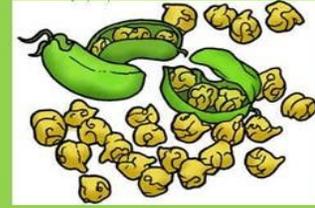


Lesson 2.A. Classroom Discussion and Activity: Experience the Life Cycle of a Bean Plant



Time required for discussion and activity: 30 minutes

Materials for Lesson 2.A.

- Cards with stages of the bean life cycle written on them (see stages listed below or see cards on following pages)
- Pencils and colored pencils for handout
- One handout for each student: *The Life Cycle of a Bean Plant*

Learning objectives for Lesson 2.A.

Students will be able to:

- Develop sequencing skills
- Identify structures of plants
- Describe a system in terms of its components

Key Words

- **Cotyledons** are the first leaves that emerge from a seed.
- **Threshing** is the process of separating dry seeds from the plant.

Preparation for Lesson 2.A.

Print the cards showing the stages of the life cycle of a bean plant (found on the following pages). Depending on how many students are in the class, make duplicates or discard steps as needed so each student has one card.

Stages of the life cycle of a bean plant:

- School garden purchases seed
- *Seed is planted in the ground
- *Seed germinates underground
- *Seed emerges above ground
- * **Cotyledons** emerge from seed
- Bean plant uses sunlight and water to grow
- Roots take up water and nutrients to grow
- *Leaves develop
- Leaves capture energy from sun (photosynthesis)
- Root nodules form on roots
- *Flowers develop
- *Bean pods develop
- *Bean pods dry out and are ready for harvest
- Bean pods are **threshed** open to release beans
- *Bean seeds are collected
- Bean seeds are saved for planting
- Bean seeds are packaged and sold
- Bean seeds are soaked, cooked, and eaten

*Necessary for this activity, others optional (for use in larger classes)

Instructional Process

Step 1. On a whiteboard, write down five main plant parts (seeds, roots, leaves, flowers, and pods). Distribute the Student Handout: *The Life Cycle of a Bean Plant*. While students are seated, project handout for all to see and point out plant parts to students as needed while they identify and color in each plant part on their handout as a different color. Keep document projected throughout the hands-on activity that follows as a reference for students if needed (teacher's discretion).

Ask Students

- How many times do you see each plant part on the handout? (The goal is to engage students in the upcoming activity, not necessarily provide right or wrong answers)

Step 2. Have students stand in a line and hand out cards with life cycle stages on them and instruct students to silently read their cards and place them on their foreheads for others to read.

Step 3. Instruct students to stand next to each other in order of the bean life cycle; students must remain silent, but can use non-verbal communication while getting in proper order.

Step 4. Once the students have completed this task, ask them to look at their cards and then the cards on either side of them. Ask students if they think they are in the correct position for each spot in the bean life cycle. Starting at the beginning of the life cycle, have the class vote by raising their hand to confirm the placement of each stage of the lifecycle. If a student is in an incorrect position, have the class decide as a group where to relocate that student. The list of stages on the front page is in chronological order to guide your discussion with the students.

Step 5. Once completed, have the students keep their cards and sit at their desks.

Step 6. Discuss each stage of the bean life cycle on the handout, asking students to raise their hand if they have the stage being discussed. Have students fill in the blanks on the handout (key provided).

Step 7. Time permitting, have students swap cards with each other and get in order again.

Step 8. Challenge students to share the life cycle handout with family and friends at home and

Lesson 2.B. School Garden Activity: Count and Record Germination Rates



Time required for garden activity: 30 minutes

Materials for Lesson 2.B.:

- Trowel
- Clipboards for students
- One handout for each student: *Count and Record Germination Rates*

Learning Objectives for Lesson 2.B.

Students will be able to:

- Determine percentage of germinated seeds (germination rate)
- Hypothesize reasons for non-germination

Preparation for lesson 2.B

Before beginning garden activity, check garden to see if at least half of the seeds have germinated. If not, wait 2 days and check again.

Instructional Process

Step 1. Before taking students to the garden, distribute the handout: *Count and Record Germination Rates* and a clipboard. Have students write the number of seeds planted in the denominator of each equation.

Step 2. In the garden, count the number of plants that are visible above ground for each variety and have students write the number of germinated seeds in the numerator of each equation (handout provides one equation per variety or row).

Step 3. Discuss reasons plants may have germinated or not (i.e., unhealthy/diseased seed, buried too deeply, birds ate seeds, seed rotted, too cold, too dry, too old). Have them think about it, pair up with a buddy and share their idea with their buddy. Ask a few students to share what they think.

Step 4. With a trowel, dig up at least one seed in each row that may have not germinated.

Step 5. Have students draw seeds that did not germinate and a growing plant on the handout.

