

Plant Power - "A Seed Spectacle"

Objectives The student will be able to observe, identify and describe the parts of a seed.

Grade Level

1-3

4-6

TEKS:

S- 1.2A; 1.2D; 1.6B; 1.9A; 2.2F; 2.4A; 2.4B; 2.7A; 2.8A; 2.9A; 2.10A; 3.2A,B; 3.5A

4.2A,B,C; 5.2A,B,C; 5.6B,C

TAKS:

GRADE

OBJECTIVES

Reading	3, 4, 5, 6	1, 3, 4
Writing	4	1, 2, 3, 4, 5, 6
Science	5	2, 3, 4

Assessment Summary:

- Objective 1: Students will be able to label the parts of a seed and describe the function of each part.
- Objective 2: Students will write an informative/narrative paper about how they would plant any kind of seed.

Background Information: Plant Power - "A Seed Spectacle" page: IV - 25
 "Oh Say Can You Seed?" All About Flowering Plants
 by Bonnie Worth (Random House)

Materials: Lima beans - two or three per student
 Water
 Bean Chart - Parts of a Seed
 Paper towels
 Index cards
 Potting soil
 Clear plastic cups
 Cotton balls
 Clear food service gloves (from school cafeteria)
 Dried pinto beans, blackeyed peas, corn seed
 Small seeds such as lettuce, radish, kale, turnip, carrot, tomato
 Construction paper - yellow, green, tan
 Glue sticks

Plant Power - "A Seed Spectacle"

Procedure

1. Introduce new vocabulary:

Grades 1-3

embryo

cotyledon

seed coat

Grades 4-6

Monocot

Dicot

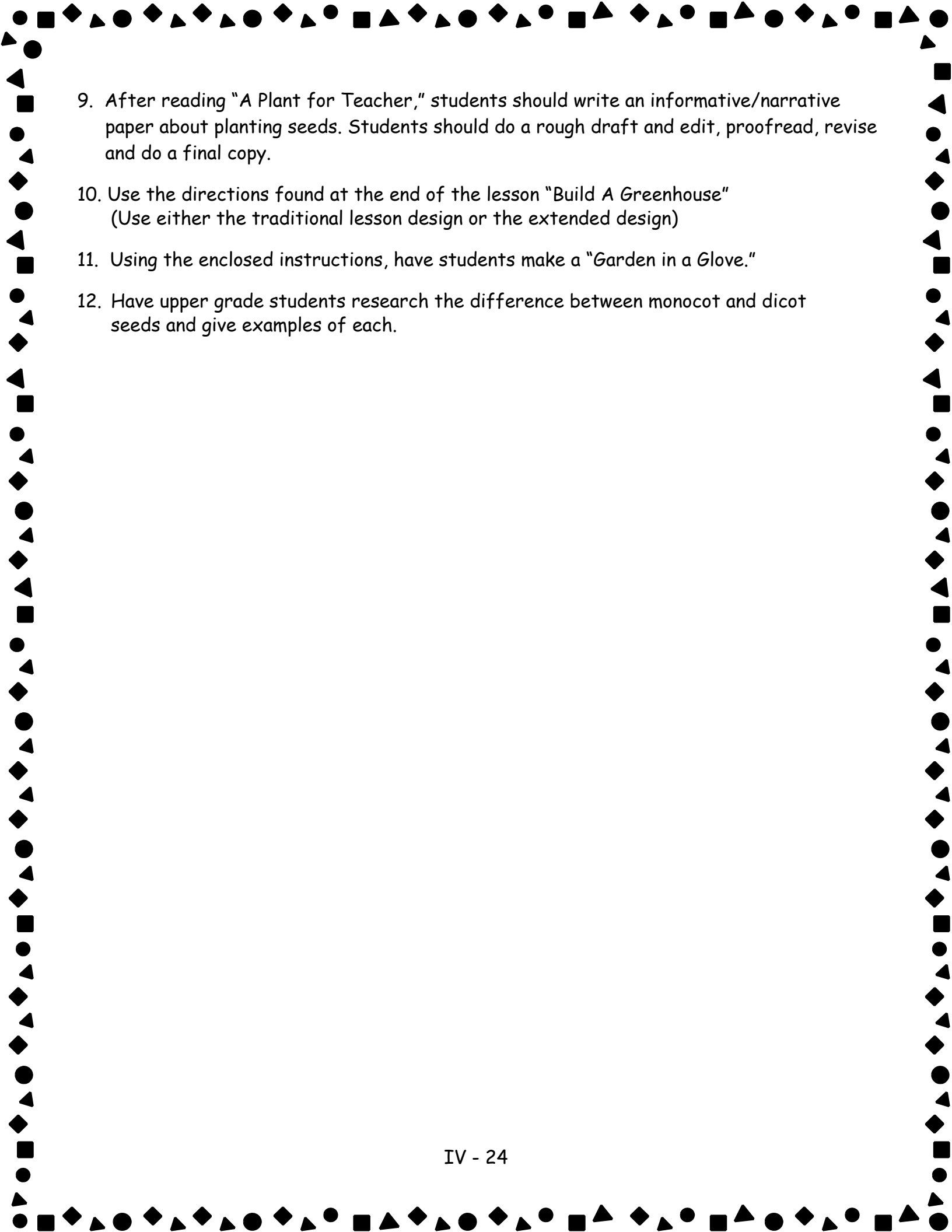
endosperm

2. Soak lima beans in a pan of water overnight.
3. While beans are soaking discuss the parts of a seed and their functions. Read pages 6 - 15 of the book *"Oh Say Can You Seed?"* by Bonnie Worth.
4. Distribute one dry bean and one soaked bean to each student, along with a "Bean Chart"
5. Have students compare the soaked bean to the dry bean. How are they alike? How are they different? Why are they different?
6. Have students observe the seed coat, then open the seed and observe the embryo and cotyledons. Students should label the parts of the seed on their "Bean Chart".

