Let That Water Breathe and Chill!

(40 minute activity)

Objectives

The student will be able to:

1) Identify properties of dissolved oxygen (DO) and temperature
2) Test the DO and temperature of a local stream and determine its health
3) Relate the factors that can change a waterway s DO and temperature

Materials

- ❑ DO and temperature worksheets from Student Section
- ❑ DO kit
- ❑ Pencil or pen
- ❑ Thermometer

Background

Dissolved Oxygen (DO)

The presence of oxygen in water is vital to healthy aquatic ecosystems. Its absence is a sign of serious pollution. Some aquatic organisms like trout and stoneflies need higher levels of oxygen to survive. Organic wastes like animal carcasses, decaying plants, sewage (containing nitrates and phosphates), urban and agricultural run-off and other industrial sources are the major threats to oxygen availability. As those wastes decay, the microbes responsible for their breakdown consume large amounts of oxygen. Additional factors influencing water quality include: altitude, barometric pressure, plant concentrations in the area and water temperature. Oxygen is more soluble in cooler water.

The amount of oxygen found in water is called the *dissolved oxygen concentration (DO)*, and is measured in milligrams per liter of water (mg/l) or an equivalent unit, *parts per million* of oxygen to water (ppm). During warm summer months, stream water temperatures go up as water and oxygen levels decline. The DO range for trout and salmon is above 6 ppm. Levels below 5 are dangerous and below 3 are lethal. Fish basically suffocate. DO levels over 9 ppm are often found in nature. In fact, some fish actually have adapted to higher amounts as evidenced by their abnormal hemoglobin configurations.

PRODUCTIVE DISSOLVED OXYGEN LEVELS

ORGANISM	DO parts per million/milligrams per liter
Cold water organisms (salmon, trout, mayfly, stonefly caddisfly)	6 ppm and above
Warm water organisms (bass, carp, catfish)	5 ppm and above

Temperature

Temperature affects everything that lives in water. Aquatic animals are cold blooded and adapt to the surrounding temperature. Removal of streamside vegetation can elevate temperatures along with increasing soil erosion. Suspended sediment in the water absorbs more solar energy. Industrial thermal discharge also raises water temperature. After water is used for cooling machinery, the warmed water is then recirculated back to a nearby water source. This is one example of *point source pollution.* There is a direct relationship between temperature and DO. Cooler water holds more oxygen. As temperature elevates, DO is reduced.

PRODUCTIVE TEMPERATURE RANGES

TEMPERATURE (Fahrenheit)	ORGANISM
Higher than 68°F (warm)	Many plant species, dragonfly, bass, bluegill, catfish
Middle range (55°F- 68°F)	Some plant species, salmon, trout, sculpin, mayfly, caddisfly
Less than 55°F	Some plant species, trout, salmon, sculpin, stonefly, mayfly

Procedure

1. Visit a local waterway (if this is not possible, practice with tap water).

2. Referring to the DO and temperature charts contained in this section, ask students to predict what aquatic life might be found there.

3. Practice using the worksheets. If possible, monitor water temperature and DO at various times of the day.

4. Answer the following questions:
   What are the average temperature and oxygen levels?
   What factors may have contributed to the findings?
   What can survive in this water?

Assessment

Ask students to:

- ❑ Create a chart that illustrates how DO and temperature are interrelated.
- ❑ Describe the tolerance levels various plants and wildlife have to changes in DO and temperature.
- ❑ Make a note of the factors that can alter levels of DO and temperature in fresh water.