

# Plant Life Cycle Begins

## OBJECTIVES

Students begin to investigate the complete life cycle of a pea plant by planting seeds and observing them until they are seedlings.

### The students

- ▶ plant their own pea seeds
- ▶ predict when the seeds will germinate
- ▶ observe the emerging plants
- ▶ begin a class Pea Life Cycle chart

## SCHEDULE

**Session I** About 40 minutes, followed by an observation 3–5 days later

**Session II** About 30 minutes, approximately 1 week after Session I, and after the completion of Activity 3, Session IV

## VOCABULARY

seed  
seedling

## MATERIALS

### For each student

- 1 Activity Sheet 2
- 1 planter cup, with base

### For the class

- 1 calendar, wall\*
- 1 chart, Pea Life Cycle
- 1 container, 0.5-liter\*
- 3 bags gravel
- light source\*

marker, felt-tip\*

newspaper\*

- 1 set pictures, Pea Life Cycle
- 1 roll plastic wrap
- 1 bag rubber bands
- 1 pair scissors\*
- 1 pkg seeds, pea
- 2 bags soil, potting
- 1 roll tape, masking
- 6 water sprinklers
- water, tap\*

\*provided by the teacher

## PREPARATION

### Session I

- 1 The day before you conduct this activity, fill a large drinking glass or a 0.5-liter container half-full with water. Add the pea seeds (enough for each student to have three seeds) and soak them overnight to speed up the germination process.
- 2 Make a copy of Activity Sheet 2 for each student.
- 3 Hang a calendar on the wall where it is clearly visible.
- 4 Attach the bases to the planter cups and fill the water sprinklers with water.
- 5 Make a copy of the Pea Life Cycle pictures and cut them apart to separate them. Set aside the pictures of the seed, sprouting seed, and seedling for use in this activity (see Figure 2-2). Retain the pictures showing other life cycle stages for use in upcoming activities.
- 6 Hang the Pea Life Cycle chart on the wall where it is clearly visible. Have masking tape and a felt-tip marker ready when using the chart.

- 7 Cover a large work surface with newspaper sheets to serve as the distribution station. Place the potting soil, gravel, seeds, water sprinklers, plastic wrap, and rubber bands at the distribution station.
- 8 Choose a warm, draft-free area where students can leave their planter cups. Set up a light source in this area for the emerging plants.

### Session II

Each student will need his or her copy of Activity Sheet 2 from Session I.

## BACKGROUND INFORMATION

The **seeds** of most plants will germinate and begin to grow only under favorable environmental conditions. Generally, these conditions include enough water and oxygen and suitably warm temperatures. Light is not needed until the plants emerge from the soil. After the **seedling** emerges, the equivalent of a 100-watt bulb about 40 cm (15 in.) from the plant is sufficient for good growth.

Even under the best of conditions, many plant seedlings do not survive. Because their root systems are not well developed, they dry out easily, and need a regular supply of water. However, seedlings can also suffer if they receive too much water. Many kinds of seedlings are susceptible to diseases, including those caused by various fungi that thrive in moist environments. Standing water on the surface of the soil may cause a condition known as “damping off,” in which fungi attack the plant’s stem. Too much water under the surface of the soil can allow fungi to attack the plant’s root system.

Therefore, drainage is extremely important to the survival of seedlings. Throughout their study of plants in this module, students will use planter cups equipped with drainage holes. They will also use a layer of gravel in the bottoms of their

planter cups in order to facilitate drainage of water from the potting soil.

### ▼ Activity Sheet 2

#### Plant Life Cycle Begins

Date of planting pea seeds \_\_\_\_\_ **Answers will vary.**  
 Date I think plants will appear \_\_\_\_\_ **Answers will vary.**  
 Date plants actually appeared \_\_\_\_\_ **Answers will vary.**

1. Draw what you think your plants will look like when they first come up.
2. Draw what your plants actually look like as they first come up.

Accept all drawings



3. Draw what your pea seedling looks like 4 days or so after it first came up.



Other observations:

**Answers will vary.**

**Possible answer: Small leaves have grown in first in a closed, folded position.**

## Guiding the Activity

### Additional Information

#### Session I

**1** Tell students that in this activity they will begin an investigation of the life cycle of the pea plant. Ask, **How do you think we should begin?**

Display the pea seeds. Hold one up and ask, **Does anyone know what this is?**

Write the word *seed* on the board.

Tell students that **seeds** are plant structures that contain a plant embryo and a stored food supply that can grow into a mature plant if conditions are right.

Tell students that since plants grow from seeds, they will begin their investigation by planting seeds.