Step 6. Return to the classroom and have students calculate germination rate: $(\text{Number of visible plants}) / (\text{Number of seeds planted}) \times 100 = \% \text{ of seeds that germinated.}$

Step 7. Time permitted, ask students what gardeners can do to increase the number of seeds that germinate?

Count and Record Germination Rates



Garden numbers: How many seeds germinated per variety?

Equation: $\frac{\text{(number of visible plants)}}{\text{(number of seeds planted)}} \times 100 = (\% \text{ seed germination})$

Variety 1: _____ x 100 =

Variety 3: _____ x 100 =

Variety 2: _____ x 100 =

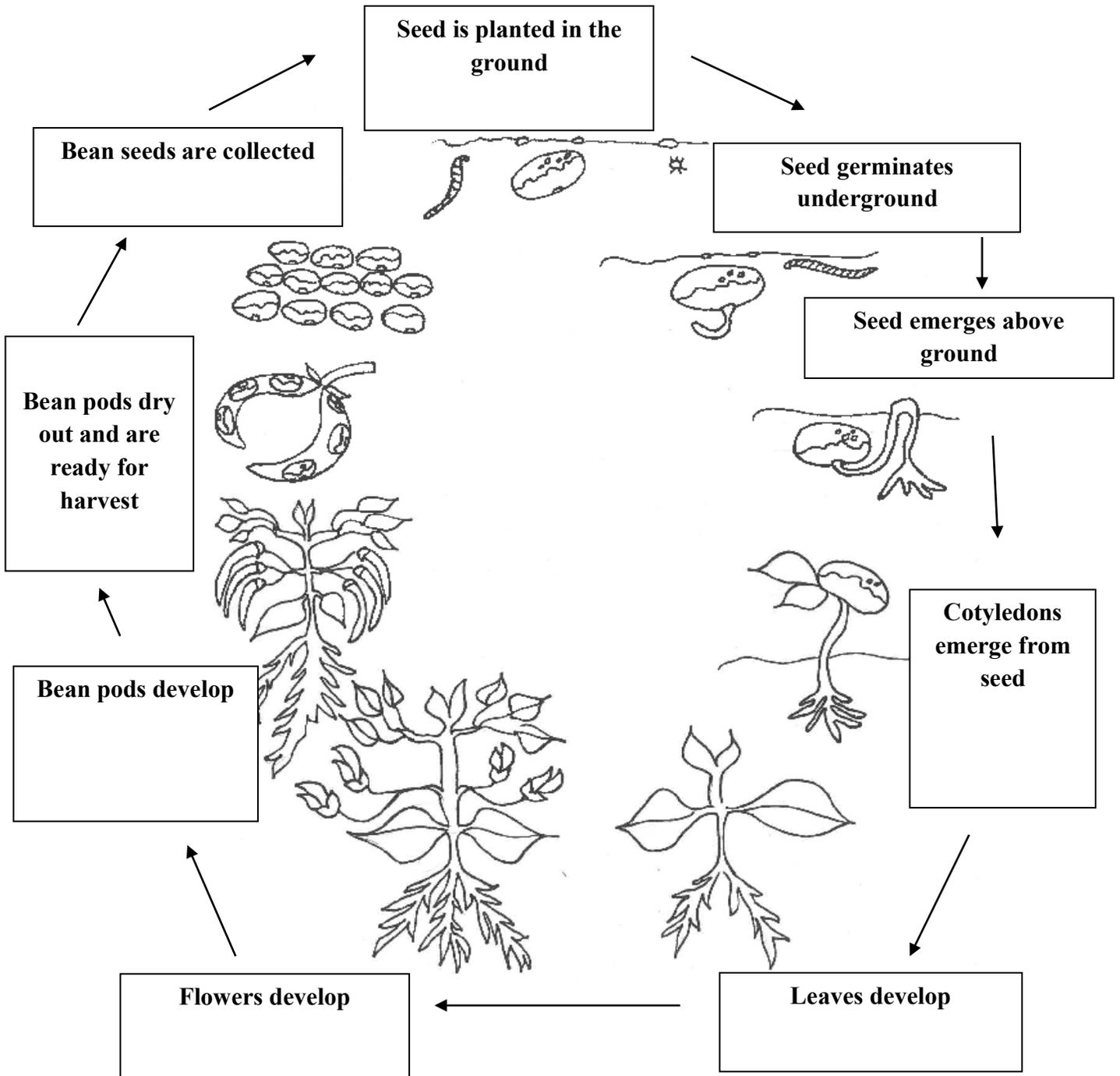
Variety 4: _____ x 100 =

Draw seed

Draw plant

Root nodules will develop on the roots of legume plants as they grow.

