Classroom Series

Nutrients in Water Lab

Code 5971

Grades 5, 6, 7, 8

Lesson Plans are provided to help organize an existing curriculum, allowing the teacher to spend more time on hands-on activities that meet key classroom learning objectives and improve student achievement. The Lesson Plans will aid the teacher in integrating LaMotte test kits and equipment into classroom activities that meet National Science Education Standards.

LaMotte

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Concept/Topic:

Introduction to nutrients in water and demonstration of simple test procedures.

Time Requirement:

One class/lab period

General Goals:

The students will gain a basic understanding of nutrients in water.

Specific Objectives:

1. Students will be able to explain how land use affects the levels of nitrogen and phosphate in natural waters.
2. Students will be able to explain how nutrient pollution impacts the aquatic oxygen cycle.
3. Students will be able describe steps that can be taken to reduce nutrient pollution.
4. Students will be able to follow instructions and work together as a team.
5. Students will be able to make observations.
6. Students will be able to collect and analyze data, and draw a conclusion.

Materials, Required:

Order Code	Description
5971	Classroom Studies, Nutrients in Water Lab
2-2146	Safety Goggles
2-2234	Gloves
	Timer/clock

Materials, Optional:

Order Code	Description
5418	Pondwater Tour
5419	Watershed Tour
5849	AM-12 The TesTab Water Investigation Kit
5870	Water Quality Educator & Monitoring Outfit

Anticipatory Set (Lead-In):

Phosphate and nitrate are nutrients that are found in natural water. They are essential for the growth of aquatic plants.

Phosphate is necessary for the metabolic functions of plants. It enables them to take energy from sunlight and make food in a process called photosynthesis. Phosphate is found in small amounts in nature.

Nitrate is used by plants to build protein. It is much more abundant in the aquatic ecosystem than phosphate. Some forms of algae can use components from the atmosphere and turn them into nitrate that is released into the water.

Nitrate and phosphate have always existed in nature but not in such large concentrations as they do today. Now, in addition to the small amount of nutrients from natural sources, large amounts of nitrate and phosphate are created by modern land use.

Although nutrients are required to grow healthy aquatic plants, too much nitrate and phosphate can be harmful. This is called nutrient pollution. Excess amounts of these nutrients, especially phosphate, can cause extensive algae growth called blooms. Dense mats of algae on the water surface can block sunlight needed by submerged aquatic vegetation (SAV) to produce the food they need to survive. As the underwater grasses and large amounts of algae die, oxygen in the water is used up in the process of decomposition. When oxygen levels decrease, sensitive fish and other aquatic organisms will have to move out of the area or die.

Nutrient pollution also causes eutrophication in rivers, lakes and reservoirs. When sediment from soil erosion falls into the water, it gets trapped in the roots of the crowded plants and a bog is formed. Eventually, the waterway is choked to death and becomes dry land.

Preparation:

Read the manual to become familiar with the text and test procedures. Cut apart foil strips of tablets as shown in the manual. Prepare the Nutrient Solution. Prepare and package a set of items for each of the 5 teams. Decide how to divide the students into 5 teams. Make a copy of the Student Procedures for each team.

Step-By-Step Procedures:

1. Divide students into 5 groups.
2. Present the Introduction lecture material.
3. Pass out a set of bagged items to each team.
4. Have members of each team decide on duties of each member. For example, instruction reader, reagent adder, mixer, timekeeper, result recorder etc.
5. Read instructions aloud and have students follow instructions for Testing for Nutrients – Nitrogen and Phosphate.
6. Discuss students' results.

Plan for Independent Practice:

Have students review additional information on nutrients and nutrient pollution on websites included in the Resources section. Have students read and become familiar with Student Procedures.

Closure (Reflect Anticipatory Set):

Nutrient pollution is a serious problem but aquatic ecosystems can recover if actions are taken now. Soil tests can be performed on lawns and golf courses to determine the actual amount of fertilizer needed to meet soil needs instead of routinely over-fertilizing, organic farming methods can be employed to eliminate the use of chemical fertilizers, cropping methods that reduce soil erosion can be used, septic systems in private homes can be maintained and monitored for sewage spills, pastures can be fenced and watering troughs can be provided instead of letting cattle drink from streams, and vegetation bordering streams and rivers can be preserved or replaced to reduce erosion and decrease the amount of nutrient pollution from run-off.

Assessment Based on Objectives:

Have students:

- list land uses that can increase nitrogen and phosphate concentrations in natural water.
- describe how high nutrient levels can impact the aquatic oxygen cycle.
- explain how land use practices can be modified to decrease nutrient pollution.

Adaptations (For Students With Learning Disabilities):

- Provide written and verbal instructions for test procedures.
- Provide a copy of lecture material.
- Give students a copy of the Student Procedures ahead of time so they may become familiar with the instructions.

Extensions (For Gifted Students):

- Have students draw a diagram of photosynthesis in aquatic plants.
- Have students follow suggestions in the manual for Additional Experiments.
- Have students use terms in the Glossary to create a nutrients in water crossword puzzle.

Possible Connections To Other Subjects:

Social studies—land use and urbanization

Resources

Literature	Methods	Equipment
Kids in the Creek www.bpa.gov/Corporate/KR/ed/kidsinthecreek/topics/waterquality/do.htm	Standard Methods for the Examination of Water and Waste Water	LaMotte Company www.lamotte.com Review and order additional equipment
National Science Foundation www.nsf.gov/od/lpa/nstw/kids/start.htm Just for Kids		

National Science Content Standards Addressed

A Science as Inquiry

All students should develop:

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

C Life Science

All students should develop understanding of:

- Structure and function in living systems
- Regulation and behavior
- Population and ecosystems
- Diversity and adaptations in organisms

E Science and Technology

All students should develop understanding of:

- Abilities of technological design

F Science in Personal and Social Perspectives

All students should develop an understanding of:

- Population, resources, and environment
- Natural hazards

Resources
National Resource Council (NRC). 1996. *National Science Education Standards*. Washington, D.C.: National Academy Press.