Ask, **What does a plant need in order to grow and be healthy?**

Ask, **What is the proper way to plant a seed?** Remind students to keep in mind the needs of plants as they answer the question. List their suggestions on the board. Discuss each helpful suggestion.

If students do not mention the following items, add them to the list on the board: Seeds should be planted near the surface of the soil. The seeds should be kept moist, but not overwatered.

**2** Give each student a planter cup with the base attached and a strip of masking tape. Have students write their names on the tape. Have them attach the tape to the sides of their planter cups.

*Accept all reasonable suggestions.*

*Accept all reasonable answers.*

**Note:** Caution students not to put seeds in their mouths.

*Light, water, air, and soil are the main requirements for growing plants; until a seed sprouts, it does not require light.*

*Accept all reasonable suggestions.*

*If you have not already done so, point out that until seedlings emerge from the soil, they do not need light.*

## Guiding the Activity

Gather the students at the distribution station and demonstrate how to plant seeds. (Use one of the students' planter cups as a model.) Place a layer of gravel—about 2 cm (about 0.8 in.)—in the bottom of the planter cup. Ask, **Why do you think we put gravel in the bottom of the planter cup?**

Explain to students that the gravel provides drainage for the water. Without it, the water may stay in the bottom of the cup. The roots should not get too much water, and the gravel helps the extra water to drain out of the cup.

Fill the cup with soil to within 2 cm (about 0.8 in.) of the top. Pat it gently with your fingers. Ask the students, **Why is it important not to pack the soil too tightly?**

**3** Have the students put gravel in their planter cups and fill them with soil.

Instruct the students to use their little fingers to make three small holes about 3 cm (about 1.2 in.) apart in the soil.

Give each student three pea seeds. Have students plant the seeds in the holes.

Tell students to push the soil back over the seeds and press down gently (see Figure 2-1).

## Additional Information

*Accept all reasonable answers.*

*If the soil is packed down tightly, the water will not be able to soak in as easily.*

*The holes should form the three points of an imaginary triangle so as to position the seeds properly in the cup.*

*The seeds should be planted no deeper than twice their diameter.*



▲ Figure 2-1. Planting pea seeds.

## Guiding the Activity

### Additional Information

- 4** Demonstrate how to water the planted seeds with the water sprinkler. Use a gentle spray so as not to displace the soil on top of the seeds, and do not leave any water standing in the base of the cup. Ask, **How do you know when to stop sprinkling?**

After students have finished watering their seeds, have them tear off sheets of plastic wrap and use it to cover each planter cup. Next, have students put a rubber band around the top of the cup to hold the plastic wrap in place. Then have students place their cups close together on a table in a warm, draft-free place.

Tell students the water sprinklers will be kept next to their pea plants, and have them place them there. Have students return extra potting soil to the bag, discard the newspapers, and then wash their hands.

*Students should realize the seeds have been sufficiently sprinkled when the water begins to run out the bottom of the cup.*

- 5** Point out the wall calendar to the class. Have students note the date of planting. Invite a volunteer to point out the date on the calendar and circle it with a felt-tip marker. Write in *Pea Seeds Planted*. Ask the students, **What do you think will happen to the seeds?**

Ask, **How long do you think it will take for the young plants to emerge?**

Give each student a copy of **Activity Sheet 2**. Have students record the date of planting and the date they think that young pea plants will appear.

Instruct students to draw on their activity sheet a picture of what they think their pea plants will look like when they first come up.

*Accept all predictions. Students will probably know that the seeds will grow and sprout, and small young pea plants will come up out of the soil. They will grow into larger pea plants.*

*Accept all answers. The young plants should emerge from the soil in 3–5 days.*

- 6** Point out the Pea Life Cycle chart. Ask, **Where does the life cycle of a pea plant begin?**

*with a pea seed*

## Guiding the Activity

Show students the picture of the pea seed. Tape the picture at the top center of the chart. Using a felt-tip marker, write the word *seed* beneath the picture (see Figure 2-2).

Tell students that they will continue to add to the chart as they observe the life cycle of the pea plant.

Return the masking tape and plastic wrap to the kit, along with any leftover soil, seeds, gravel, and rubber bands. Leave the Pea Life Cycle chart in its display position. Return the water sprinklers to the area where the pea plants are kept.

## Additional Information

- 7 Over the next 3–5 days, have students monitor the planter cups to make sure that the soil remains evenly moist. The seeds should not need any additional water until after they germinate. However, if the soil surface becomes dry, have students water the surface gently with the water sprinklers and then replace the plastic wrap.

