Investigate 2

Plant Growth

10 minutes per day for 2 weeks

Small Groups

Objectives

- Students make predictions about the growth of plants.
- Students observe and record plant growth over time.

Materials

For each group

- terrarium, planted, from Investigate 1

For the class

4 spray bottles

- *water

For the teacher

3 lamps with 100-watt bulbs (optional)

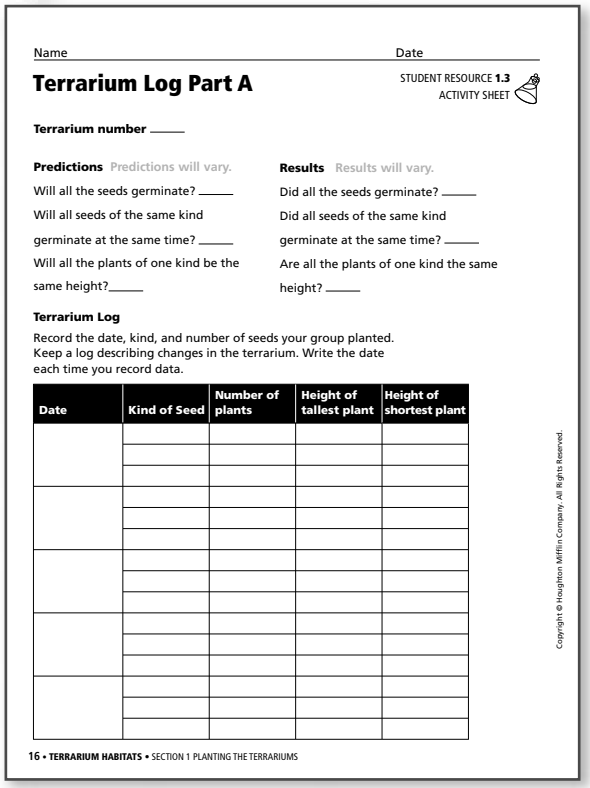
**Not provided in kit*

Student Resource

- 1.3 *Terrarium Log Part A*

Inquiry Focus

- Predict



Name _____ Date _____

Terrarium Log Part A

STUDENT RESOURCE **1.3** ACTIVITY SHEET

Terrarium number _____

Predictions Predictions will vary.

Will all the seeds germinate? _____

Will all seeds of the same kind germinate at the same time? _____

Will all the plants of one kind be the same height? _____

Results Results will vary.

Did all the seeds germinate? _____

Did all seeds of the same kind germinate at the same time? _____

Are all the plants of one kind the same height? _____

Terrarium Log

Record the date, kind, and number of seeds your group planted. Keep a log describing changes in the terrarium. Write the date each time you record data.

Date	Kind of Seed	Number of plants	Height of tallest plant	Height of shortest plant

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Student Resource 1.3 (p. 16)

1. Discuss the water needs of plants.

Discuss how much water the plants will need over a two-week period. Suggest that students water the terrariums on Monday, Wednesday, and Friday.

2. Discuss the light needs of plants.

Ask students to suggest a good place to keep their terrariums as the plants grow. Make sure they choose a place that does not get direct sunlight for long periods, as the plants may wilt. If your classroom has no windows, provide lamps for the terrariums.

3. Students begin the *Terrarium Log.*

Make copies of Student Resource 1.2, *Terrarium Log Part A,* and distribute to students. Have each group record the number of their terrarium on the Resource page. Tell students that each group will always observe the same terrarium.

4. Students make predictions.

Under *Predictions* on the Resource page, have students record their answers to the questions.

5. Students record data.

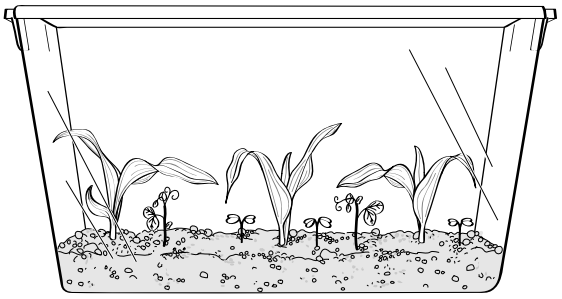
Students should keep a daily record for about two weeks, starting after seeds have begun to germinate. Data to be collected for each kind of plant include the number of plants, the height of the tallest plant, and the height of the shortest plant.

Teaching Tip

Step 2: Seeds do not require light for germination. After the seeds germinate, the terrariums can be grouped around the lamps provided in the kit or put outdoors for two hours a day.

Safety

Step 5: Remind students to wash their hands thoroughly after handling plants.



