WARM WATER
a good thing?

TEACHER

Activity Overview

How does water temperature affect the health of your aquatic ecosystem?

Water temperature is an important factor in determining the quality of any aquatic site. Changes in temperature can influence the behavior of aquatic life and can often put aquatic animals and plants in danger.

Students measure air and water temperatures at their local aquatic site. They collect their data using a Temperature Sensor connected to a TI CBL 2™ or Vernier LabPro, and a TI-73 Explorer™. They repeat the experiment at a second site about 1 mile away and compare the results.

Conclusion: High water temperature often indicates poor water quality, which may have negative impact on animals and plants. Cold water usually provides a healthier environment for aquatic life.

This activity is part of a series of activities to help students determine the water quality of a local aquatic site.

Activity at a Glance

Grade: 4-9

Subject: Science

Category: Life Science, Earth Science,

Topic: Living Things, Plants, Animals, Ecology, Photosynthesis, Water Quality, Erosion

Time required

- One 45-minute periods

Level of complexity

- Low

Materials*

- TI-73 Explorer™
- TI CBL 2™ or Vernier LabPro
- TI-73 DataMate
- Temperature Sensor
- Small paper or plastic cup (optional)

Temperature Sensor

* This activity has been written for the TI-73 Explorer™ but you can easily substitute the TI-83 or TI-83 Plus. Also see Appendix A for steps on how to transfer DataMate to your graphing device and how to use DataMate for data collection.

JASON

Adapted from "Experiment 1 - Temperature" *Water Quality with Calculators*, written by Johnson, Robyn L., Holman, Scott, and Holmquist, Dan D., published by **Vernier Software & Technology**, 2002.

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Concept Background

- Air and water temperature often determine the variety of species in aquatic habitats.
- In warm water dissolved oxygen levels drop. Low oxygen level can put aquatic life in danger.
- Usually fish cannot survive temperatures below 0ºC, and very few can tolerate temperatures above 36ºC.
- Many factors can change the temperature in the water, such as weather, seasons, depth and volume of water, water clarity, calmness of water, and more.
- Humans often cause thermal pollution, which increases the temperature in the water. Thermal pollution happens when warmer water flows into colder water.

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National Education Standards

Content Standard A: Science As Inquiry.
Students should learn about scientific inquiry and develop the abilities necessary to do it.

Content Standard B: Physical Science.
Students should develop an understanding of properties and changes in matter, motions and forces, and the transfer of energy.

English Language Arts Standard 3.
Students should apply strategies to comprehend, interpret, evaluate, and appreciate text.

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Preparation and Classroom Management Tips

- Water temperature must be measured on site by either placing the probe directly in the stream or by collecting a sample and immediately measuring its temperature.
- If you need to collect a sample to measure onsite, obtain the water sample from below the surface of the water and as far away from shore as is safe. If suitable areas of the stream appear to be unreachable, samplers consisting of a rod and container can be constructed for collection.
- If repeating the experiment at a second site 1 mile away is not practical, take the data from a second site as far away from the first site as possible.
- This activity works well with students working in groups or as a demonstration.
- Encourage students to answer the questions in Observations and Conclusions in a *Journal*.
- Create your own student questions for use on your student's TI graphing devices using the Texas Instruments StudyCard applications. For more information, go to http://education.ti.com/us/product/apps/studycards/scresources.html

Observations and Conclusions

A. What observations did you make at your aquatic site (weather, description and type of site, signs and condition of animal life, signs and condition of vegetation, signs of thermal pollution)?
Answers will vary.

B. Compare you temperature readings (air and water) with your observations. Based on your observations and the information provided in the research article, identify the factors that influenced your temperature readings.
Many factors can change the temperature in the water such as weather, seasons, thermal pollution, depth and volume of water, water clarity, calmness of water, and more.

C. A water temperature change of a few degrees over a one-mile stretch of the aquatic site, may indicate a source of thermal pollution. Does your data indicate the possibility of thermal pollution? If so can you identify the source of thermal pollution?
Students need to understand that a change in temperature between Site 1 and Site 2 does not necessarily indicate a source of thermal pollution. Such temperature change can be caused by other factors like depth of water and calmness of water.

D. Find examples of watersheds (local or outside of your area) where water temperature affected aquatic life. Describe efforts that are being done to maintain healthy temperature levels.
Answers will vary.

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Vocabulary

Dissolved Oxygen. The amount of oxygen dissolved in water. It is usually measured in milligrams per liter (mgs/L).

Ecosystem A group of organisms together with its environment, seen as a unit.

Habitat The environment where a particular plant or animal is normally found.

Photosynthesis The process by which plants harness the energy of the sun to make food. In photosynthesis, plants absorb carbon dioxide (CO_2) and give off oxygen (O_2). Thus, there is an overall accumulation of carbon (C) in the plant.

Plankton A small freely floating group of organisms (plants and animals).

Thermal Pollution. An increase in water temperature caused by adding relatively warm water to a body of water at a lower temperature.

Watershed An area of land that delivers runoff water, sediment, and dissolved substances to surface water bodies, such as rivers or lakes. All watersheds consist of boundaries, a basin and collection areas.