*If water is standing in the bases of the cups, tip the cups gently to allow it to drain off.*

- 8 About 3–5 days after planting, emerging seedlings should appear. When they do appear, have students observe their plants and draw a picture on their activity sheets of what the plants look like. Have them note on their activity sheets the actual date that most of the young pea plants emerged.

At this point, have students remove the plastic wrap from the pots and place the plants under the light source. Turn the light source on, and instruct students to water and tend their young plants on a regular basis. Tell them that in future activities, they will observe changes in their pea plants. Collect each student's copy of Activity Sheet 2 for use again in Session II.

## Session II

- 9 Have students retrieve their pea plants when the seedlings are about 5 cm (about 2 in.) tall. Then redistribute each student's copy of **Activity Sheet 2**, and have the students

## Guiding the Activity

### Additional Information

complete their activity sheets by drawing the plants again. If more than one seed in a cup has germinated, have the students break off the stems of the smaller or weaker-looking plants at the soil line.

Explain to students that the first leaves that appear will not resemble the leaves of the mature plant. The next leaves to appear will be the first true leaves.

*Each student needs only one healthy plant to study. Eliminating the other seedlings in the pot will give the stronger plant more room for the development of its root system.*

- 10** Ask, **How did your predictions about when the young pea plants would come up compare with their actual date of emergence?**

*Answers will vary.*

Ask, **How did your predictions about what the plants would look like compare with how they really appear?**

*Answers will vary.*

- 11** Write the word *seedling* on the board.  
Ask, **What is a seedling?**

*Accept all reasonable answers.*

Tell students that a **seedling** is a small, young plant.

Ask, **What can you call the plants in your planter cups?**

*pea seedlings*

Ask, **Where did the pea seedlings come from?**

*They sprouted and grew from the pea seeds.*

Ask, **In what ways is your seedling different from the seed you planted?**

*Accept reasonable answers. It grows; it is larger; it has leaves and a stem; and so forth.*

- 12** Ask, **What other seedlings have you seen?**

*Students may mention young tree seedlings or seedlings of plants in gardens.*

Ask, **Where do you think these seedlings came from?**

*They sprouted and grew from seeds.*

- 13** Refer students to the Pea Life Cycle chart.  
Ask, **Based on what you have observed, what happens to a seed when it is planted?**

*It sprouts and grows into a seedling, or a new plant.*

Ask, **What should we show next on our Pea Life Cycle chart?**

*a sprouting seed and a seedling*

## Guiding the Activity

Show students the pictures of the sprouting seed and the seedling. Ask a volunteer to come up and show where to put the picture of the sprouting seed on the chart. Tape the picture in place. With a felt-tip marker, write the words *sprouting seed* beneath the picture. Draw an arrow on the chart from the seed to the sprouting seed (see Figure 2-2).

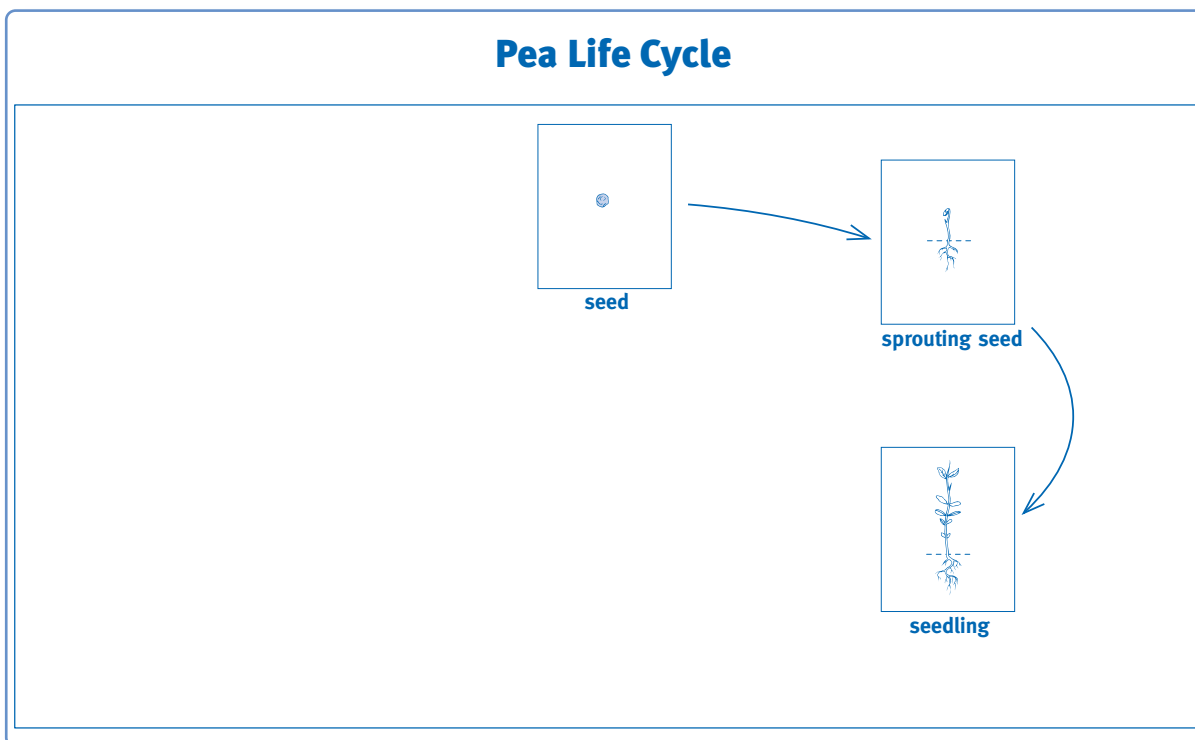
Ask a second volunteer to come up and show where to put the picture of the seedling on the chart. Tape the picture in place. With a felt-tip marker, write the word *seedling* beneath the picture. Draw an arrow on the chart from the sprouting seed to the seedling. Ask, **What do the arrows show?**