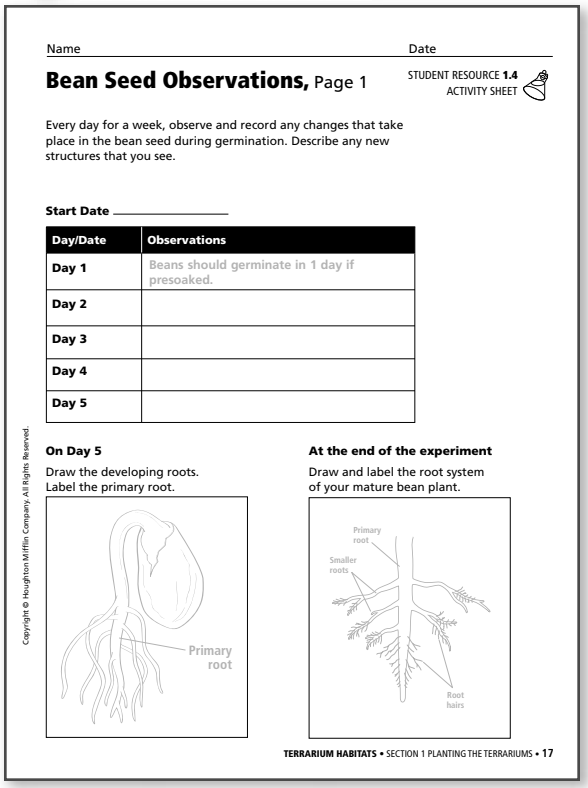
▲ Terrarium with growing plants

6. Students identify the terrarium as an ecosystem. Have students identify the living and nonliving things in their terrarium. Remind them that some things, such as air, cannot be seen. Then ask: **Is the terrarium an ecosystem?** *(Yes, it is a habitat for living things and also contains nonliving things in the environment.)*

Assessment

Ask: **All living things need air. How does a germinating seed get air if it is planted in soil?** *(There is air in the spaces between soil particles.)*

Investigate 3



Name _____ Date _____

Bean Seed Observations, Page 1

STUDENT RESOURCE **1.4** ACTIVITY SHEET

Every day for a week, observe and record any changes that take place in the bean seed during germination. Describe any new structures that you see.

Start Date _____

Day/Date	Observations
Day 1	Beans should germinate in 1 day if presoaked.
Day 2	
Day 3	
Day 4	
Day 5	

On Day 5

Draw the developing roots. Label the primary root.

Primary root

At the end of the experiment

Draw and label the root system of your mature bean plant.

Primary root
Smaller roots
Root hairs

Student Resource 1.4, Page 1 (p. 17)

What Is the Life Cycle of a Plant?

10 minutes for setup, then 10 minutes per day for 5 days, then 10 minutes every other day for several weeks

Pairs

Objectives

- Students observe the germination of a bean seed.
- Students measure the height of a growing bean plant.
- Students graph plant growth over time.

Materials

For each pair

1 bean seed
1 magnifier
1 metric ruler
1 *paper towel
1 planting cup with base
1 *plastic cup half-full of soil

For the class

4 spray bottles
• *water

For the teacher

3 lamps with 100-watt bulbs

**Not provided in kit*

Student Resources

- 1.4 *Bean Seed Observations, Pages 1 and 2*
- 1.5 *Graphing Bean Plant Growth*

Inquiry Focus

- Analyze Data

Name _____ Date _____

Bean Seed Observations, Page 2

STUDENT RESOURCE **1.4**
ACTIVITY SHEET

Measure and record the height of the bean plant every other day until the bean plant is fully grown. Students' data will vary.

Date	Height of plant
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm
	cm

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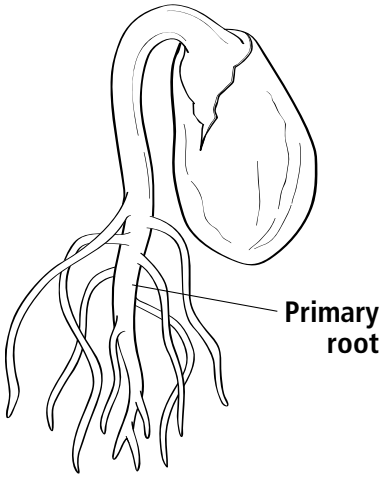
Student Resource 1.4, Page 2 (p. 18)



▲ **The main root of a germinating bean seed is called the primary root.**

Teaching Tip

Step 2: Put 5 beans on a wet paper towel in a self-sealing bag to use as extras in case some beans mold or fail to sprout.

