

Glossary

aquatic (ə kwä tik): Growing or living in or upon water.

average (ə v(ə rij): The usual kind or amount. The number gotten by dividing the sum of two or more quantities by the number of quantities added.

ecosystem (ē kō sis tēm): Community of plant and animal species interacting with one another and with the nonliving environment.

flume (flüm): A sloping channel for directing the flow of water.

geology (jē ä lə jē): Earth's matter, including its materials, structure, physical properties, dynamics, and history, and the processes by which Earth's matter is formed, moved, and changed.

gradient (grā dē ənt): The rate of sloping upward or downward.

groundwater (graund wä tər): Water that sinks into the soil.

habitat (hə bə tat): Environment where a plant or animal naturally grows and lives.

invertebrate (in vər tə brət): An animal with no spinal column. About 95 percent of all animals are invertebrates. These include all animals except mammals, birds, reptiles, amphibians, and fish.

Piedmont (pēd mänt): An area of land lying at or near the base of a mountain range. In the Eastern United States, the Piedmont area lies between the Appalachian Mountains and the Atlantic coastal plain.

solar radiation (sō lər rā dē ā shən): Electromagnetic energy from the Sun; sunlight.

variable (vər ē ə bəl): Thing that can vary in number or amount.

Accented syllables are in **bold**. Marks are from the Merriam-Webster Pronunciation Guide.

FACTivity



Time Needed

1 class period

Materials needed:

- Three clear 1-quart plastic containers (or four for extension). A plastic soft drink bottle will work, but the tops should be cut so that the opening is at least 3 inches across.
- Two aquarium thermometers (or four for extension).

In this FACTivity, you will answer the following question: Does the movement of water affect its temperature?

You may do this FACTivity in pairs or in groups, depending on how many thermometers and containers are available.

First, develop and write a hypothesis for this FACTivity. You should develop your hypothesis based on your reading of this article and a review of the FACTivity. A hypothesis is an educated guess about something. Your hypothesis should take the form of a specific statement, and it should be written as if no change is expected as a result of the experiment. It should also be something you can test in an experiment. The following is an example of a hypothesis: "A glass of water left in the Sun for 3 hours will not have a higher water temperature than a glass of water left in the shade."

After you have read the article and reviewed the FACTivity, write your hypothesis on a piece of paper.

Test your hypothesis using the following process:

Perform this experiment outside on a sunny and warm day.

Fill two of the plastic containers with water up to 3 inches from the top. Use water from a refrigerated water fountain or refrigerated water. The water must be cooler than the outdoor air temperature, and the water must come from the same source at about the same time. The temperature of the water should be exactly the same in each container. If the two samples vary at all, mix them together and then divide the water between the two containers. Put one water-filled container in the Sun and place a thermometer in the water. Record the beginning water temperature after 3 minutes, then every 3 minutes until the temperature has raised 2 degrees.

At the same time a student, holding one filled container and one empty one, should stand in the Sun close to the area where the first water container has been set. The student will pour the water continually from container to container. If more students want to be involved, a relay may be set up. The important thing is to keep the water moving from container to container while in the Sun.

Continue pouring the water back and forth until the water in the “still” container has raised 2 degrees.

Using the second thermometer, measure the water temperature of the “moving” water. Is it 2 degrees warmer than its starting temperature? Why do you think it is the temperature that it is? Has your hypothesis been proven true or false? What is the answer to the question posed at the beginning of this FACTivity? Do the results of your experiment agree with the results in the research you just read? Develop and write an explanation of your results. How is this FACTivity similar to and different from the scientists’ research?

Assessment

Collect students’ written hypotheses and explanations of results. Use the rubric below to assess their work.

HYPOTHESIS	Included in report?	Clearly written?	Grammar/punctuation correct/no mistakes?
In form of statement?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
In form of null hypothesis (no change expected)?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
Is hypothesis testable?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
RESULTS			
Written statement of results?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
Stated whether hypothesis is proven true or false?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
Provided answer to FACTivity question?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
Stated whether results agree with article research?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)
Provided written explanation of results?	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)	Yes (1 pt) No (0 pt)

Scoring categories: 0-6, 7-12, 13-19, 19-24 (0-6=Lowest achievement, 19-24=Highest achievement)

Extension



Repeat the experiment in the shade.
Compare all four temperatures.

What You Can Do:

Be a stream detective! Around your home, school, and community, notice whether streams and rivers have trees and other plants growing near their banks. If not, begin a campaign to grow and care for trees and other plants along waterways. Always have an adult you know and trust with you when you begin your detective work. Also, always get permission from the landowner to walk on his or her private land. In addition, you can create posters to educate adults about the importance of having trees and other plants near waterways.



If you are a PLT-trained educator, you may use Activity # 38: "Every Drop Counts."

National Science Education Standards

Standards addressed in this article include:

Science As Inquiry:

Abilities Necessary To Do Scientific Inquiry,
Understandings About Scientific Inquiry

Earth Science:

Structure of Earth System

Science and Technology:

Understandings about Science and Technology

History and Nature of Science:

Science as a Human Endeavor,
Nature of Science

Additional Web Resources

More possible impacts of climate change on streams:

<http://www.sciencedaily.com/releases/2009/07/090723142116.htm>

<http://www.sciencedaily.com/releases/2007/05/070504101355.htm>

Adapted from Boggs, J.L.; Sun, G.; McNulty, S.G.; Swartley, W.; Treasure, E.; and Summer, W. 2009. Temporal and spatial variability in North Carolina Piedmont stream temperature. *AWRA 2009 Spring Specialty Conference*, May 4-6, Anchorage, AK. http://www.srs.fs.usda.gov/pubs/ja/ja_boggs005.pdf.