Ask, **What does our chart show now?**

## Additional Information

*The first arrow shows that the seed sprouts and begins to grow. The second arrow shows that it grows into a seedling.*

*The chart shows that the life cycle of a pea plant begins with a pea seed that sprouts and grows into a pea seedling (see Figure 2-2).*



▲ *Figure 2-2. Starting the Pea Life Cycle chart.*



## **R** E I N F O R C E M E N T

Have students bring in pictures of a variety of seedlings from magazines or seed catalogs, and compare the development of those seedlings with that of the pea seedlings.

## **S** C I E N C E J O U R N A L S

Have students place their completed activity sheets in their science journals.

## **C** L E A N U P

Have students return their seedlings to their position under the light source. Leave the Pea Life Cycle chart in its display position. Remind students to water their seedlings as needed. They will examine their plants again in Activity 6.

## Connections

### Science Extension

► After students have planted their seeds correctly, let teams choose one planting condition to do incorrectly with additional seeds that you supply, as listed below. As students notice effects, have teams share their observations. In a concluding discussion, ask students to identify the conditions that seemed to have the most harmful effects on seed germination and seedling growth.

1. Do not put gravel in the bottom of the cup.
2. Tightly pack the soil before and after planting the seeds.
3. Plant the seeds deeply in the soil.
4. Lay the seeds on top of the soil.
5. Plant all three seeds in the same hole.
6. Do not water the seeds when they are first planted or afterward.
7. Overwater the seeds so the soil is kept constantly soggy.
8. Do not cover the cup with plastic wrap (but do water the seeds correctly).
9. Do not put the cup under a light source when the seeds have sprouted.
10. Do not cut off the smaller/weaker sprouts.

► Students may think that all plants need soil, but this is not true. For example, epiphytes, or “airplants”—including bromeliads, Spanish moss, and some ferns and orchids—grow on tree branches and are not rooted in soil. Ask students to investigate such plants. (Also see the Science, Technology, and Society connection.)

### Science and the Arts

Ask students to bring in a variety of dried seeds, including peas and beans of various types, nuts, and seeds from squash,

pumpkins, watermelon, and other fruits and vegetables eaten at home. Provide strong, large-eyed needles, heavy thread (such as waxed button thread), and white glue. Let students use the seeds to make necklaces, bookmarks, pull-chains for lamps, and other decorative items of their own design. Give students an opportunity to share their creations with the rest of the class before they take them home. (You may need to supervise student handling of needles, especially with hard seeds.)

### Science and Careers

Invite a horticulturist or a nursery or greenhouse manager to visit the class and describe his or her work. If possible, arrange a field trip to a greenhouse or nursery, with the manager or other knowledgeable worker giving the class a guided tour. Help students prepare for the visitor or trip by discussing issues they would like to know more about.

### Science and Language Arts

For thousands of years, people have held superstitions about planting crops, such as planting during a particular phase of the moon or planting certain crops according to the signs of the zodiac. Ask students to consult library sources to find out about such superstitions and whether people still believe them today.

### Science, Technology, and Society

Suggest that students find out about the science of *hydroponics*—growing plants in a nutrient solution without soil. Some students might like to devise a set-up to demonstrate hydroponics. (In an aggregate culture, plants are rooted in sand, gravel, or another coarse material, and a nutrient solution is circulated through the material. In a water culture, plants are suspended on a bed over a tank of nutrient solution.)