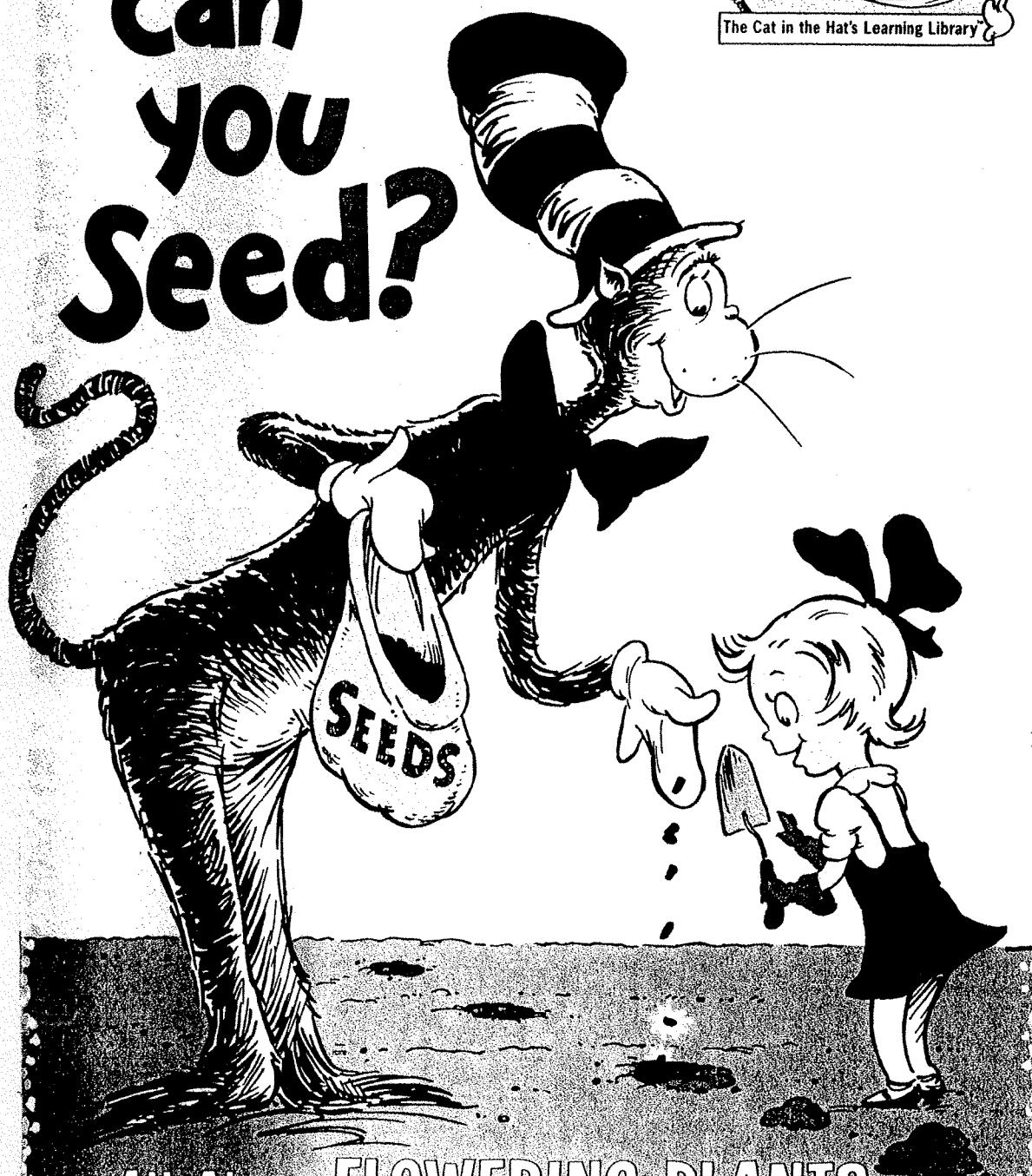
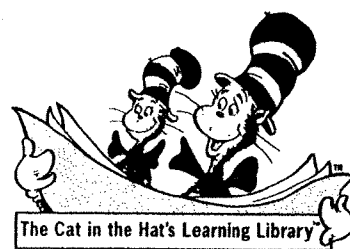


# Oh say can you Seed?



All About **FLOWERING PLANTS**

by Bonnie Worth • illustrated by Aristides Ruiz

# BEAN SEED DISSECTION

## *5E Lesson Design*

### **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 students 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. To obtain Bean Book plans, visit

<http://www.agintheclassroom.org/060605/Teachers/Make%20&%20Takes/Bean%20Book.pdf>.

