

Planting the Seeds for Science Exploration



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Pre-assessment Activity

Entrance Slip

What is found inside of a seed? Make your best guess.

Draw or explain.

Engagement

Closely examine the seeds. Use your magnifying glass to notice details.

Draw pictures and record observations.

How are the seeds similar? How are they different?

Exploration Phase – Part A

What's the reason for a seed?

Part A: Closely examine the dry lima bean seed. Draw a picture of the seed. Describe its physical properties.

Part B: Closely examine the soaked lima bean. Draw a picture of the seed. Describe its physical properties. Carefully open the soaked lima bean. Draw a picture or describe with words.

Explanation Phase – Part A

What do you notice on the inside curve of the seed? This is where the bean was connected to the bean pod. It is called the scar.

Do you see a small hole above the scar? (micropyle)

Do you see a little bump at the top of the bean seed? (hypocotyl)

What happened to the outside of the seed when it was soaked? This is called a seed coat. What do you think the seed coat is supposed to do?

What happened to the two halves of the seed?

What did you find inside the seed? Describe what you found.

If we planted this lima bean seed, what type of plant would it grow into?

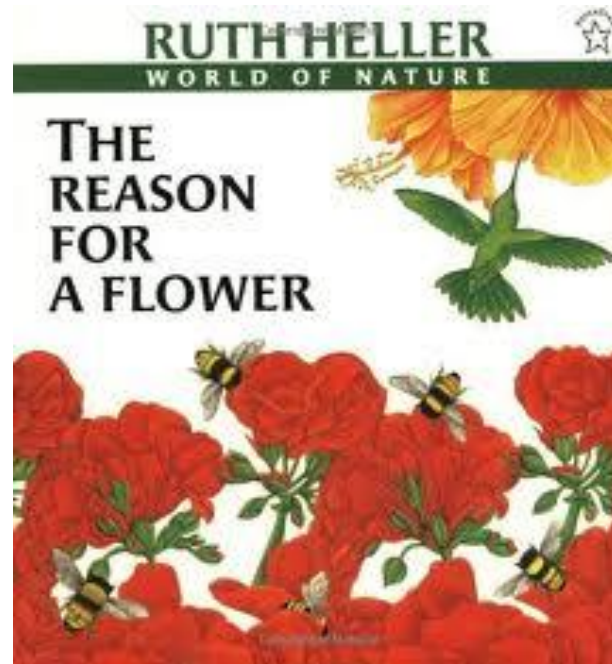
Since this seed will grow into a lima bean plant, what do you think the object inside the seed is? (embryo)

Why do you think the seed coat softened and the two seed halves opened up a little when the bean seed was soaked? What will the embryo be able to do now?

What does every living thing need to survive? (food, nourishment) What will the embryo use for food? The two halves of the bean seed are stored food, the embryo plant will use the stored food to grow. The stored food is called the cotyledon.

Exploration – Part B

What do you notice on the cover of this book, “The Reason for a Flower” by Ruth Heller?



What do you notice happening to this flower?

Exploration – Part B (cont.)

Read the book. Stopping periodically to discuss the pictures.

On the page with all the different seeds ask:

Are there any items that you recognize on this page?

Where are the seeds in the tomato?

Are any of the seeds on this page similar? How are the seeds different?

Continue reading until you come to the page with the carnivorous plants.

What do you notice about the shapes of these plants?

Do you know the names of any of these plants?

How could we find out the names of these plants?

Continue reading the book.

Look carefully at the pictures of “This one has become a plum”. What do you notice about the petals? What eventually replaces the seeds?

Expansion Phase

What does a seed need in order to grow?

Record your predictions.

Does a seed have to be planted in the ground in order to start growing?

We're going to see if these bean seeds will grow when we place them in a plastic bag on top of a damp paper towel. Do you think the seeds will grow? Record your prediction.

Expansion Phase (cont.)

