▼ *The Activity*

Part I

How much of our bodies are water?

NOTE: K–2 teachers may wish to focus on **Part I** only.

1. **Have students work with partners to trace their body shapes onto butcher paper or newsprint.** An alternative is to have students stand against a wall or lie on the blacktop and trace each other with chalk.

2. **Explain to students that the percentage of water in a human body is approximately 60 percent.** Although the actual amount varies with age, for this activity, 60 percent will be used. For younger students, demonstrate 60 percent by showing them a circle, or a block divided into 10 equal parts, and shade in six of the 10 pieces.

3. **Have students color 60 percent of the figure they have traced onto the paper.** It may help to show 60 percent of various objects. Or students might fold their drawing into 10 equal parts and color six of the 10 sections. Students may also color the rest of their bodies (using a contrasting shade), then cut them out for display.

Part II

Where is water found in our bodies? The entire adult human body is approximately 60 percent water. But where is that water found in the body? Is it sloshing around inside of us? Explain to the students that two-thirds of the water in the human body is in the cells and the remaining one-third is found in the blood, the lymphatic system and between cells.

1. **Now have the students think about where the water in their bodies is found.** Body parts vary in their water content. Use the Water in Human Organs chart and body drawing from activity background section for reference. On their drawings from Part I, have students identify different organs by circling and labeling where they are found in their bodies (more advanced students could also sketch in the organs shapes). Be sure to have students include key organs such as the heart, lungs, kidneys, skin and stomach.

2. **Explain that the bodies of most living organisms are at least 50 percent water.** Show the class an example of a dried fruit next to a ripe fruit. Compare the difference in size. Demonstrate the percentage of the fruit that is water by cutting off a representative piece. For example, bananas are 75 percent water, so cut off 25%, leaving 75% which represents the percentage of water. A carrot is about 88 percent water, so a similar demonstration of 88% could be undertaken with the carrot. Ask the students why water did not spill out of the fruit or vegetable when you cut it. Emphasize that the water is within the tissues and cells of the fruit and so did not spill out. (This may counter a misconception that water is loosely sloshing throughout the body.)

Part III

Why is water important in our bodies? Water is found in various locations throughout our bodies and in varying amounts in each body part and has important functions within our bodies.

1. **Provide each student with a copy of the Water Drop Student Copy Page.** Instruct students to cut out the water drops. Have them tape the water drops to their body drawings (from Parts I and II) where they deem appropriate for the function described. For example the drop that reads "water is important to my body because it helps me cool down when I am hot" can be placed on the skin to indicate sweat; the drop about waste removal can be placed on the kidneys as they filter wastes or on the urinary tract; and the drop discussing the breakdown of food may be placed on the stomach area or the mouth where saliva helps break down food.

2. **Once students have placed the water drops, as a group, discuss each function and have students check their own body drawings.**

▼ *Wrap Up*

Display the student's "Aqua Bodies" around the classroom. Use these as reminders of the importance of hydration in our bodies and for reference as they participate in the remainder of the Healthy Hydration Module.

Extension

Obtain a food drier or build a solar food drier; have students dehydrate several food items (such as grapes they can make their own raisins). Have students predict what the foods will look like when dried. Have students compare the weight of a food before and after it is dried. How much water (by weight) did the food contain?

ActionEducation™

Challenge the students to develop an educational poster or brochure that raises the community's awareness of the important role that water plays in the human body. They could include these materials in a larger community health campaign or educational event.

Assessment

Have students:

- indicate what percentage of their bodies is water (Part I, step 2).
- discuss where water is found in their bodies (Part II, step 2)
- list major functions of water in the body (Part III, step 1)

Resources

Amos, William H. 1981. *Life in Ponds and Streams*. Washington, D.C.: National Geographic Society.

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Bowes and Church's Food Values of Portions Commonly Used. 14th ed. Harper and Row.

Burnie, David. 1989. *Plant*. New York, N.Y.: Alfred A. Knopf.

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Jéquier, E and Constant F. Cahier. 2009 Pourquoi faut-il boire de l'eau? Pour maintenir la balance hydrique (Why should we drink water? To maintain the water balance). Nutrition et de Diététique.

Mitchell, H.H., T.S. Hamilton, F.P. Steggerda, and H.W. Bean. 1945. The chemical composition of the adult human body and its bearing on the chemistry of growth. *The Journal of Biological Chemistry*. 158: 625–637.

Montain, S.J., W.A. Latzka, M.N. Sawka. 1999. Fluid Replacement Recommendations for Training in Hot Weather. *Military Medicine* 164 (7): 502-508

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Peavy, Linda, and Ursula Smith. 1982. *Food, Nutrition, and You*. New York, N.Y.: Charles Scribner & Sons.

van der Leeden, Frits, Fred Troise, and David Todd. 1990. The Water Encyclopedia, 2nd ed. Chelsea, Mich.: Lewis Publishers, Inc.,

Wang, ZiMian, Paul Deurenberg, Wei Wang, Angelo Pietrobelli, Richard N Baumgartner and Steven B Heymsfield. 1999. Hydration of fat-free body mass: review and critique of a classic body-composition constant. American *Journal of Clinical Nutrition*. 69(5): 833-841.

E-Resources

- "Nutrition and healthy eating," The Mayo Clinic. **"http://www.mayoclinic.com/health/medical/IM00594"** and "Water: How much should you drink every day? **"http://www.mayoclinic.com/health/water/NU00283** (accessed July 9, 2010).
- "Water in diet". National Institute of Health. **"www.nlm.nih.gov/medlineplus/ency/article/002471.htm** (accessed July 9, 2010).
- "Drink to Your Health." Student nutrition (and body image) action committee. The Regents of the University of California. **"http://www.snac.ucla.edu/** (accessed July 9, 2010).

WATER DROP - STUDENT COPY PAGE