Students can also make a "Bean Book" using the directions and patterns included with this lesson.
7. Give each student an index card. Each student should write one "test" question on the card about the seed. Teacher should collect and check questions for accuracy and clarity. The teacher can develop a few more questions if needed. Students can then participate in a "Baseball Review".

Divide the students into two teams. Establish a home plate and bases in the classroom. Select the team that "bats" first. Ask the first batter a question submitted by a student. If the student answers correctly he or she should proceed to first base. If the student answers incorrectly, that is a strike and it is the next batters turn. Repeat until a side gets 3 strikes or 5 runs. It is then the other team's turn at bat. Repeat this process for 3-4 "innings." Reward the entire class by allowing them to have 30 seconds for recess for each run scored by both teams. (10 runs equal 5 minutes.)

8. In preparation for writing a "How To" paper, students will read the story "A Plant for Teacher."

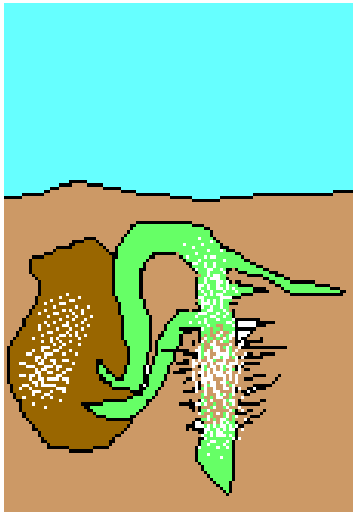
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- A decorative border of various geometric shapes (circles, triangles, squares, diamonds) surrounds the page.
9. After reading "A Plant for Teacher," students should write an informative/narrative paper about planting seeds. Students should do a rough draft and edit, proofread, revise and do a final copy.
 10. Use the directions found at the end of the lesson "Build A Greenhouse" (Use either the traditional lesson design or the extended design)
 11. Using the enclosed instructions, have students make a "Garden in a Glove."
 12. Have upper grade students research the difference between monocot and dicot seeds and give examples of each.

PLANT POWER—"A SEED SPECTACLE"

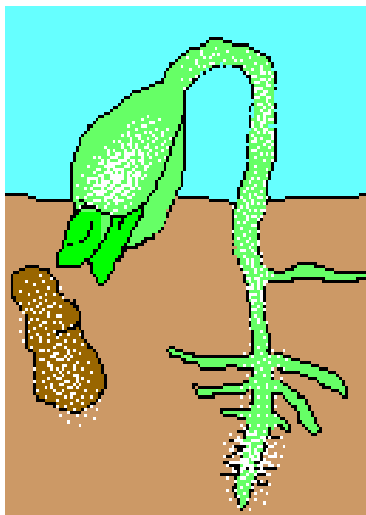
Flowering plants grow from seeds. Seeds have basically three parts: Inside the seed, the *embryo* develops into the roots and the stem. The *cotyledons* store the food and surround the embryo. Around the seed is the *seed coat*. The seed coat protects the inside of the seed.

When a seed is planted it begins to absorb water. The seed gets softer and larger. This causes the embryo to begin to grow. The embryo pushes its way through the softened seed coat. The part of the embryo that will become the root grows downward. The part that will become the stem grows upward.

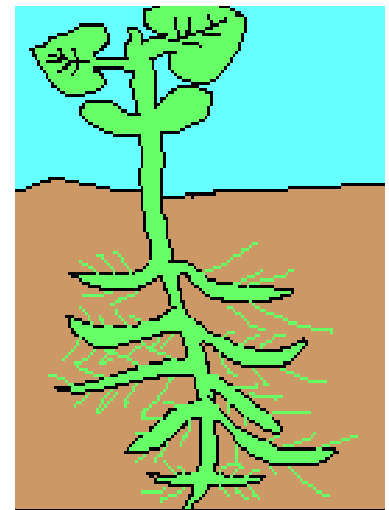
The cotyledons supply the baby plant with food until the stem breaks through the surface of the soil. When the baby plant grows its first leaves it begins producing its own food and the cotyledons are not needed any more.