### 3. GARDEN IN A GLOVE

Teach students about seed germination using gloves and cotton balls.

#### Materials Needed:

- Clear plastic glove
- 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.
2. Wet five cotton balls 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). You may want to keep track of which seed is in which finger.
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. Blow up the plastic glove and close it with a twist tie.
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 seeds about 1  $\frac{1}{2}$  to 2 weeks by cutting the tips of the fingers off the glove. Transplant the cotton ball and small plants into soil or sphagnum moss.
9. After growing to full size, plants can be made into a salad.

# Garden in a Glove

## VOCABULARY

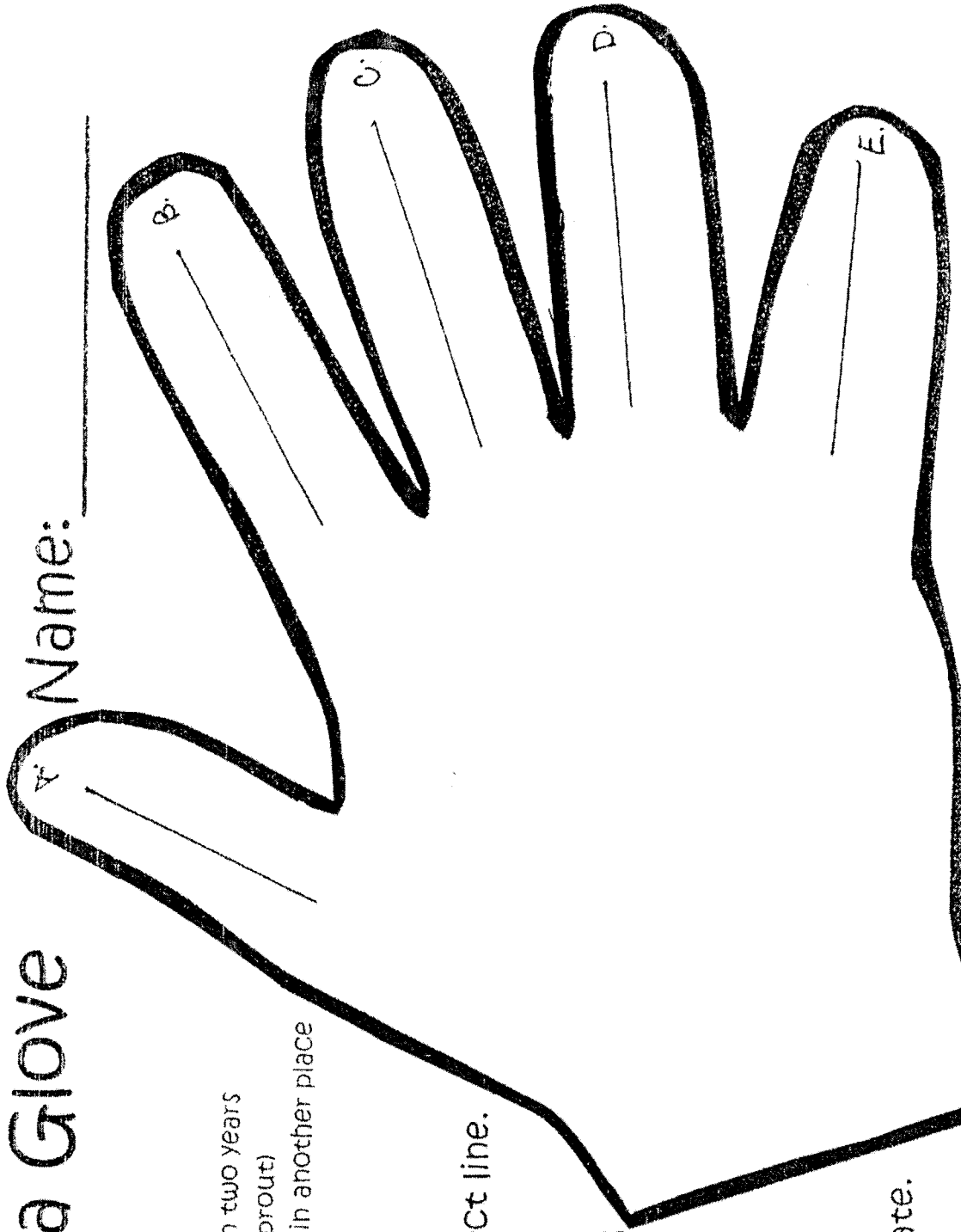
Annual – life cycle of one year  
 Perennial – life cycle of more than two years  
 Germination – to begin to grow (sprout)  
 Transplant – to remove and plant in another place