Teacher's Key: The Life Cycle of a Bean Plant

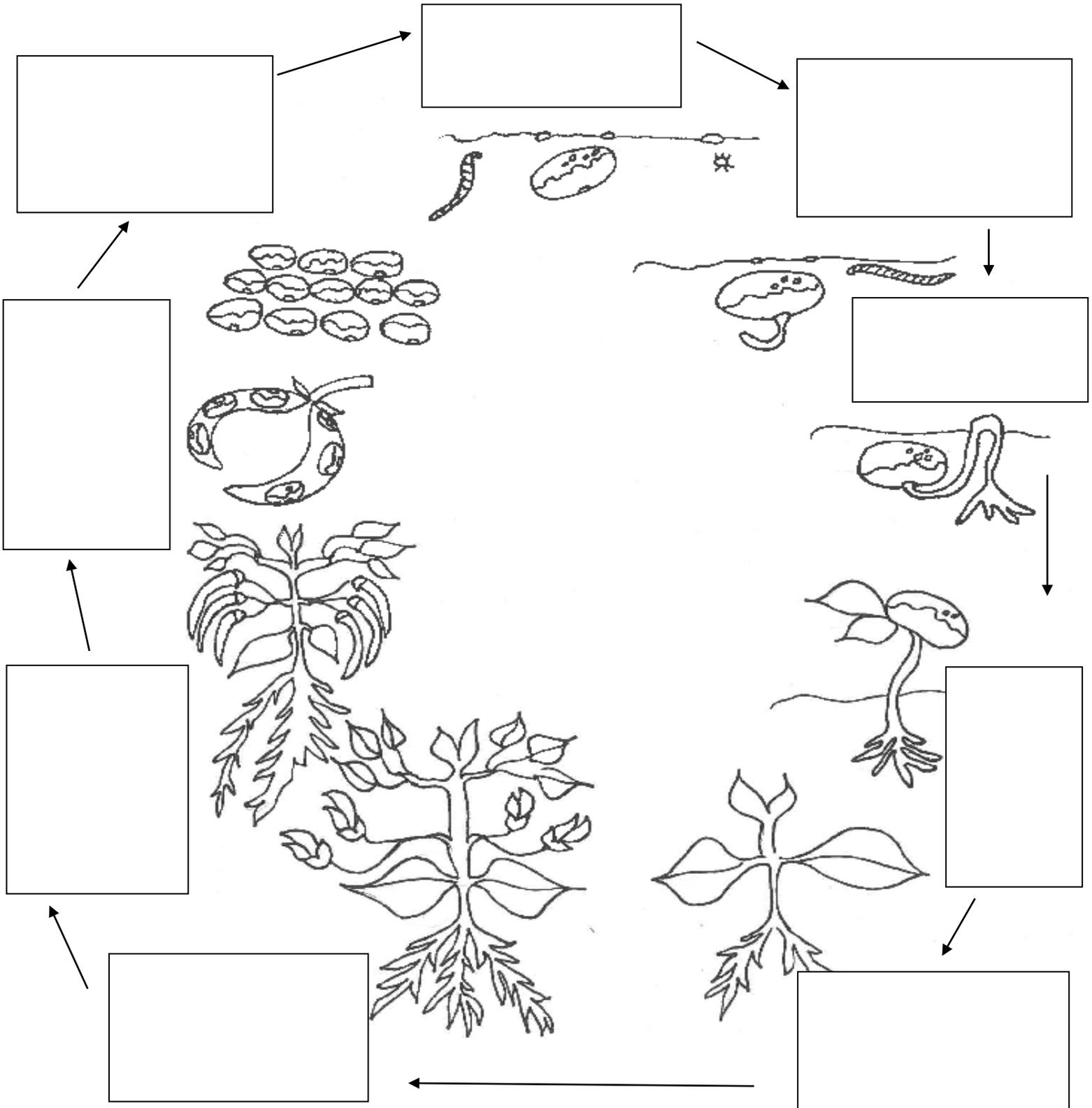


The Life Cycle of a Bean Plant



Name _____

Date _____



School garden purchases seed	*Seed is planted in the ground
*Seed germinates underground	*Seed emerges above ground
*Cotyledons emerge from seed	Bean plant uses sunlight and water to grow

<p>Roots take up water and nutrients to grow</p>	<p>Root nodules form on roots</p>
<p>*Leaves develop</p>	<p>Leaves capture energy from the sun (photosynthesis)</p>
<p>*Flowers develop</p>	<p>*Bean pods develop</p>

<p>*Bean pods dry out and are ready for harvest</p>	<p>Bean pods are threshed open to release beans</p>
<p>*Bean seeds are collected</p>	<p>Bean seeds are saved for planting</p>
<p>Bean seed are soaked, cooked, and eaten</p>	<p>Bean seeds are packaged and sold</p>