First the young roots appear



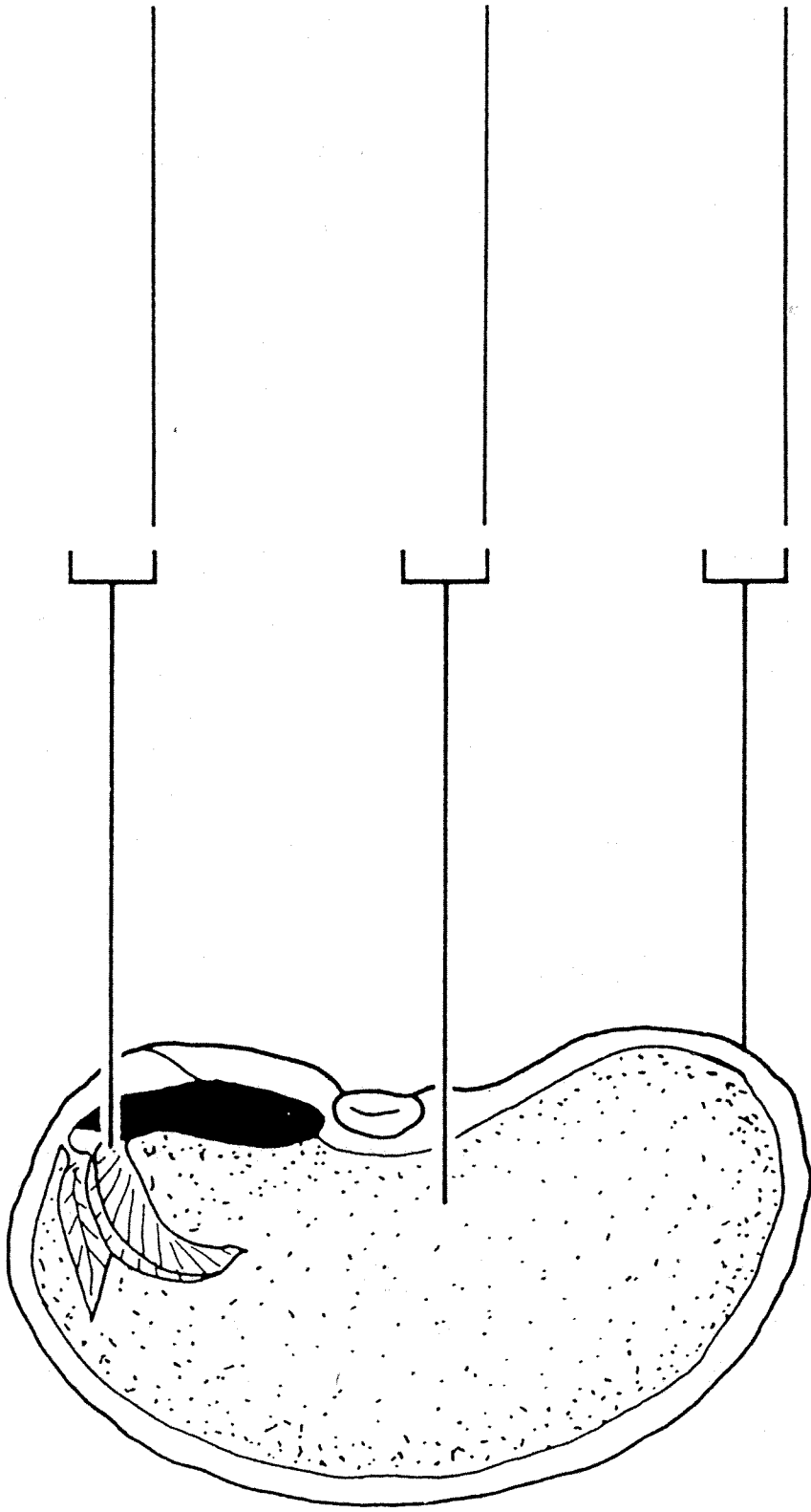
The skin splits and the shoot straightens, pulling the cotyledons with it.



The main root gets bigger and grows side roots, and the first leaves appear.

Parts of a Seed

Label the parts of the seed.



A Plant For Teacher

My younger sister's teacher is celebrating a birthday. My sister, Rebecca, wants to give her a plant as a gift. Since I made one for my teacher last year, I am going to give her directions.

First, you need to gather all of the supplies. You should get a bag of potting soil, a small flowerpot, a watering can, and a packet of your favorite seeds. It would be best if you work outside.

Next, pour about two inches of potting soil into the flowerpot. With your hands, smooth the soil to make it level. You probably want to wear old clothes when planting seeds.

Third, carefully open the packet of seeds. Select three good-looking seeds and drop them on top of the potting soil. Arrange the three seeds in a triangular shape.

Now, put about one-half inch of potting soil on top of the seeds. Pat the soil to pack it down. Again, make sure the soil is level.

Finally, fill the watering can with water. Pour about one-half cup of water to dampen the soil. Do not over water the seeds because that will kill them.

By following these directions, you should make a pretty and healthy plant. When you give it to your teacher, she will be surprised. It will look great sitting on her desk in the classroom.

Bean Dissection

Traditional Lesson Design

Preparation:

Purchase a bag of large lima beans at the supermarket.

Count out approximately 2 beans for each student who will participate in the Bean Dissection activity.

Place counted beans in a bowl and cover with water.

Soak beans overnight.

Teacher Information:

Introduce the book *Oh Say Can You Seed*, by Bonnie Worth to the class. Read orally pages 6-15 and discuss.

Distribute 2 beans to each student. Place beans on dry paper towels.

Discuss seed parts with students as they investigate the beans.

Ask students to take beans apart and identify the seed coat, cotyledon(s), and embryo.

- You may ask students to observe and record findings as they locate seed parts.
- You may ask students to sketch the seed parts as they locate and identify them.
- Provide "Ag in the Classroom Bean Book" kits for students to construct as a reference tool for future use.

