

## Chapter Twelve: Introduction to Plants

### Teacher Notes

#### Lesson One: What is a Plant?

- Plant Characteristics
  - Photosynthesis
    - plants contain chlorophyll. Chloroplast is a green pigment that captures energy from sunlight. Chlorophyll is found in chloroplasts.
    - photosynthesis is the process of converting sunlight into energy.
  - Cuticles
    - a waxy layer that coats most of the surfaces of plants that are exposed to air; keeps the plant from drying out.
  - Cell Walls
    - lies outside the cell membrane to give the plant structure
    - secondary cell wall forms after the cell is mature; plant can no longer grow larger
  - Reproduction
    - sporophyte stage
      - plants make spores, in the right environment they can grow; new plants are called gametophytes
    - gametophyte stage
      - female gametophytes produce eggs; male gametophytes produce sperm
      - sperm and egg cells are called sex cells; sex cells can't grow directly into a new plant
      - sperm cells fertilize egg cells and this grows into a sporophyte
- Plant Classification
  - Nonvascular Plants-the three groups of plants (liverworts, hornworts, and mosses) that lack specialized conducting tissues and true roots, stems, and leaves
    - depend of diffusion to move materials from one part of the plant to another
      - is possible because nonvascular plants are small
  - Vascular Plants-a plant that has specialized tissues that conduct materials from one part of the plant to another.
    - move water to any part of a plant; these plants can be almost any size
    - vascular plants are divided into three groups
      - seedless plants-ferns, horsetails, and club mosses
      - gymnosperm-a woody, vascular seed plant whose seeds are not enclosed by an ovary or fruit.
      - angiosperm-a flowering plant that produces seeds within a fruit.
- The Origin of Plants
  - some scientists believe that plants and green algae share a common ancestor

#### Lesson Two: Seedless Plants

- Nonvascular Plants-don't have true stems, roots, and leaves
- Mosses

- often live together in large groups
- cover soil or rocks with a mat of tiny green plants
- have leafy stalks and rhizoids
  - rhizoids-a rootlike structure in nonvascular plants that holds the plants in place and helps plants get water and nutrients.
- Liverworts and Hornworts
  - small, nonvascular plants that usually live in damp places
  - gametophytes of liverworts can be leafy and mosslike or broad and flattened.
  - hornworts also have broad, flattened gametophytes.
  - both liverworts and hornworts have rhizoids
- The Importance of Nonvascular Plants
  - usually the first plants to live in a new environment
  - when they die they form a thin layer of soil
  - some may grow and hold the soil in place
  - may provide food for animals
- Seedless Vascular Plants
  - are usually taller than nonvascular plants
- Ferns
  - grow from cold areas to tropical forests
  - most have rhizome
    - rhizome-a horizontal, underground stem that produces new leaves, shoots, and roots
- Horsetails and Club Mosses
  - Horsetails
    - usually grow in wet, marshy places.
    - stems are hollow and contain silica
  - Club Mosses
    - grow in woodlands
    - are not actually mosses; they have vascular tissue
- The Importance of Seedless Vascular Plants
  - help the soil by preventing erosion
  - can play a role in the formation of new plant communities
  - add to soil depth
  - popular houseplants and some parts are eaten
  - can be used dietary supplements, shampoos, and skin-care products
  - plants of this nature that died 300 million years ago formed coal

### **Lesson Three: Seed Plants**

- Characteristics of Seed Plants
  - seed plants produce seeds; seeds nourish and protect young sporophytes
  - gametophytes of seed plants do not live independently of sporophytes
    - are tiny; form within the reproductive structures of sporophytes
  - sperm of seedless plants need water to swim to the eggs of female gametophytes
  - sperm of seed plants don't need water; they form in structures called pollen
    - pollen-the tiny granules that contain the male gametophyte of seed plants