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: \_\_\_\_\_



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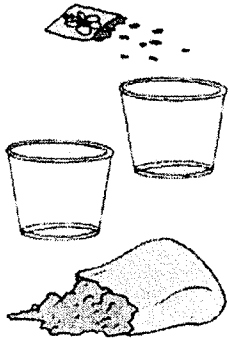
# BUILD A GREENHOUSE

## *Traditional Lesson Design*

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

With these supplies you can build the greenhouse below.

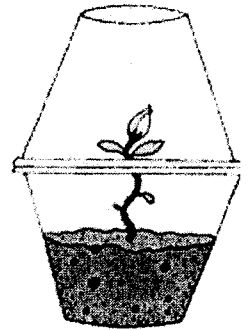
### Directions:



- 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 this 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**

## ***5E Lesson Design***

### **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 of 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.



**BY:**

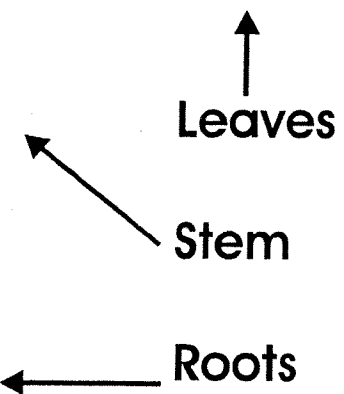
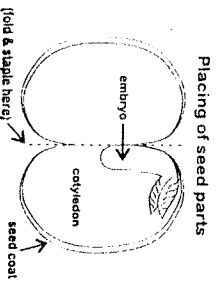
- The bean has a cover called the **seed coat**. It protects the seed. ②
- Inside the seed coat are two **seed leaves (cotyledon)**. They hold the food the new plant needs to grow. ③

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

- 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.