Bean Seed Dissection

Extended Lesson

Engagement Activity

Bring a bowl of large lima beans, which have been soaked in water overnight to class. Invite students to work individually or in pairs and to take two beans from the bowl and place them on paper towels in their work space.

Instruct students to take one of the objects and observe.

Ask attention focusing questions such as:

- Describe what you see.
- What clues does this lima bean give you about its growth?

Exploration Activity

Instruct students to investigate one of the beans they have placed on the paper towel. They may use their hands or other simple instruments you may provide. (Tweezers, toothpicks, files, etc.)

Encourage the use of process skills by asking students to observe size, shape, number of parts, textures, etc. Ask students to record observations in appropriate ways. Ask students to draw a diagram of the parts of a seed and label it. (See picture of the seed.)

Explanation Activity

Tell students that the bean they have investigated is a part of a plant. Every flowering plant has six parts and their bean is one of them.

Ask a student to hypothesize which plant part they think the bean might be and explain why. (It is the seed)

Instruct students to discuss the three different parts they found when dissecting the bean and hypothesize their purpose. (The seed coat protects the seed, cotyledons provide food prior to germination and photosynthesis, and the embryo is a tiny plant) Ask students how they might test hypotheses.

Instruct students to hypothesize as to the needs of the seed in order to germinate/sprout. (water, soil or other medium to hold moisture, warm temperature) Ask students how they might test their hypotheses.

Would the same be true for all seeds?

Elaboration Activity

Allow students to set up and conduct experiments to test hypotheses formed during the Explanation Activity. Have them gather needed resources (books to verify guesses, materials to test needs of seeds) and follow through with experimental activities.

Require students to journal findings of all experiments stating whether hypotheses were proven or disproved.

Evaluation/Extension Activity

Draw, label, and write explanations of the purposes of each part of the seed.

Provide "Ag in the Classroom Bean Book" kits for students to construct as a reference tool for future use.

Garden in a Glove

Teach students about seed germination using gloves and cotton balls.

Materials Needed:

- Clear plastic gloves (food service gloves are best)
- 5 cotton balls
- 5 types of seeds, 3-4 seeds of each
(examples: lettuce, carrot, cucumber, tomato, broccoli)
- Pencil
- Water
- Marker

1. Write your name on a clear plastic glove. Blow air into the glove to help open it up.
2. Dip five cotton balls in water and wring them out.
3. Place 3-4 seeds of the same type on each cotton ball (or dip the cotton balls in the seeds to pick them up). Label each finger with the type of seed.
4. Put a cotton ball with the seeds attached into each finger of the glove. Hint: You may have to use a pencil to get the cotton ball all the way to the tips of the glove fingers.
5. Close the glove using transparent tape.
6. Tape the glove to a window, chalkboard, or wall. You may want to hang a clothes line under a chalk tray and use clothes pins to hold the gloves on.
7. The seeds will germinate in 3 to 5 days. Keep a plant diary and look at the seeds under a microscope.
8. Transplant the seedlings in about 1 $\frac{1}{2}$ to 2 weeks by cutting the tips of the fingers off the glove. Transplant the cotton ball and seedlings into potting soil or sphagnum moss.
9. After growing to full size, plants can be made into a salad.

Garden in a Glove

VOCABULARY

Annual – life cycle of one year

Perennial – life cycle of more than two years

Germination – to begin to grow (sprout)

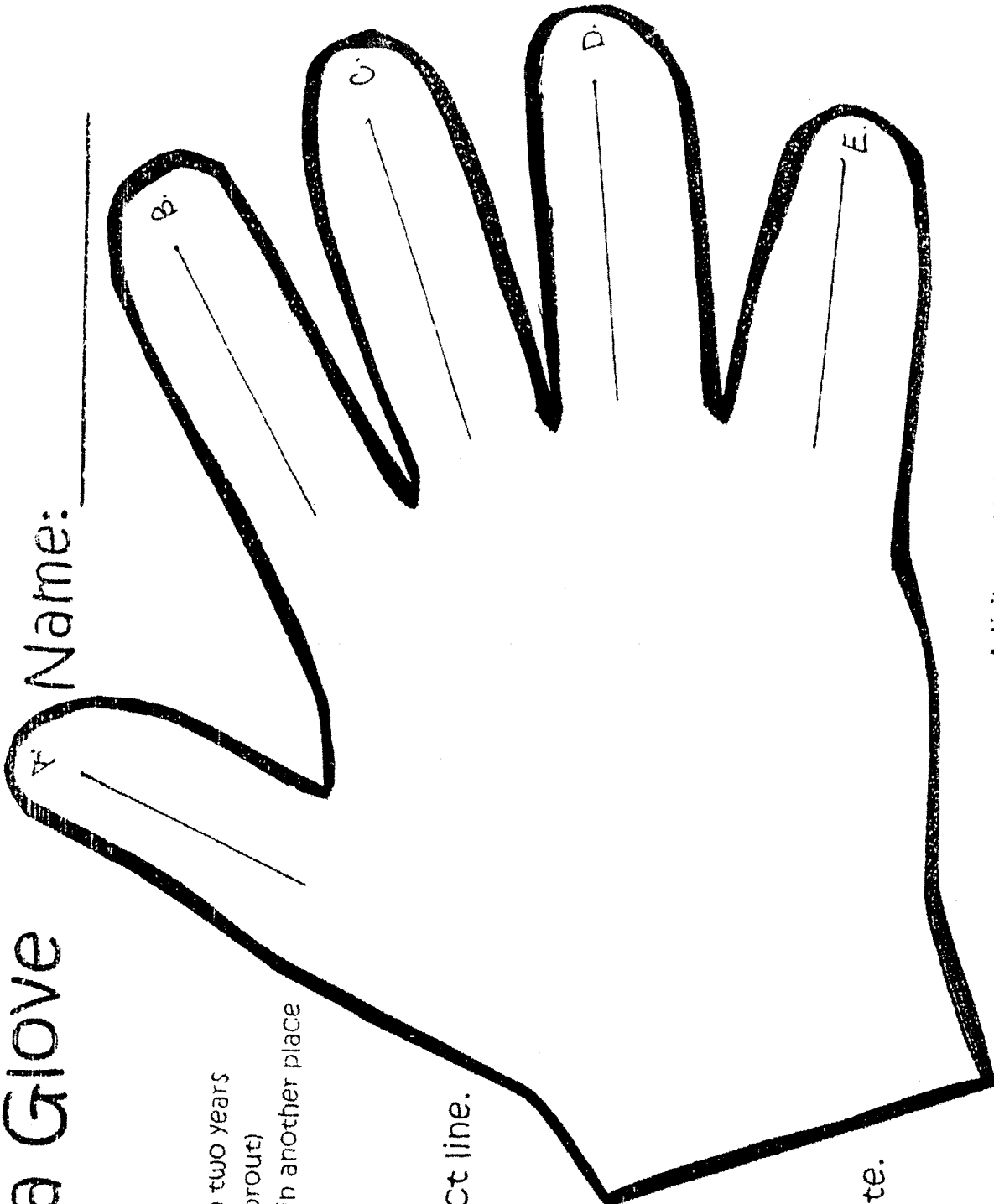
Transplant – to remove and plant in another place

