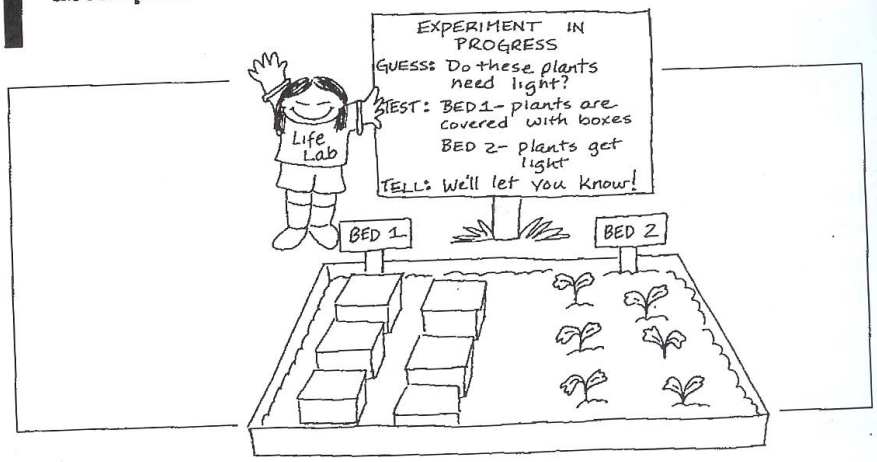
Scientists at Work

Students devise an experiment to test one of their assumptions about plant needs.



Indoor or Outdoor

Time
Part 1: 45 minutes, and daily monitoring
Part 2: 20 minutes

Related Subjects
Art
Language Arts

Process Skills
Predicting
Communicating

Materials
For the Class:
- markers
- Plant Needs Poster from Plant Care Planners lesson
- 2 prepared garden beds or planter boxes (optional)
- camera (optional)

For Each Group of 4–6:
- 2 seedlings, each in a separate container

For Each Student:
- Plant Test, Lab Book pp. 23–24
- Plant Care Plan from the previous lesson
- pencil

Outcome
Students are introduced to the Guess-Test-Tell process.

For the Teacher
This lesson formally introduces the Guess-Test-Tell process, a simplified version of the scientific method. It is a process that students will use again and again. Every experiment begins with a guess or prediction. That is, students formulate a question and predict an answer based on prior knowledge. The experiment itself tests that prediction. Students then tell, or interpret, the results.

In this experiment children think about what makes a test fair. For example, they may decide that their plants need water to stay healthy. How can they be sure that water makes the difference? Scientists face similar problems. They solve them by making comparisons. A scientist would set one or more plants aside as test plants. These plants would be treated exactly like every other plant—except that the test plants would not get any water. If the unwatered plants showed signs of poor health while the watered ones remained in good condition, the experiment would suggest that water is important to a plant's health. If all the plants withered or dried up, that would suggest another factor was probably responsible.

The experiments that the children will be conducting are simplified models of scientific experiments. In a controlled scientific experiment there may be 100 or more experimental subjects and controls. Students do not need to know the terms *control* or *variable* at this point, but they should become familiar with the Guess-Test-Tell process and the concept of a "fair test."

Teacher to Teacher

Most of the children in my class decided on a test that involved their plants' need for water. But they needed quite a bit of prompting on how to set up a fair test. I found it useful to give the children several simple examples of possible ways to set up the experiment. First I just set one seedling aside and said, "We won't water this one." Most of the class thought that was fine. Then I complicated matters by saying, "We'll give another one lots of water." The class was baffled. Finally one child piped up with, "We need to water one the normal way." Gradually they come to understand why scientists use controls, but it takes some time and practice!

–Phyllis Weber, El Portal Elementary School, El Portal, CA

Preparation

1. This lesson can be taught to groups of 6–8 at a time or to the whole class together. If you choose to involve the whole class at once, either have groups of 4–6 set up their own experiments, or you can set up one class experiment.

2. Each group needs two seedlings, one as a control and the other as an experimental plant. Seedlings can be taken from extras planted in the Plant Watchers activity.

3. If you involve the whole class at one time, arrange for a parent or aide to be in class to help students fill out test plans and to help set up experiments.