1. Write your name on your bag with a marker.
2. Line a quart-sized resealable bag with a moist paper towel.
3. Place six staples 4 – 5 centimeters from the bottom of the bag.
4. Position each seed above one of the staples. Position the seeds in different directions.
5. Pour enough water into the bag to have about a finger's width of water in the bottom of the bag.
6. Hang up your bag.

Expansion Phase (cont.)

Assuming that the seeds will grow:

Which do you think will push through the seed first, the roots or the stem? Record your prediction.

If a seed is turned sideways, which way will the root grow? Record your prediction.

We will monitor the growth of our seeds. Date and draw a picture of your lima bean seeds in your science notebook daily.

As the seeds start to grow. Introduce the term germination.



Evaluation Phase

Exit Slip

What is inside a seed? Draw a picture and label the parts.

Seed Concepts

Beans are angiosperm seeds. Angiosperms are flowering plants.

A seed coat protects the contents of a seed. A seed coat is formed by the wall of the ovule.

The little hole above the scar is the micropyle. This is a small hole in the ovule through which a pollen tube enters.

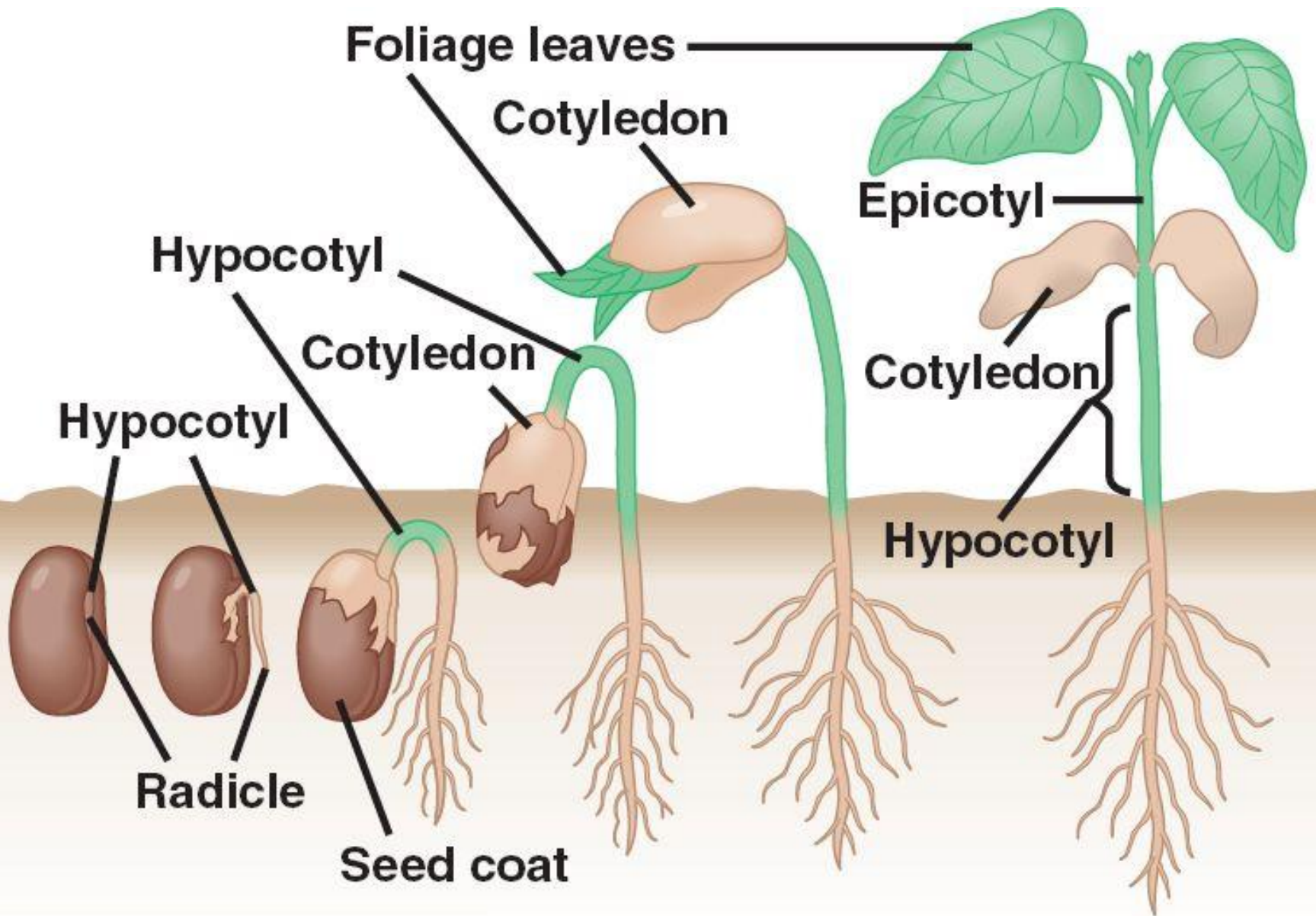
There is a little bump above the micropyle. This is the hypocotyl which develops into the lower stem and root.