What seeds did you plant in each finger?

Write them on the correct line.

Write the date when you see the first sprout.

Number each finger in the order they germinate.



Name: _____

BUILD A GREENHOUSE

Traditional Lesson Design

Materials Needed: potting soil, two clear plastic cups, 1 bean seed, 1 corn seed, 1 pea seed, water, transparent tape, permanent pen

With these supplies you can build the greenhouse below.

Directions:

- Place some soil in one of the cups, filling it about halfway up.
- Plant each of the three seeds equidistant next to the "wall" of the plastic cup so you can observe the germination and growth of your plants.
- Add a 10 ml of water and then place the other cup on top. Tape the cups together.
- Label seed type above each planting (on top cup). Bean, corn, pea.
- Once you've completed your mini-greenhouse, observe it over time. Experiment by placing your greenhouse in different locations. If it doesn't grow in one spot, try another. Place your greenhouse in indirect sunlight.
- Most likely, your plant will quickly outgrow its container. When the plants touch the top of the upper cup, remove the tape and begin watering.
- Your plants will need to be transplanted to a larger container or into outside soil shortly thereafter.

Pointers for making a successful greenhouse using the Ag in the Classroom plan:

- Seeds should be planted next to the "wall" of the cup so children can see them as they begin to germinate. To get the seeds where they can be seen, put the potting soil into the bottom cup, then use a plastic knife or popsicle stick to push the seeds down into the soil right up next to the "wall" of the cup. Make sure that each seed is visible through the wall of the cup.
- It is suggested that by planting 3 different seeds children can observe differences in germination and growth. Plant them equidistant around the cup.
- Have children write name and date on top (or bottom) cup with a permanent marker.
- Do not put too much water - basically, get the soil moist throughout. Place greenhouses in indirect sunlight. Placing them in direct sunlight will cause them to become too hot and prevent germination and/or proper growth.

BUILD A GREENHOUSE

Extended Lesson

Engagement Activity

Prepare several greenhouses using printed directions (see traditional lesson). Display one greenhouse for students to investigate.

Ask attention focusing questions such as:

- What is this? What is it called?
- Have you seen anything like it before?
- What do you think will happen inside and why?
- Where should it be kept?

Exploration Activity

Provide additional greenhouses for students to observe in small groups. Instruct students to deconstruct the greenhouses to investigate the contents. Allow students to observe contents of the greenhouse and record their findings in their science notebook.

Ask explorative questions such as:

- What are the contents of the greenhouse?
- Why do you think each item was placed in the greenhouse? What is its purpose?
- What changes do you think have taken place since the time that the greenhouse was assembled?
- If the greenhouse is reassembled, what do you think will happen?

Explanation Activity

Provide materials and directions for students to make their own greenhouses. Allow them to do so. Instruct students to journal their activities and continue to note changes in the greenhouse over a period of several weeks.

Ask explorative, measuring, and how/why questions such as:

- What seeds did you plant?
- What happens if you plant the seeds deeper or shallower?
- What happens if you add more or less water?
- What will this environment cause the seeds to do?
- What factors are present in the greenhouse which will enable the seeds to germinate and grow?
- Why will you not need to water the seeds and young plants?
- Which seed do you predict will germinate first, second, last?

Elaboration Activity

Provide reference materials for students to view. Challenge them to find text that describes the processes taking place inside their greenhouses. Have them record their findings and cite sources.

