



## **Pond to Cup**

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### **Research Host:**

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### **Grade-Level:**

Middle School

## Pond to Cup

### Purpose:

To determine what affects the growth of microorganisms in pond water. How can the pond water be made safe for human consumption? This activity is to be used with seventh graders, but can be adapted for a wide range of grade levels.

### Objectives:

Students will be able to:

- know what will cause growth and death in microorganisms in pond water.
- learn the scientific method through designing and using an experiment to clean the pond water to a level suitable for human consumption.

### Materials:

Each **group** of 3-4 students needs:

- a microscope
- slides
- 30-cm fishing line
- 3-4 2-liter soda pop bottles

Each **class** needs:

- large tank (30 to 45 L)
- bleach
- salt
- baking soda (base)
- vinegar (acid)
- fertilizer (teacher-made solutions of 5%, 15%, and 25%)
- air pump for water tank
- coffee filters
- litmus paper
- balance scales

To make solutions, use 5g of fertilizer and 95 mL water; 15g fertilizer and 85 mL water; and, 25g of fertilizer and 75 mL water.

### Preparation:

One or two weeks before the start of the lab, talk to water treatment plant personnel in your area to see if they could test the students' final water sample. This lab can be done in about two weeks. To test one or two variables it will take 2-3 class periods plus 5 to 10 minutes each day for one week.

The students will need to have the skills to use a microscope, and have a basic understanding of concentrations, how to measure pH with litmus paper, and how to take notes and keep records. The teacher can either take the students to the pond to collect the water and sediment or get the water and sediment before the class starts. The solutions of fertilizer and bleach should be made up before class begins.

**Procedure:**

1. Collect pond water, sediment, and plant life.
  - If possible, take the class and have students collect what they need for experiment and control, 1L each.
  - If the class cannot go, then the teacher will collect a large amount in a fish tank for the whole class to use, about 2L per group.
  - Leave 5 to 10 cm of sediment in the bottom of the control tank for organisms to live in.
2. Visual observation of water.
  - Brainstorm about what is in the water.
  - Throughout the experiment, to do organism counts, hang the microscope slide in the water sample using fishing line. Remove slide only to place on microscope. To do a count, have students count what is in the field of view at a particular power.
  - Have students identify living and non-living organisms.
    - Green and/or moving is living.
    - Not green or moving is non-living.
3. At this point, the teacher will introduce the solutions and other materials that can be added to the water to affect the growth of the organisms within it.
4. Students design an experiment to find what effects the population of organisms in the water.
  - Students create hypothesis that relates to question.
    - Question: What affects the population of organisms in pond water?
  - Students test only one variable at a time.
  - Experiment must be approved by the teacher.
  - Data will be collected and recorded in such a way that anyone could understand what has been done and observed every day for one week.
5. Reporting of results:
  - Each group will make a poster showing its experiment and results.
  - Results will be presented in “science fair” style so that each member of each group will present to a small group.
6. Clean water experiment (four or five days). Students will need two days to design experiment and collect data; one day to make a poster presentation; and, one or two days to present posters.
  - Using a KWL chart, students will use information gained from presentations to design an experiment to make the pond water usable for human consumption. To do this, students will:
    - create hypothesis and design an experiment on how to clean water
    - have experiment approved by teacher (this is required)
    - test one variable at a time
    - send water samples to be tested.
  - After poster presentations, finish KWL charts (i.e.: What did you learn?)

**Safety:**

Students need to protect eyes and clothing from bleach, vinegar, and fertilizer with lab coats and safety glasses. Wash hands after each lab.

NOTE: Students will NOT test water for human consumption themselves. This will be the responsibility of the local water treatment plant.

**Questions to Ask:**

1. Can anyone read and understand your lab report?
2. Would we find the same results in all bodies of water?
3. What other sources of water could we use?
4. What would be your prediction if water from different areas was to be tested?

**Suggestions for Assessment:**

Evaluate the presentations for clarity and use of the scientific model. The second method of evaluation would make the students responsible for knowing the material presented by the other students. Give a teacher-developed quiz using the information from the presentations.

**Where to Go From Here:**

This activity is used in a seventh grade life science class as an introduction to microorganisms. As a follow-up, use the control tank to identify the different organisms as to which kingdom they belong. It would also be fun and interesting to have a person from the water treatment plant to visit and talk about how the water is treated before and after human use, and the role microorganisms play in water treatment. Allow students to use this activity for a Science Fair project.

**References and Resources:**

1. Water treatment personnel.
2. School and public libraries.

# Pond to Cup Student Activity Sheet

## Pond Water Lab Data

Your Name \_\_\_\_\_

Other Group members \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Control (e.g. nothing added)

Experiment (something added)