



# Lesson Plan

## Invisible Life (3-5)

**Estimated Time:** Over several days.

### Central Benchmark

*5C Cells (3-5)#1*

Some living things consist of a single cell. Like familiar organisms, they need food, water, and air; a way to dispose of waste; and an environment they can live in.

### Objective

Students will be able to describe some macroscopic and microscopic organisms that live in their classroom aquarium.

### Advance Preparation

Set up an aquarium in the classroom several weeks before this lesson is to be taught. Include in the aquarium ecosystem some elodea plants, one or two small goldfish, and two or three snails. Several days before the lesson use a microscope to check that there are enough microorganisms of different kinds present that students can easily observe their activities.

### List of Materials

*For each student:*

Microscope (Discovery Scopes could be used)

Slide

Cover glass

Dropper

*For the class:*

Aquarium ecosystem

Field guides to microorganisms such as *Golden Guide: Pond Life* and other appropriate reference books

**Note:** This lesson will take several days. It is important for each student to have ample time for a leisurely microscopic study of the aquarium water without interruption, using his or her own microscope. If you do not have enough microscopes for the whole class, rather than having students share microscopes, teach the lesson to part of the class on one day and to the rest of the class on a succeeding day or days.

### Motivation

Ask the class to observe the aquarium for a few minutes. Then ask the students to name the living things they see in the aquarium. (Probable responses: goldfish, snails, and plants.)

### Development

#### 1. The Needs of Macroorganisms.

Ask students to work in pairs to explain how they know the aquatic organisms they have named are alive. Combine two pairs making a group of four, and have each group compile a list of what living things need. Have several pairs

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justify the statements on their lists, referring specifically to the aquarium organisms named. Develop a class list of what living things need. Accept all reasonable answers, but be sure the final class list includes these statements:

- Living things need food.
- Living things need water.
- Living things need air.
- Living things need a way to dispose of wastes.
- Living things need a place to live.

### **2. The Needs of Microorganisms.**

Say: *Now let's use our microscopes to look at some water from the aquarium.*

Distribute microscopes, slides, cover slips, and droppers. If necessary, demonstrate how to prepare a slide to study aquarium water. Throughout the observation period, help students with effective use of the microscopes as necessary.

Invite students to examine the aquarium water with the microscope. Each student should work next to a research partner, with whom he or she may talk about what is observed. After they have observed the water sample for about 10 minutes, ask several students to share their findings. Students will probably say that they see tiny living things in the water. If they do not suggest this, ask students whether they see anything that is alive. Do not dwell at this time on how students know the things are alive.

Ask the students to continue observing their slides. Ask them to devise and carry out a way to make a record of interesting things they observe and questions that occur to them during the study. Some students may draw, some may write, and some may choose a combination of drawing and writing. Circulate among the students, looking at their samples and encouraging them to make detailed and accurate representations of their observations. Encourage them also to share especially interesting events with their research partners and to look at their research partners' slides from time to time. When a student asks you what a certain organism is, do not identify the organism, but ask the student to formulate a question about it.

After students have had enough time for examining the water, have them clean up.

### **3. Reflection on the Investigation.**

Ask students whether the fish, snails, and plants are the **only** living things in the classroom aquarium. Students will probably respond that they saw tiny living things in the water. Say: *Yes. We have observed some microscopic organisms, also called microorganisms. Some of the living things you have been watching are so small that they consist of a few cells or even only one cell. What did you observe about the cells that caused you to believe these organisms are alive? What interesting things did you see the one-celled organisms doing?* Write some of these statements on the board or on a transparency.

Referring to the list of the needs of living things generated earlier in the lesson, ask students to work in pairs to decide whether the one-celled organisms have the same needs. Remind the pairs to be sure they can justify their responses. Combine pairs into groups of four and have them develop joint responses. It is probable that, besides locomotion, the only life process of the microorganisms that students actually observed was feeding. However, some students may argue logically that, since microorganisms are living things, they must have the same needs as other living things.

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Do not attempt to resolve this question finally, but ask students what they might do to become more certain about the answer to this question. (Among possible responses: conduct more observations, read about what other scientists have discovered about one-celled organisms.)

Collect the drawings and writings students prepared during the investigation.

### **4. Further Research.**

Have the class work individually or in small groups to identify two or three questions formulated during the investigation which students now wish to explore further. Distribute field guide books and other appropriate reference books, and allow students to search for answers to their questions. Students should be able to find the names of particular organisms and some information about their life processes in these books. Tell students they will have other opportunities to make microscopic observations of aquarium water. Tell students they will report on their findings during the next science class.

While students are working on this activity, post some of the drawings and writings they prepared during the investigation.

Have students review the posted items. Discuss whether students generally saw the same things in their microscopes. Have students suggest possible reasons for differences in observations. Ask students why it is useful to have accurate records of what was observed in this investigation. (Possible answers: So that results can be compared; so that results can be remembered.)

### **Summary**

Have students write two or three sentences summarizing what they did in this lesson.

### **Evaluation**

Have students complete a learning journal entry on the topic: "Living Things in Our Classroom Aquarium."

### **Extensions**

Have students devise and implement procedures for further investigations. Some questions that might be explored include:

- Do the aquarium organisms we **can't** see without a microscope have anything to do with the aquarium organisms we **can** see without a microscope? If so, what?
- Would there also be microorganisms in another classroom's aquarium? Would they be like the microorganisms in our aquarium?
- Would we find these same microorganisms in our aquarium in a month? Would they look the same as they do now?

In later classes be sure to raise again the question of whether microscopic organisms have the same needs as macroscopic organisms.