Ask clarifying questions such as:

- What term did you find that describes the sprouting of a seed? (germinate/germination)
- What are the names fo the three parts of a seed? (seed coat, cotyledon, embryo)

- What is the function of each seed part? (the seed coat protects the seed, the cotyledon provides food for the baby plant, the embryo is the baby plant that will grow)
- What does a seed need in order to germinate? (water, soil or other growing medium, warm temperature)
- Once a seed has germinated, what does the young plant need in order to grow? (water, soil or other growing medium, appropriate temperature, sunlight)
- Why did you not need to water the seeds and seedlings inside the greenhouse? (the greenhouse was able to sustain its own water cycle)
- What are the stages of the water cycle (evaporation, condensation, precipitation)

Evaluation/Extension Activity

Allow students to continue to care for, observe, and journal the activities associated with their greenhouses. They should remove the tops when the first leaf touches the top of the upper cup. Students may condition the plants to be transplanted outdoors by placing the greenhouses outdoors briefly, adding a few minutes each day.

Read orally and discuss pages 16-17 from the text, Oh Say Can You Seed, by Bonnie Worth.

The Bean Book

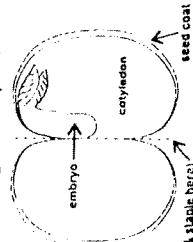
By: _____

1

Bean Book Instructions:

- Cut out the seed coat, seed leaves, and embryo.
- Cut apart blocks of text, following the dotted lines.
- Fold the seed leaves (yellow) into the seed coat (tan) and tuck the embryo (green) into upper center of seed leaves.
- Attach seed parts by stapling along fold.
- Using the numbers as reference (see below), glue text onto the pages of your Bean Book.
- Write your name on the cover of your book.

Placing of seed parts



Place Bean Book text in the following order:

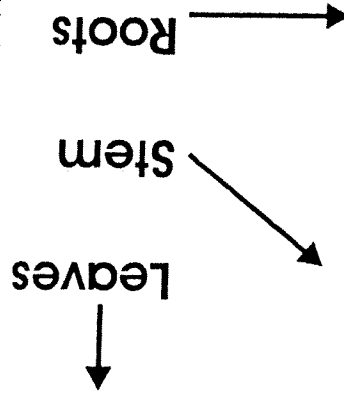
- 1 Front cover
- 2 Inside front cover
- 3 Page after inside front cover (first cotyledon)
- 4 Inside of first cotyledon, next to embryo

- 5 Inside of second cotyledon, with arrows pointing to parts of embryo
- 6 Inside back cover
- 7 Outside back cover

Where can you find soybeans? Almost everywhere! Soybeans can be found in all of these products...

- | | |
|----------------|----------------|
| plastic | car wax |
| paint | tofu |
| chocolate | soap |
| crayons | insulation |
| body lotion | glue |
| cooking oil | makeup |
| candles | candy |
| printing ink | cereal |
| biodiesel fuel | livestock feed |

...and so much more! Check out the ingredients listed on packages around the house or school and see what else you can find!



The bean has a cover called the **seed coat**. It protects the seed. **2**

Inside the seed coat are two **seed leaves (cotyledon)**. They hold the food the new plant needs to grow. **3**

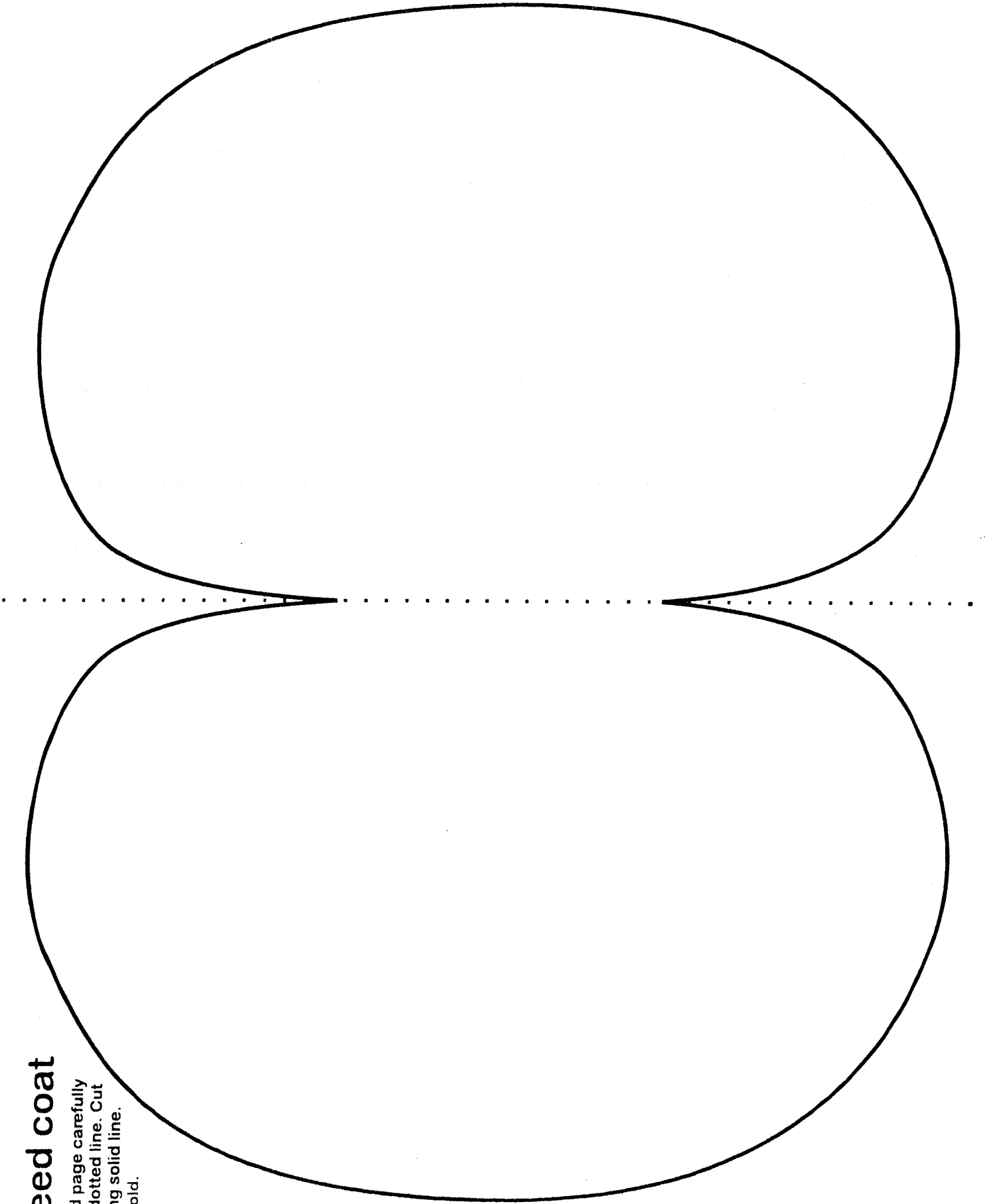
A baby plant is hiding between the seed leaves. It is called an **embryo**. **4**