Ovules are seedlike parts within a flower's ovary that contain eggs and ripen into seeds when fertilized.

A seed contains an embryo plant and cotyledon (seed leaves). The embryo plant contains the plumule (leaf and stem) and radicle (root) parts. The cotyledon is store food.

Germination takes place when a plant starts to grow.

Germination requires moisture, air, and warm temperatures.



Common garden bean

The 5E Model of Instruction

Phase	Learning Purposes
Engage	<ul style="list-style-type: none">•Initiates the Learning Task•Introduces the major ideas of science in problem situations•Makes connections between past and present learning experiences•Focuses student thinking on the learning outcomes of the upcoming activities•Mentally engages students in the concept to be explored•Motivates students
Explore	<ul style="list-style-type: none">•Provides opportunities for students to test their ideas against new experiences•Provides opportunities for students to compare their ideas with their peers•Provides a common base of experiences in which students actively explore their environment or manipulate materials
Explain	<ul style="list-style-type: none">•Provides opportunities for students to develop explanations•Introduces formal language, science terms, and content information to make students' previous experiences easier to describe and explain.
Expansion	<ul style="list-style-type: none">•Applies or extends students' developing concepts in new contexts•Provides opportunities for students to develop deeper and broader understanding.
Evaluate	<ul style="list-style-type: none">•Encourages students to assess their understanding as they apply what they know to solve problems.