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

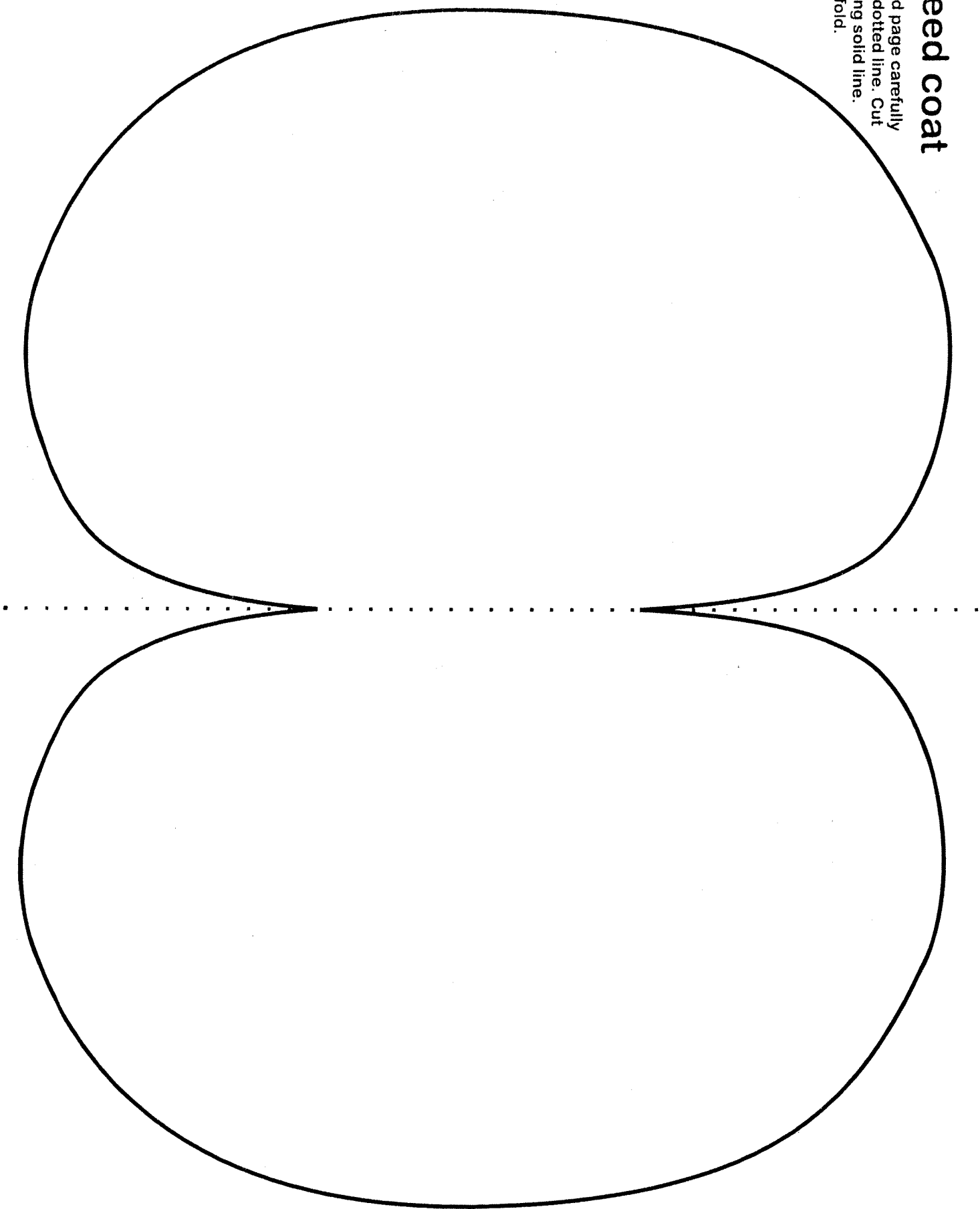
- 5 Inside of second cotyledon, with arrows pointing to parts of embryo
- 6 Inside back cover
- 7 Outside back cover



