

Grow Lab Background Info for Teachers

Lesson 1: Journey to the Center of a Seed - Seed Parts

Day 1

Seeds are baby plants in a dormant state and are composed of three parts: the baby plant (embryo), food storage (endosperm), and seed coat. The seed coat is the outermost part of the seed which surrounds the seed and protects the food supply. The food storage becomes the seed leaves (cotyledons) when the seed germinates. After seed dispersal from the parent plant, the seeds dehydrate and enter a period of dormancy. Scientists have germinated seeds that are over one thousand years old!

Lesson 2: Germination and Sprouting - Seeds Sprouting into Seedlings

Days 4-6

Germination means to sprout and is the growth of seeds into seedlings. It starts when seeds become active below ground sending out roots and ends when the true leaves appear above ground.

In the first stages of germination the seed absorbs water, the embryo starts to use its food storage (endosperm), and the embryonic root emerges while taking in water. The sprout continues to grow and the embryonic shoot emerges above ground with the seed leaves (cotyledons), which were formerly the endosperm. The sprout continues to grow and true leaves emerge.

Seeds germinate after the dormant period if they have the necessary requirements. Most seeds require water, warmth, and air. Some seeds require unique conditions like coldness, fire, or passing through an animal's intestinal tract.

Lesson 3: Plant Parts and Functions - Roots, Stems, and Leaves

Days 10-12

Roots are the underground parts of plants. They have three main functions. First, they anchor the plant in the soil. Second, they absorb water and minerals from the spaces between soil particles. The roots' absorptive properties are increased by root hairs, which grow behind the root tip, allowing maximum absorption of vital substances. Third, roots act as food storage. Carrots are an example of this storage capability.

The stem is the main supportive part of a plant that grows above ground. Stems support leaves, which grow at nodes. Buds grow from the stem tip and house the future flowers. The stem's main function is to transport water and nutrients up, and carry down the sugar, which is produced in leaves. Stem tissues are also used for storing water and food.

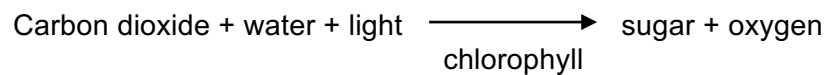
Leaves are the food factories and main sites of photosynthesis and transpiration (water loss by evaporation) in plants. A typical leaf consists of a thin, flat blade supported by a network of veins, a leaf stalk, and a leaf base. Leaves can be classified as simple, in which the blade is a

single unit (a maple leaf), or compound, in which the blade is divided into separate leaflets (a box elder leaf).

Leaves come in many shapes and sizes and plants are often identified by these shapes: oaks, maples, and grasses. Many leaves are adapted help the plant survive in a particular environments.

Lesson 4: How Light Affects Plant Growth - Photosynthesis **Days 12-14**

Photosynthesis is what makes plants so unique; plants are the only living things that produce their own food. This is the chemical equation for what is going on



Photosynthesis is the process by which plants make their food using sunlight, water, and carbon dioxide. It takes place inside special structures in plant cells called chloroplasts. The chloroplasts contain chlorophyll, a green pigment that absorbs energy from sunlight. During photosynthesis, the absorbed energy is used to join together carbon dioxide and water to form the sugar molecule called glucose, which is the energy source for the whole plant. Oxygen, a waste product, is released into the air. Leaves are the main sites of photosynthesis and have various adaptations for that purpose.

The amount of light a plant receives impacts the growth rate and health of a plant. Most plants require 12-16 hours of light to survive.

Lesson 5: Flower Parts and Functions **Days 14-17**

The one function of a flower is reproduction, or the production of seeds. The petals surround the reproductive structure, which consists of stamen (male organ) and pistil (female organ).

Pollen grains (male sex cells) are produced by the stamen. The pistil is composed of the stigma, style, and ovary. The pistil accepts pollen only during a specific period, and it varies for every flower.

Lesson 6: Pollination and Symbiosis **Days 15-18**

Pollination is the process of transferring pollen from the stamen to the pistil. Self-pollination is when pollination occurs within the same flower or within the same plant. Cross-pollination is when pollination occurs between flowers on separate plants of the same species.

In most plants, pollination is carried out either by insects or by the wind. The relationship between different species, such as insects and flowers, which benefits both parties, is known as symbiosis. Other pollinators include: birds, bats, water, and other insects. Insect-pollinated flowers are typically scented and brightly colored. They also produce nectar on which insects feed. Such flowers also tend to have patterns that are visible only in ultraviolet light, which

many insects can see, but humans cannot. These features attract insects, which become covered with the sticky pollen grains when they visit one flower, and then transfer the pollen to the next flower they visit.

Wind-pollinated flowers are generally small, relatively inconspicuous, and unscented, like grasses. They produce large quantities of light pollen grains that are easily blown by the wind to other flowers. The pollination process precedes fertilization.

Lesson 7: Fruit and Adaptations

Days 27-32

Pollinated and fertilized flowers produce fruits and seeds. A fruit is formed from a plant's female reproductive organ when fertilization has taken place.

Fruits protect seeds and help seeds travel. Fruits come in many different shapes and sizes: apple, pear, tomato, pepper, string beans, and peanuts. Fruits are an adaptation to protect seeds and to assist in seed dispersal.

Lesson 8: Seed Dispersal and the Cycle of Life

Days 37-45

Fruits have different adaptations to help them disperse. Succulent fruits are fleshy and brightly colored, making them attractive to animals, which eat them and disperse the seeds away from the parent plant. Dry fruits are dispersed by the wind, sometimes assisted by wings or parachutes, or by hooks, which attach to an animal's fur to aid dispersal. Plants disperse so new plants do not compete with the parent plant for sunlight, water, and nutrients.

Seeds are dispersed in 5 ways.

- Fluffy or feathery fruit – adapted to be carried by wind
- Tasty, colorful fruit – adapted to be carried inside animals
- Fruit with hooks or barbs – adapted to be carried on the outside of animals
- Hollow fruit or one that floats – adapted to float on water
- Fruit that have a spring-like mechanism – adapted to be flung from parent or use gravity to help them travel

Wrap Up Activity: Passing on the Seeds of Knowledge

Day 40 or later

Students and teacher will harvest the seeds of their plants and store them to give to next year's class. Students can write letters offering suggestions and advice for future botanists. Teachers should complete the evaluation and submit this to receive a free packet of Brassica rapa seeds.