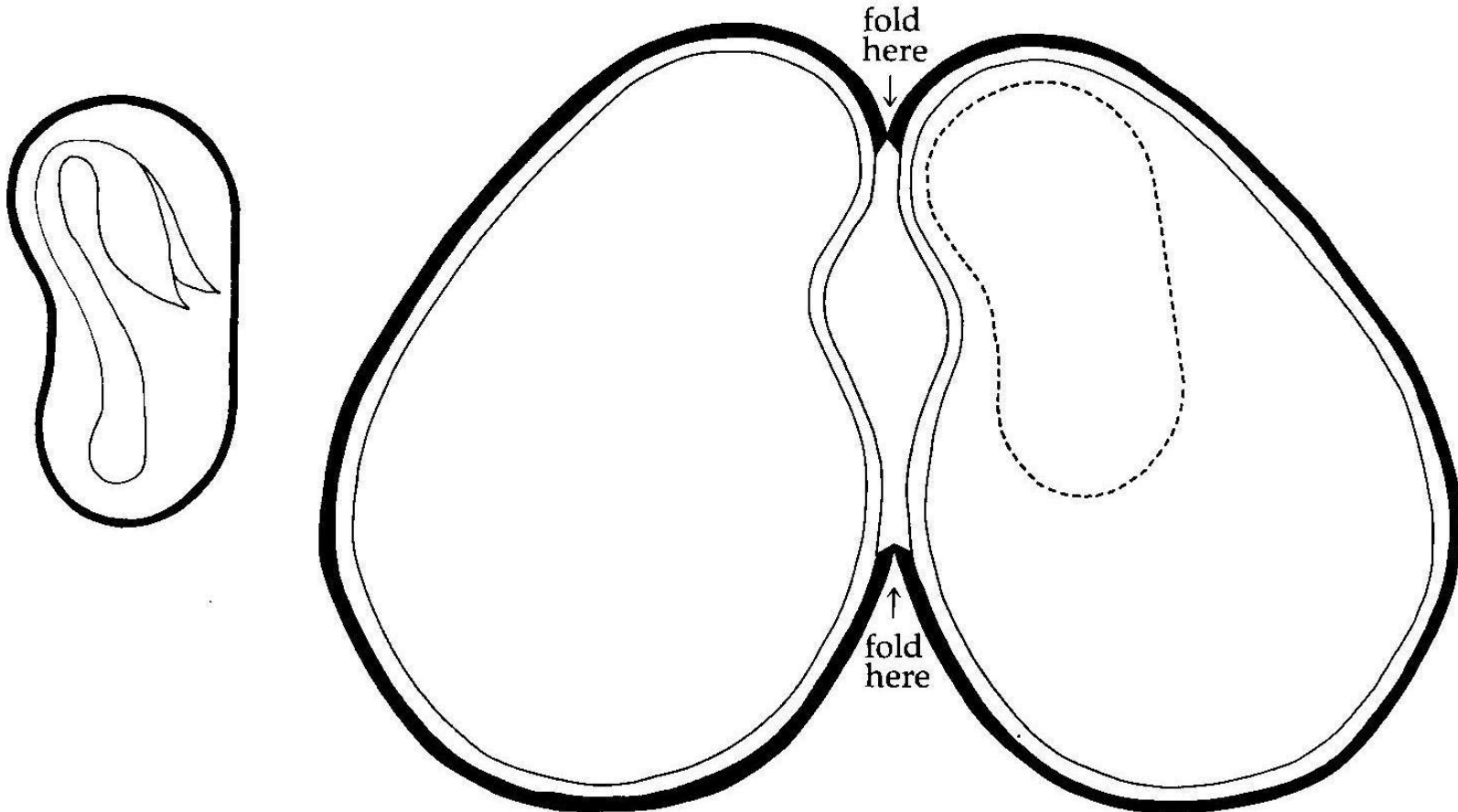
Seamless Assessment-5 E Model

Model Phase	Assessment Purposes
Engage	<ul style="list-style-type: none">•Teachers identify student's incoming science ideas and misconceptions.•Teachers determine what student need to explore in the next phase.
Explore	<ul style="list-style-type: none">•Teachers determine how students are progressing in their conceptual understanding.•Determine what students don't understand and determine instructional interventions•Determine what needs to be explained in the next phase
Explain	<ul style="list-style-type: none">•Students demonstrate their current understanding.•Determine what ideas need further instructional attention•Determine what elaborations will help scaffold learning
Elaborate	<ul style="list-style-type: none">•Demonstrate ability to apply and transfer understanding to new context.•See how students use formal representations of science knowledge.•Determine what will be important to evaluate in the next phase.
Evaluate	<ul style="list-style-type: none">•Determine what students learned from the unit.•Students are metacognitive about their learning.•Teachers make decisions about new 5E learning cycles.

Name: _____

Make a Seed

1. Color the seed and the baby plant.
2. Cut out the seed and the baby plant.
Be sure to cut on the dark lines.
3. Paste the baby plant
on the dotted lines in the seed.
4. Fold the seed together.



To the teacher: Using the finished seeds, students can name parts of a seed. Students may punch holes in the tops of their seeds and hang them from the ceiling as mobiles.

SEED

FACTS

References

Seamless Assessment in Science: A Guide for Elementary and Middle School Teachers by Sandra K. Abell & Mark J. Volkman, (2006). Portsmouth, NH: Heinemann.

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Plants: Mind-Boggling Experiments You can Turn into Science Experiments by Janice Van Cleave (1997). New York: John Wiley & Sons, Inc.