

INVESTIGATING WHAT'S BLOOMING – TEACHER GUIDE

This investigation models a real-world scenario and ecological issue: eutrophication, which results in bodies of water that are depleted of oxygen. The goal of the investigation is for students to gather experimental data on the impacts of nutrients on the growth of algae in an aquatic system. They will use their data as evidence later in the lesson.

There are other possible results, but you can expect that many groups will observe that as nitrogen and/or phosphates increase:

- Oxygen decreases.
- Water grows cloudier over time.
- Water becomes greener/algae is visible on the surface.

Materials

- 250-500 mL mason jars (half-pint or pint) or other glass container
 - 7 per group
- Cheesecloth or coffee filters
- Rubber bands
- Masking tape
- Pond water
 - Pond water is best, but if it is not available water from a slow-moving stream or a lake should work as well. Be sure to collect enough to fill each jar half-way (125 or 250 mL each, for mason jars). You can also collect a smaller volume of water a few weeks ahead of time, add a little fertilizer, and leave the jars in a sunny place until more algae grows.
 - If you do not have access to a natural water source, algae can be purchased through Carolina Biological ([Algae Survey Mixture](#)). Follow their culturing instructions and be sure to set up the cultures at least a week in advance to grow enough algae for all your student groups.
- Spring water (in bottles or jugs; enough to fill each jar half-way)
- Graduated cylinders
- Nutrient measurement/analysis kits (from aquarium shop or pet store; these might be sold individually or as a single kit so the number you need will depend on your source)
 - Dissolved oxygen kit
 - Dissolved nitrogen kit
 - Dissolved phosphates kit
- Fertilizer (powdered or granulated; e.g., Miracle Gro)
- Powdered detergent containing phosphates (e.g., Cascade)
- Nitrile or latex gloves

- Safety goggles
- Digital scale or balance
- Camera (optional)

Procedure (Note: Procedures in the student version are more detailed.)

Set-up

1. Label the jars 1-7 with the masking tape.
2. Fill each jar with a mixture of $\frac{1}{2}$ pond water and $\frac{1}{2}$ spring water. Use the graduated cylinders to be sure you put the same amount of water in each jar.
 - a. **Note:** It may be more efficient to give students the jars with the pond water already inside.
3. Add the detergents and fertilizers as follows. You may want to increase the amount if using the larger volume jar to maintain the nutrient concentration, but it is not necessary.
 - a. Jar 1: control, add nothing
 - b. Jar 2: 1.25 g of fertilizer
 - c. Jar 3: 2.5 g of fertilizer
 - d. Jar 4: 5 g of fertilizer
 - e. Jar 5: 1.25 g detergent
 - f. Jar 6: 2.5 g detergent
 - g. Jar 7: 5 g detergent
4. Cut 7 squares from the cheesecloth large enough to cover the openings of the jars or use coffee filters.
5. Cover each of the jars with a square of cheesecloth or coffee filter and secure with a rubber band.
6. Set the jars in a sunny location.

Data Collection

1. On day 1, test the dissolved oxygen, nitrogen, and phosphates in each of the jars.
 - a. Be sure to provide students with the specific instructions for your kit(s).
2. Observe the jars for 14 days. Consider having students take pictures every day as well.
 - a. Make visual observations and describe how each jar looks every day.
 - b. On day 7 test the dissolved oxygen, nitrogen, and phosphates in each jar.
 - c. On day 14 test the dissolved oxygen, nitrogen, and phosphates in each jar.
3. Provide students clean-up instructions.