Every kind of seed has three parts. They are the **embryo**, **stored food (cotyledon)**, and a **seed coat**. **6**

5

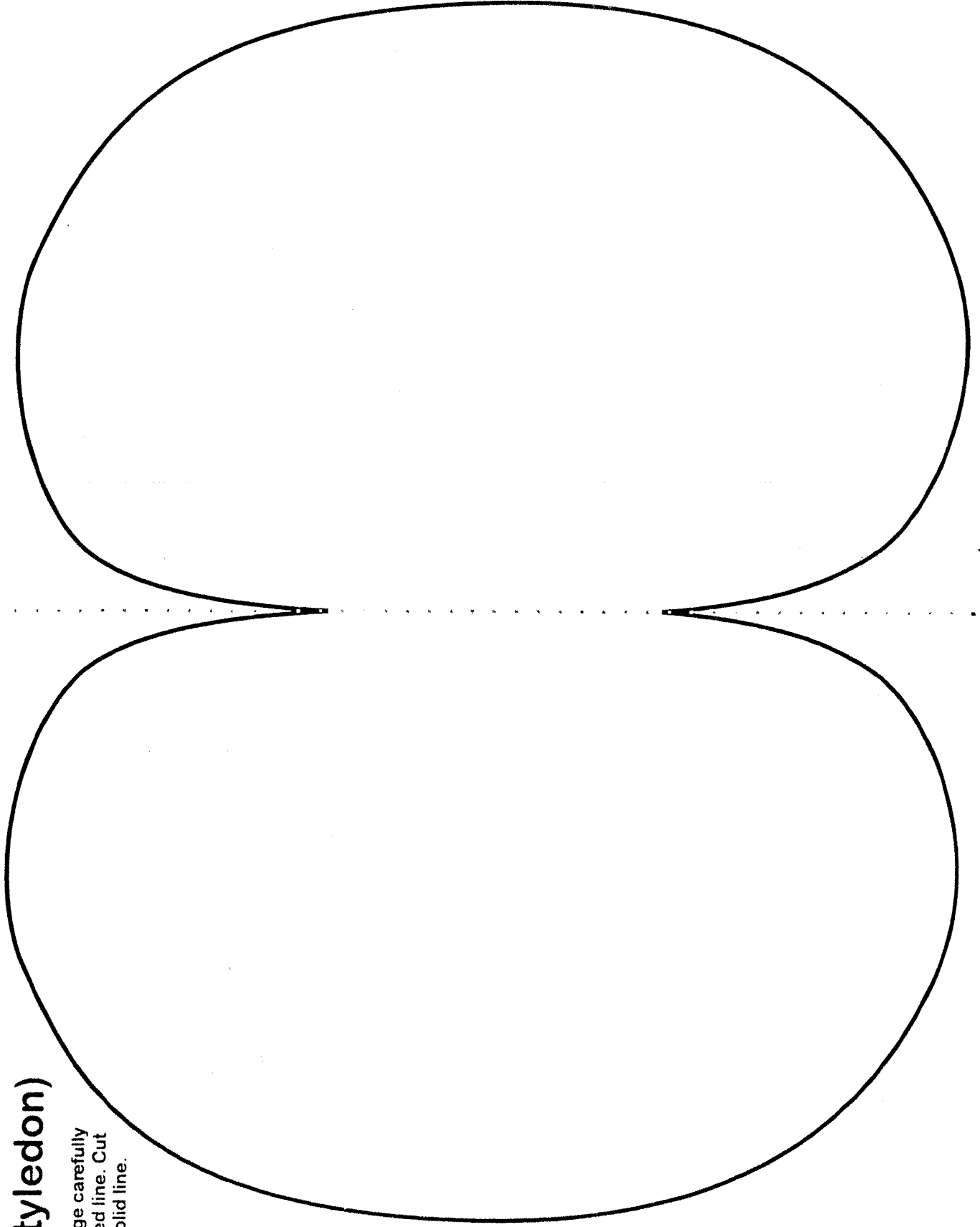
seed coat

Fold page carefully
on dotted line. Cut
along solid line.
Unfold.