In Advance

- Ask each pair of students to bring in a plastic cup half-filled with garden soil.
- Soak the bean seeds in water overnight for faster germination. They should begin to germinate within 24 hours of being soaked.

1. Distribute the Student Resources.
Make copies of Student Resources 1.4, *Bean Seed Observations, Pages 1 and 2,* and 1.5, *Graphing Bean Plant Growth*, and distribute to students.

2. Students prepare bean seeds for germination.
Have each student pair fold a paper towel several times, put it in the plastic base of a planting cup, and moisten the towel. They should place a bean seed on the towel and cover it with the planting cup. Remind them to keep the paper towel moist at all times.

3. Students observe germination.
Have students observe the germinating seed every day for a week. On Day 5 they should use a magnifier to observe root hairs on the developing roots and draw a diagram on the *Bean Seed Observations*, *Page 1* Resource page.

4. Students plant sprouting seeds in soil.
After one week have each pair plant the sprouting bean seed in a cup with soil they have brought from home. Remind them to keep the soil moist. Students should measure plant height every other day and record their data on the *Bean Seed Observations, Page 2* Resource page. When plant growth slows, observations can be made less frequently.

5. Students graph their data.
Have students graph their data on Student Resource 1.5, *Graphing Bean Plant Growth*. Discuss the label, units, and increments that students should use on the graph's vertical axis.

6. Students evaluate the plants.
After several weeks, have students compare plant height, stem thickness, leaf shape, and plant color. Point out that the plant leans toward the light. This plant response to light is called *phototropism*. Healthy plants are greener with thicker stems. When light is inadequate, plants may be yellow, long, and unhealthy because they waste energy trying to reach light.

Teaching Tip

Step 7: It will take about two months for bean seeds to flower and produce bean pods. You can end the observations at any point if you do not want students to observe a complete life cycle.

Safety

Step 7: Remind students to wash their hands thoroughly after handling soil and plant materials.

7. Students examine plant roots.
When the bean plants are mature or when you have ended the experiment, have each pair carefully pull up the plant to observe its root system. Roots have a main shaft, the primary root, and a system of smaller roots. Root hairs on the roots increase absorption of water from soil. Have students draw and label the root system on the *Bean Seed Observations* Resource page.

8. Discuss plant needs.
Discuss plant requirements for growth, such as the type of soil and the amounts of water and light.

Assessment

Ask: **Do seeds need light to germinate? Explain.** *(Seeds do not need light to germinate. They usually germinate underground where it is dark.)*

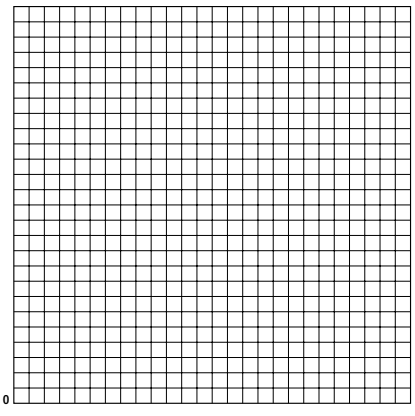
Name _____ Date _____

Graphing Bean Plant Growth

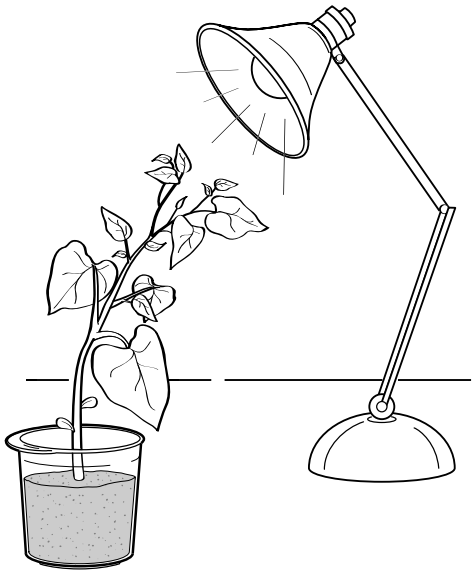
STUDENT RESOURCE **1.5**
ACTIVITY SHEET

Make a line graph to show the growth of your bean plant. Use the data you recorded on *Bean Seed Observations Page 2*. The horizontal axis is labeled for you. Write the label and units for the vertical axis. Decide the smallest and largest heights that should be shown on the vertical axis.

Graphs will vary according to plant growth, but should show steadily increasing height.



Student Resource 1.5 (p. 19)



▲ **Plants grow toward light. This response is called phototropism.**