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

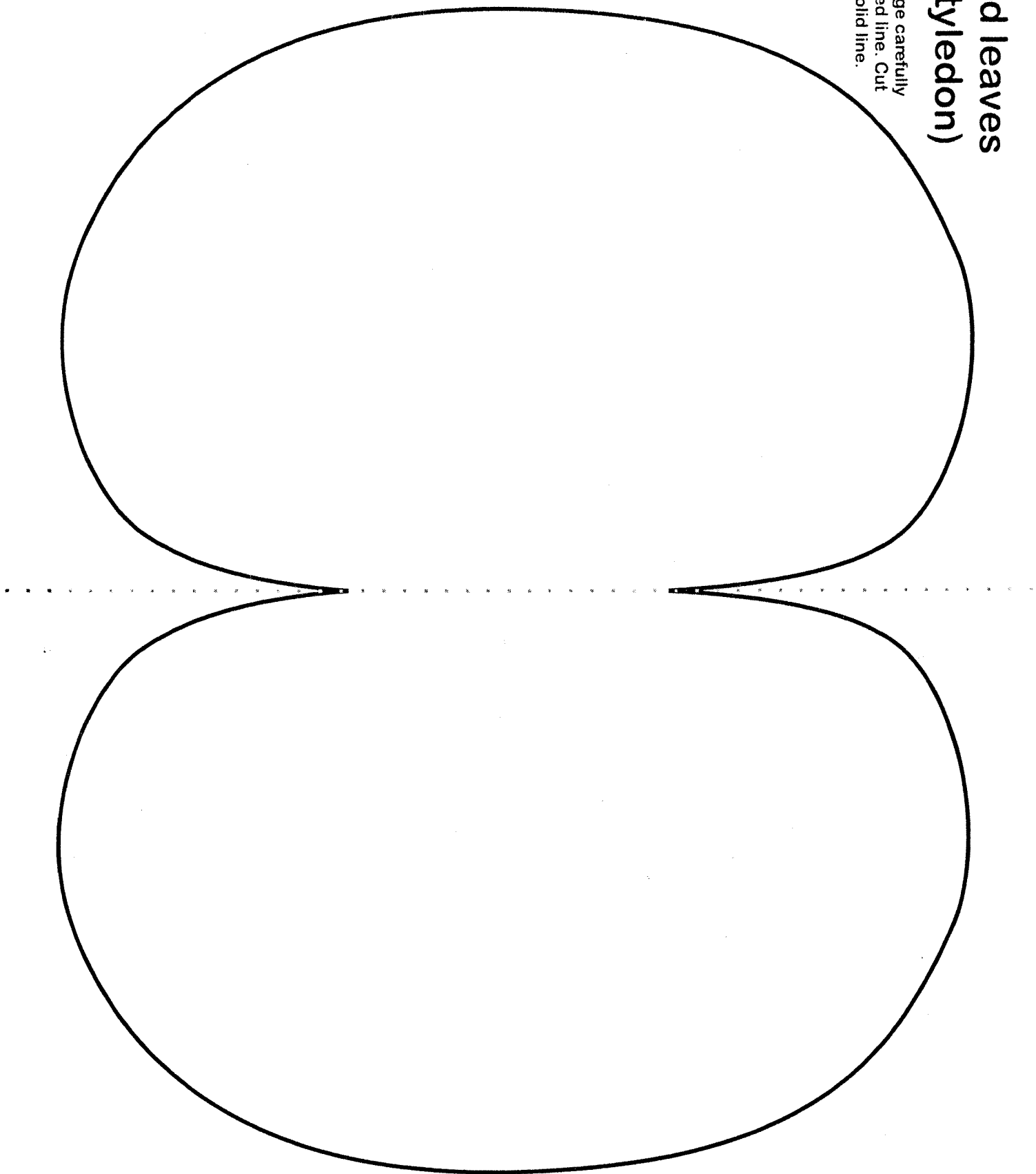
# seed coat

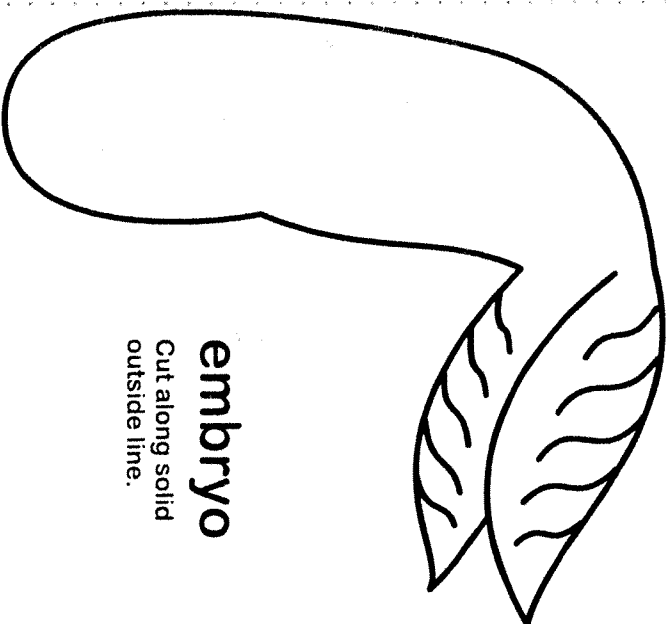
Fold page carefully  
on dotted line. Cut  
along solid line.  
Unfold.