- The Structure of Seeds
  - seed forms after fertilization
    - made up of three parts
      - young plant or sporophyte
      - stored food which is often found in the cotyledons or the seed leaves of the young plant.
      - seed coat which surrounds and protects the young plant
  - advantages of seed plants over seedless plants
    - uses food stored in plant
    - seeds can be spread by animals
- Gymnosperms-seed plants that do not have flowers or fruit
  - seeds are usually protected by a cone
  - four groups of gymnosperms are conifers, ginkgoes, cycads, and gnetophytes
- The Importance of Gymnosperms
  - used for building materials, paper products, resin for soap, turpentine, paint, and ink, anticancer drugs, and for gardens and parks.
- Gymnosperm Life Cycle
  - pollination-the transfer of pollen from the male reproductive structures to the female structures of seed plants.
  - Steps of the Life Cycle
    - step 1-the seed contains a young sporophyte, which grows into an adult sporophyte
    - step 2-spores are produced; they grow into gametophytes
    - step 3-sex cells are produced in the cones
    - step 4-wind carries pollen to the egg; a sperm from a pollen grain fertilizes the egg
    - step 5-the fertilized egg develops into a young sporophyte within a seed
- Angiosperms-plants that produce flowers and fruits
  - Angiosperm Reproduction
    - flowers help angiosperms reproduce
    - angiosperms depend on the wind for pollination
    - fruits surround and protect seeds
    - some fruits and seeds have structures that help the wind carry them short or long distances.
    - some fruit attracts animals that eat the fruits; animals discard the seeds
    - some are carried as burrs from place to place by animals
  - Two Kinds of Angiosperms
    - angiosperms are divided into two classes – monocots and dicots
      - monocots-have one cotyledon
      - dicots-have two cotyledons
  - The Importance of Angiosperms
    - provide land animals with food
    - are major food crops, building materials, clothing, medicines, rubber, perfume, and decoration.

## Lesson Four: Structures of Seed Plants

- Xylem-the type of tissues in vascular plants that provides support and conducts water and nutrients from the roots.
- Phloem-the tissue that conducts food in vascular plants.
- Roots
  - Root Functions-three main functions
    - roots supply plants with water and dissolved minerals, the minerals are absorbed from the soil, water and minerals are transported to the shoots in the xylem.
    - roots hold plants securely in the soil.
    - roots store surplus food made during photosynthesis; the food is produced in the leaves; then it is transported in the phloem to the roots, then surplus is usually stored as sugar or starch.
  - Root Structures
    - epidermis-layer of cells that covers the surface of roots
      - some cells extend from the root; these increase the surface area which helps it absorb water and minerals
    - after water and minerals are absorbed they diffuse into the center of the root where the vascular tissue is located.
    - roots grow longer at their tips (root cap)
      - root cap produces a slimy substance that makes it easier for the root to push through soil as it grows.
  - Root Systems
    - two kinds of systems
      - taproot systems
        - has one main root that grows downward with smaller roots branching from the taproot.
        - can reach water deep underground
      - fibrous root systems
        - has several roots that spread out from the base of a plant's stem, roots are usually the same size, usually get water from close to the soil surface. (usually monocots)
- Stems
  - Stem Functions
    - Stems support the plant body, leaves are arranged along stems or on the ends of stems which helps leaves get sunlight or photosynthesis.
    - stems transport materials between the root system and the shoot system, xylem carries water and dissolved minerals from the roots to the leaves and other shoot parts, phloem carries the food made during photosynthesis to roots and other parts of the plant
    - some stems store mineral
  - Herbaceous Stems
    - soft, thin, and flexible stems
  - Woody Stems
    - rigid stems made of wood and bark
- Leaves

- vary greatly in shape and size

- Leaf Functions

  - make food for the plant

- Leaf Structure

  - outer surface of leaves are covered by a cuticle which prevents water loss from the leaf

  - single layer of cells, epidermis, lies beneath the cuticle

  - light passes through the epidermis

  - tiny openings in the epidermis called to stomata let carbon dioxide enter the leaf. Guard cells open the stomata.

  - most photosynthesis takes place in the middle of a leaf

- Leaf Adaptations

  - may have spines

  - may be modified to catch insects

- Flowers

  - come in many shapes, colors, and fragrances

- Sepals and Petals

  - Sepals-one of the outermost rings of modified leaves that protect the flower bud.

  - Petals-one of the ring or rings of the usually brightly colored, leaf-shaped parts of a flower.

- Stamens and Pistils

  - Stamen-the male reproductive structure of a flower that produces pollen and consists of an anther at the tip of a filament.

  - Pistil-the female reproductive part of a flower that produces seeds and consists of an ovary, style, and stigma,

  - Ovary-in flowering plants, the lower part of a pistil that produces eggs in ovules.

- Importance of Flowers

  - help plants reproduce

  - arrangements, eaten, teas, spices, perfumes, lotions, shampoos