

The Norwood Science Center

Plants Grade 2

Background Information

Seeds develop in the ovary of a plant found deep within the base of the flower. Every seed consists of three main parts: a little plant called the embryo; stored food that helps the tiny plant grow until it can make food of its own; and the seed coat which is a protective covering for the developing embryo. The seed coat develops from the wall of the ovary.

Differences in seeds are used to classify flowering plants into two large groups. Inside the seed are seed leaves or cotyledons. Plants that have seeds with only one seed leaf are called monocotyledons or monocots. Plants with seeds that have two seed leaves are called dicotyledons or dicots. In monocot seeds, a material called endosperm is present. Endosperm is a tissue that contains stored food. Both the endosperm and the embryo are enclosed within the seed coat.

In dicots, the cotyledons are attached to the plant embryo. The cotyledons also store food. When the seed begins to grow, one part of the embryo becomes the root of the new plant. Another part becomes the lower stem and the rest becomes the upper stem and leaves.

A bean seed (dicotyledon) has a tiny embryo tucked between two halves of the seed. These two halves of the bean seed are cotyledons. The cotyledons are filled with stored food and are quite different in form from the leaves that develop later. These dicot cotyledons serve as seed leaves and turn green. They last for a short time and actually make food by photosynthesis.

TITLE: SEED DISSECTION

PURPOSE: What are the parts of a seed?

MATERIALS: (per pair of students)
One dry kidney bean seed
One kidney bean seed, germinated
Two hand lenses
Paper towel
Iodine (to be distributed and handled by the teacher only)

Teaching Note

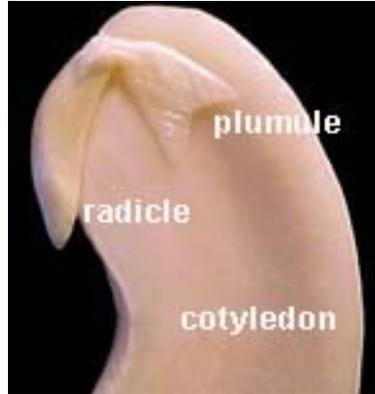
This lesson calls for the students to compare dry and germinated seeds side by side. This approach can take place in one class period. You may have the students examine dry seeds one day, then look at the same seeds a day later after they have been soaked in water for twenty-four (24) hours. This will impress upon the students the changes that take place when germination occurs.

PROCEDURE:

01. Distribute the dry kidney beans (dicotyledon) seeds to the students.
02. The students should write down several observations regarding the seed such as size, shape, hardness, roughness, etc.
03. Students are to feel the outer layer (coat) of the seed to determine if it is loose or tight.
04. Distribute the germinated kidney bean seeds on a piece of paper towel.
05. The students are to compare the dry seeds to the germinated seeds. One of the differences they should observe is that the germinated seed is much larger. Ask the students how that could have happened.

06. Another difference is that the seed coat on the dry seed is tight whereas the germinated seed has a loose coat. Now that the plant is growing the seed does not need the coat anymore. Have the students slip the seed out of its coat.
07. The portion of the seed that can be seen is the cotyledon. The cotyledon is the "lunch box" for the young plant. This is where all the nourishment is stored for the plant as it grows out of the dirt. Once it grows out of the dirt and is in direct sunlight the plant can make its own food through the process of photosynthesis.
08. The cotyledon for the kidney bean actually comes in two parts. If the students hold up the seed and look along the edge they can see a seam. This seam is actually the separation between the two cotyledons. This is why the kidney bean is a dicotyledon. If the students very carefully pull the two cotyledons apart, they can separate the two pieces with a minimal amount of breakage.
09. Attached to the inside curve (concave portion) of one cotyledon is the young plant or embryo.
10. The embryo consists of two portions. The stem is the part that will grow up out of the dirt and form the stem and flower portion of the plant. The other portion is the young root that will grow down into the dirt to bring in water and minerals.
11. To prove the embryo is a young plant living inside its "lunch box", the students will now test for the presence of starch. The starch test is conducted by simply placing a drop of iodine on a material. If starch is not present, the iodine will remain the brown/red color that is characteristic of iodine. If starch is present, the material and starch will turn a middle-of-the-night-eyes-shut-tight-lights-out-inside-a-closet-with-the-door-closed black.

Radicle-
embryonic
root



Plumule-
embryonic
shoot, bears
first leaves.

<http://www.saburchill.com/images04/0011.jpg>

12. The teacher walks around and places a dab of iodine on a cotyledon and has the student show the embryo. It may have broken off in the dissection but that will not change the results. A dab of iodine goes on the plant.
13. Students will see the cotyledon turns middle-of-the-night-eyes-shut-tight-lights-out-inside-a-closet-with-the-door-closed black while the embryonic plant remains red. This proves that the cotyledon is starch - not the plant.

**DUE TO THE LOOSE PARTS AND THE USE OF
THE CHEMICAL IODINE,
ALL THE PARTS OF THE DISSECTED SEED
ARE TO BE DISCARDED.**

CONCLUSION: Ask students the following questions:

01. What is the difference between a seed that has been soaked and one that is dry? (usually the soaked seed is larger and the coat is loose).
02. Explain why the kidney bean is called a dicotyledon.
03. What parts did you see when you split open the germinated seed?
04. What is the importance of seeds?