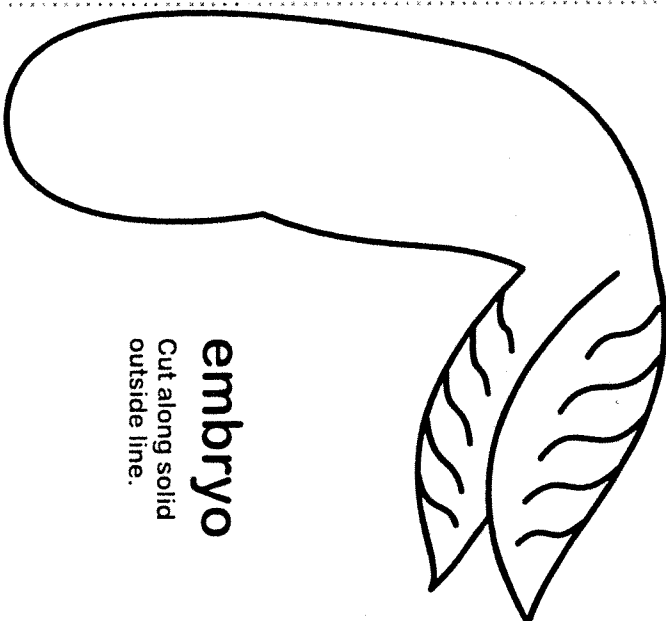
# seed leaves (cotyledon)

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

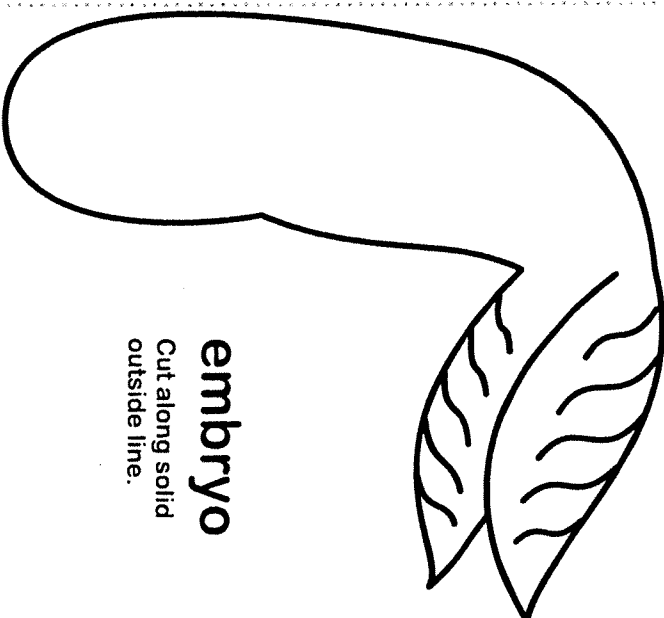




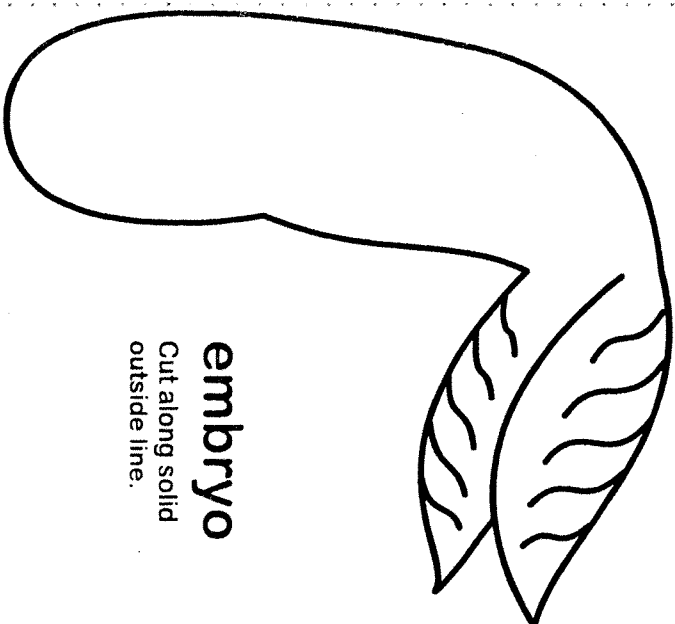
**embryo**  
Cut along solid  
outside line.



