Oregon benchmarks

Benchmark 1
- Recognize characteristics that are similar and different between organisms.
- Describe the basic needs of living things.

Benchmark 2
- Group or classify organisms based on a variety of characteristics.

National Science Education Content Standards

Grades K–4
- Systems, order, and organization
- Form and function
- Characteristics of organisms

Grades 5–8
- Systems, order, and organization
- Form and function
- Structure and function of living systems
- Understanding about scientific inquiry

Content objectives

Learners will be able to do the following:
- List one or more varieties (species) of aquatic plants.
- Explain the effects of water quality on aquatic plants.

Process objectives

Learners will be able to do the following:
- Make observations.
- Ask questions that can be answered through a scientific investigation.
- Design an investigation to answer a question.
- Collect, organize, and summarize data from an investigation.
- Analyze and interpret data from an investigation.

Amazing Aquatic Plants?

FYI

Algae are members of the Protist Kingdom. In the Protist Kingdom, there are three groups: the plantlike, animal-like, and funguslike protists. The plantlike protists include euglenas, diatoms, dinoflagellates, green algae, red algae, and brown algae.

Green algae is likely to be found in the school pond or other aquatic environment. Green algae also can live in other types of environments and on other organisms, such as lichens.

Because of their many interesting shapes, looking at green algae under the microscope would be a nice addition to this Unit. If you have access to a microscope, consider buying prepared microscope slide study sets of various green algae. These may include *Spirogyra, Chlamydomonas,* and *Volvox.* They are available from scientific supply houses (see Appendix IV).

Materials

- ⬭ Two clear plastic jars for each team of learners, plus one additional set for a control group
- ⬭ Algae
- ⬭ Elodea (aquatic plants that are available from pet or aquarium supply stores)
- ⬭ Pond water or distilled water
- ⬭ Thermometers
- ⬭ pH paper
- ⬭ Salt, vinegar, lemon juice, baking soda, food coloring, soil
- ⬭ Home plant fertilizer (diluted for learners' use, if needed)

Preparation

Review the 4-H Science Inquiry Model and the learner evaluation criteria in the Scientific Inquiry Scoring Guide to assist in coaching learners as they complete this lesson.

If there is algae in the school pond, learners may collect it along with some water for this lesson. Otherwise, get algae from a local natural watercourse or order it from a biological supply company (see Appendix IV).

Procedure

Pass out to learner teams the samples of algae and elodea in clear plastic jars with pond or distilled water. Keep one control set of jars with algae and elodea separate for comparison later.

Have the teams of learners use a microscope or hand lens to look at the algae and elodea. Ask learners to record the similarities and differences they see. Lead a discussion of what the teams observed.

Remind learners of lesson 2B—Water Quality Tests. Which water quality factors have they learned affect aquatic plants' growth? Record the responses on the board. Ask learners if they think the two green organisms have the same requirements for survival, or if they might be different based on what they can observe.

Ask each team to select one water quality factor to change to see how it affects each of the two green organisms. Ask them to state the change they propose to make in the form of a question. For example, "Will adding fertilizer to the water make the algae and elodea grow larger?" Encourage older learners to use an "If….., then….." hypothesis format.

When all the teams have formulated a question, ask them to share it aloud with the group. If two teams ask the same question, work with the teams to ensure that each team will be testing a different variable. Assist teams to follow the steps outlined in the 4-H Science Inquiry Model.

Possible changes learners can make to the water include raising or lowering the temperature, adding salt, lowering the pH with vinegar or lemon juice, raising the pH with baking soda, or adding other "contaminants" such as food coloring or soil for turbidity. Learners also may propose taking the plants out of the water altogether. Accept any experiment design that is not dangerous and that will produce an observable result.

Now, ask the teams to create an experiment design including a materials list and a data sheet. Remind them to determine how long their experiment will continue. If you have a set time frame, state this to learners. Avoid open-ended time frames such as, "Until the plant dies."

Continue to facilitate the experiment design. Will they add a tablespoon of vinegar today, observe the two organisms daily, then add additional vinegar in a week? How will they test to see what is happening to the pH of the water? When all teams have completed their experiment design, ask them to share it aloud with the group. Allow learners to ask the teams questions about their design.

Pass out the materials requested by each team and facilitate as needed while they prepare their two samples. Set the samples aside. Allow time each day of the experiment period for learners to view the samples and record what they observe. Ask learners to compare what they observe in their jars with the organisms in the control jars.

At the end of the experiment period, ask the teams to analyze and interpret the data they collect and give a summary report to the group. Ask learners, "How does what we learned from these experiments apply to how we manage our school pond?" and then, "How does what we learned from these experiments apply to how other ponds or natural bodies of water are managed?"

Extend the learning

Project WILD Aquatic Education Activity Guide: Kelp Help