4. Tape up on the wall the Plant Needs Poster (from the previous activity).

Getting Started

Use the Plant Needs Poster to review students' ideas.

What have you learned about the things plants need? How can we find out if plants need what we think they need? What would happen, for example, if our plants did not get any water? If they did not get any light? If they were not in enough soil? How can we know for sure? How can we test our ideas about plant needs?

Brainstorm class ideas. Emphasize that setting up a fair test with a comparison is important. **Would you like to be a scientist and do an experiment to find out if your plants really need one of the things you think it needs? Which need should we test?** Take a vote to select one or two of the needs to test.

Part 1

Action

1. Teach to one group at a time or divide the class into groups of 4–6.

2. Ask each group to develop a plan to test the selected seedling. Then have students turn to Plant Test in their Lab Book. Ask them to describe the plan in their own words. Be sure they understand that for their experiments to be fair, they must treat both plants the same except for the one factor that they are testing.

3. Give each group two seedlings, one to use as a comparison and the other to test. Have them carefully mark both accordingly.

4. Ask students to draw a life-size picture of the test plant on the Plant Test lab sheet, carefully noting its height, color, and number of leaves. Ask them to do the same with the comparison plant.

5. Depending on your climate, students can monitor the plants in the pots or transplant them to the garden. If you are using the garden, take students there and place the control seedlings in one bed and the test subjects in another.

6. If possible, photograph the test and control plants.

7. Ask students to check their plants once a day and record their observations on the Plant Care Plan from the previous lesson. Check during the week to see that all teams are recording their observations.

Assessment

Review the experiments with the class.

Why are we doing these experiments? When will we know if there are any results? How much time do you think it will take to see any results? Do you think we should stop the experiment for any reason—for example, if a plant looks like it might die? Why do you think your test will be a fair one?

Part 2 (one week later)

Getting Started

Show the class the photographs taken at the start of the experiment, or have students review the pictures they drew on the Plant Test lab sheet.

What has happened to your test plant? The plant you used to compare it with? How do they look today?

Action

1. Ask each group to examine the plants and discuss any differences between the test and the comparison plants that they noticed during their week of monitoring.

2. Ask the children to complete their Plant Test lab sheet and to include a drawing of both plants as they look today.

3. Encourage each group to discuss how the test plant changed and why. As they talk, circulate and take note of their ideas, progress, and interactions.

Assessment

Assess the experiments as a class.

What happened with our tests? What did we find out? How did that compare with our guesses? What do our tests suggest about what plants need?

Digging Deeper

- Take a tour of the school garden or grounds and look for plants whose needs are not being met.

- Ask students to make a waterproof sign for the garden explaining that an experiment is in progress and telling what the experiment is about.

Teacher Reflections

- How did children respond to the results of their experiment?

- Do they understand the reason why they did it?

- Do they seem to understand why a comparison is needed?

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Plant Test

Names_____Date_____

_____

We will test to find out what will happen if our plant does not get_____.

GUESS

Without_____,we think our plant will _____.

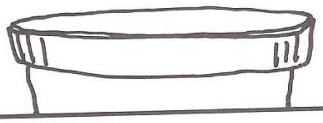
TEST

1. We will give_____ to_____.
(comparison plant name)

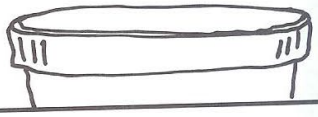
2. We will not give_____ to_____.
(test plant name)

3. We will give both plants_____ _____.

4. Here is a picture of the test plant before the test:

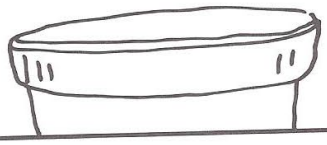


5. Here is picture of the comparison plant before the test:

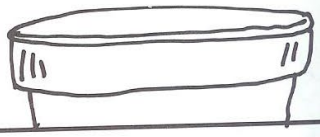


TELL

1. Here is a picture of the test plant after the test:



2. Here is a picture of the comparison plant after the test:



3. The test tells us that_____

_____

_____