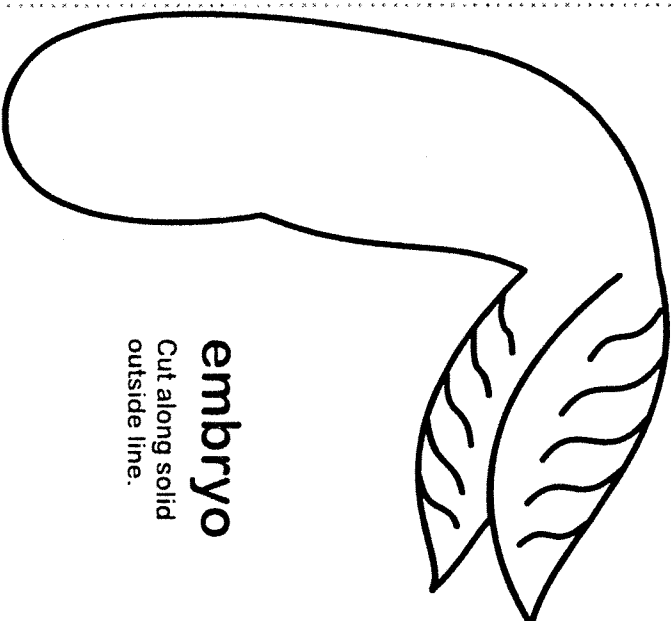
**embryo**  
Cut along solid  
outside line.



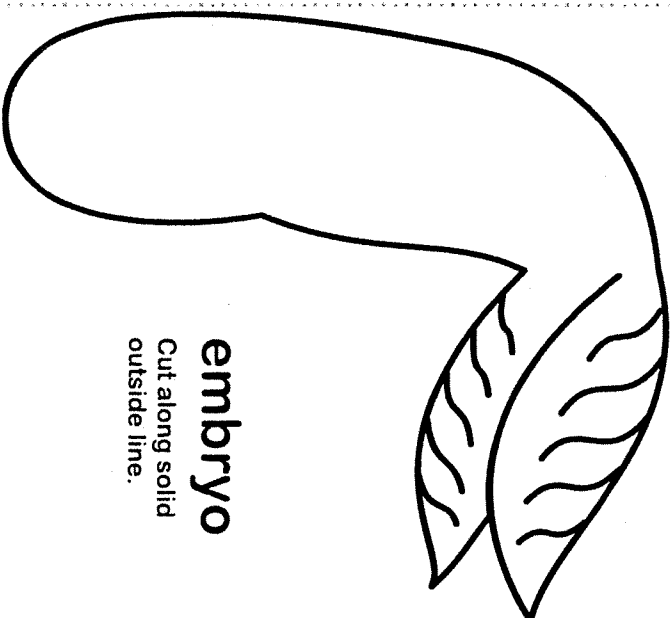
**embryo**  
Cut along solid  
outside line.



**embryo**  
Cut along solid  
outside line.



**embryo**  
Cut along solid  
outside line.



**embryo**  
Cut along solid  
outside line.

# The Bean Book

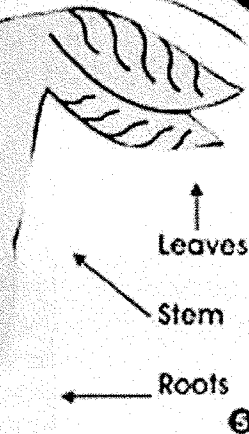
By:

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1

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

①



Leaves

Stem

Roots

②

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

peas	car wax
paint	soy
chocolate	soap
claybars	insulation
body lotion	glue
cooking oil	ink/printer
condes	candy
printing ink	ceramic
bio diesel fuel	laminated wood

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