**seed leaves
(cotyledon)**

Fold page carefully
on dotted line. Cut
along solid line.
Unfold.





embryo

Cut along solid
outside line.



embryo

Cut along solid
outside line.



embryo

Cut along solid
outside line.



embryo

Cut along solid
outside line.



embryo

Cut along solid
outside line.



embryo

Cut along solid
outside line.

The Bean Book

By:

1

A baby plant is hiding
between the seed
leaves. It is called an
embryo.

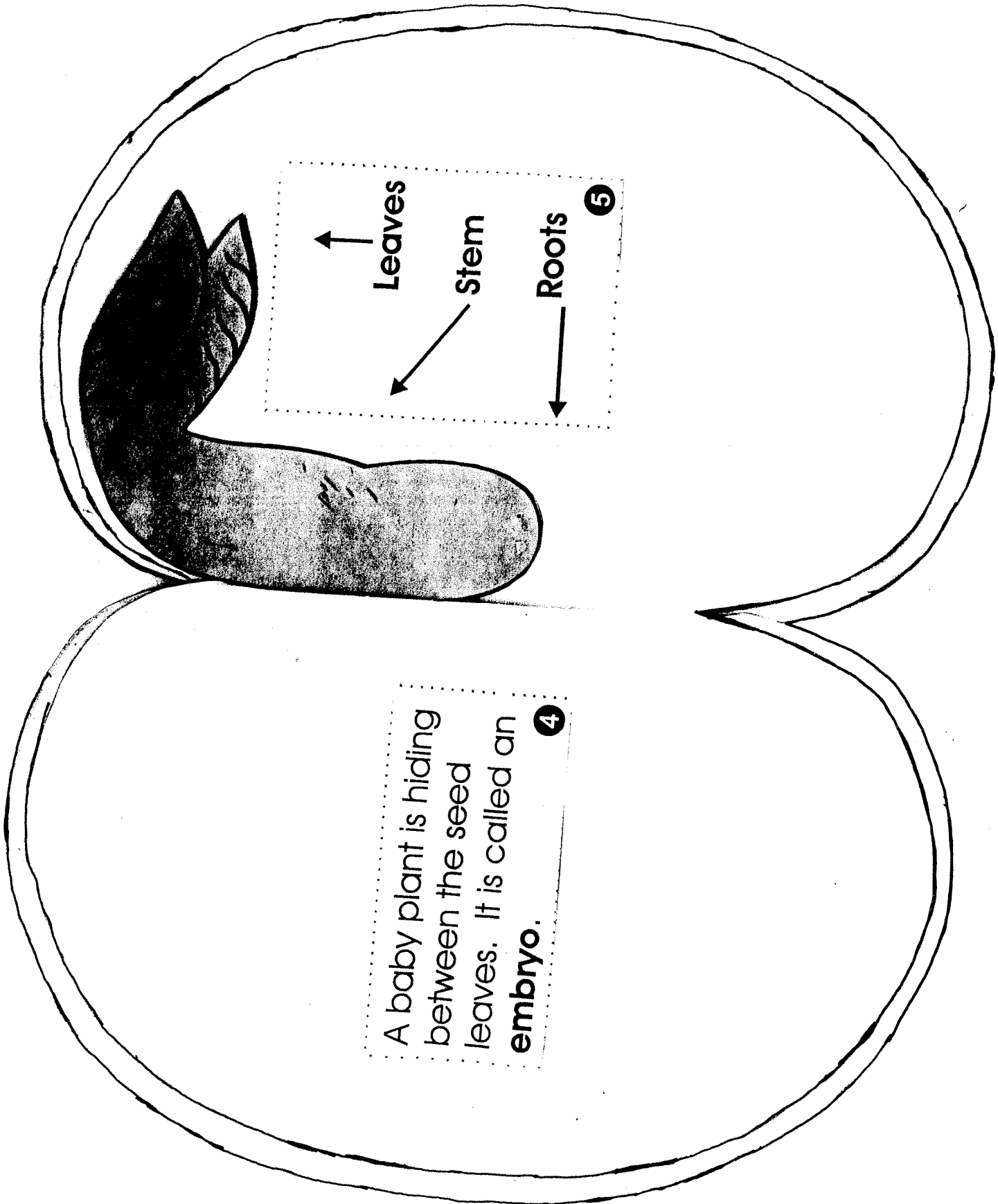
4

Leaves

Stem

Roots

5



Where can you find soybeans?
Almost everywhere! Soybeans
can be found in all of these
products...

plastic	car wax
paint	tofu
chocolate	soap
crayons	insulation
body lotion	glue
cooking oil	makeup
candles	candy
printing ink	cereal
biodiesel fuel	livestock feed

...and so much more! Check
out the ingredients listed on
packages around the house or
school and see what else you
can find!