THE STEMS

Materials

- A full stem (*Ficus, Schefflera)* collected by the teacher and/or the children
- Botany nomenclature cards #24 - #34
- Magnifying glasses
- 3 x 5 cards, blank labels, black pen

Group Presentation: Levels I - III

1. Share the stem with the children.
2. Refer to 'The Plant' wall chart and point out the stem.
3. Ask the children if they can name or describe the parts of the stem: nodes, internodes, leaf axils, axillary stem buds, terminal stem bud, leaf scars, vascular bundle scars, lenticels, shoot tip, and terminal bud scale scars.
4. Name the parts of the stem. Write the title on a blank label. Label the parts of the stem. Ask the children to describe and define the parts of the stem and write the definitions on 3 x 5 cards.

5a. Discuss the functions of the parts of the stem:

A. The Stems - The stems are a part of the shoot system of the plant. The stems transport water and minerals from the root system to all parts of the shoot system. The stems also transport the food produced in the shoot system to the root system for use and for storage. The parts of the stem are nodes, internodes, leaf axils, axillary stem buds, terminal stem bud, leaf scars, vascular bundle scars, lenticels, shoot tip, and terminal bud scale scars.

B. The Nodes - The nodes are the parts of the stem where the leaves are attached to the stem. The vascular bundles continue from the stem through the node and into the main veins of the leaf.

Latin: nodus - a knot.

C. The Internodes - The internodes are the parts of the stem that are between two nodes.

D. The Leaf Axils - The leaf axils are the angles formed where the leaves are attached to the stem.

E. The Axillary Stem Buds - The axillary stem buds are the buds at the axils. The axillary buds can form stem shoots. Most axillary buds of young stems are dormant. The axillary buds can grow and form vegetative stems with a terminal stem bud, leaves, and axillary buds. The axillary bud also can develop into next season's flowers.

Latin: axilla - armpit

F. The Terminal Stem Bud - The terminal stem bud is the bud at the tip, or apex, of the stem. The terminal bud has developing leaves and several nodes close together. Growth of the stem is concentrated at the terminal bud. Growth at the terminal stem bud of the shoot system is called apical dominance.

5b. Discuss the functions of the parts of the woody stem:

G. The Leaf Scars - The leaf scars are the scars left on the stem when the leaves separate from the stem in the fall. The leaf scars may be shield- shaped or U-shaped

H. The Vascular Bundle Scars - The vascular bundle scars are within the leaf scars. The bundle scars are the tiny dots left where the xylem and the phloem entered the leaf from the stem.

The vascular bundle scars are seen when the leaf separates from the stem in the fall.

I. The Lenticels - The lenticels are tiny pores in the outer layer of bark on the woody stem. The lenticels allow oxygen for respiration to pass from the air into the tree. The lenticels also allow carbon dioxide to pass from the tree into the air.

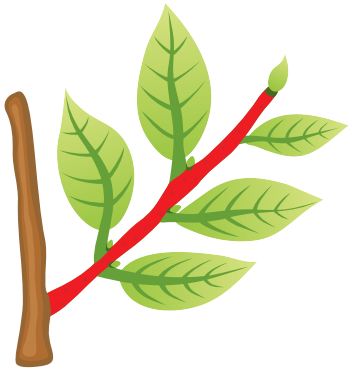
J. The Shoot Tip - The shoot tip or shoot apex is the growing tip of the stem. The shoot tip usually has small bud scales covering the very small leaf bud. The apical meristem is the tissue within the shoot tip that divides and grows. The shoot tip has all the buds for new leaves, stems, and flowers. When the stem grows longer, the buds begin to grow.

K. The Terminal Bud Scale Scars - The terminal bud scale scars are the scars left on the twig by the scales that enclosed the terminal bud during the winter. The terminal bud scales fall off in the spring. Further down the stem are more terminal bud scale scars. They are from previous winters. The scars are identified as several closely packed, raised rings on the twig. Counting the number of groupings of the scars on a twig indicates the age of the twig.

6. Encourage each child to repeat the functions of the parts of the stem.
7. Have the children observe or collect specimens from nature that depict these morphological features.
8. Allow the children to draw or in other ways render what they observe. They may label the parts of the stem and write the definitions in their own words.

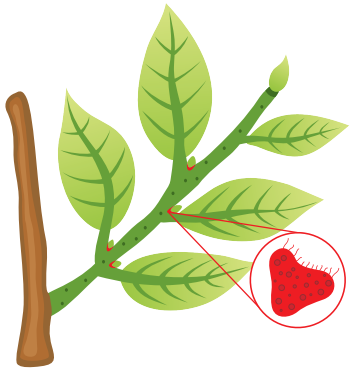
9. Lay out the pictures of the parts of the stem from left to right. (#24 - #34)
10. Distribute the labels for the children to match to the pictures.
11. Display the wall chart.
12. When the children know the definitions of the parts of the stem, distribute the definitions for the children to read and to match to the pictures.
13. Check the definitions with the booklet.
14. Place The Stem classified nomenclature material on the shelf.
15. Place The Stem booklet on the shelf.
16. Follow-up activities for the child:
    A. Match the picture and the label (simple nomenclature).
    B. Match picture label and definition (classified nomenclature).
    C. Make a booklet of The Stems.
    D. Make a chart of The Stems.

THE PARTS OF STEM

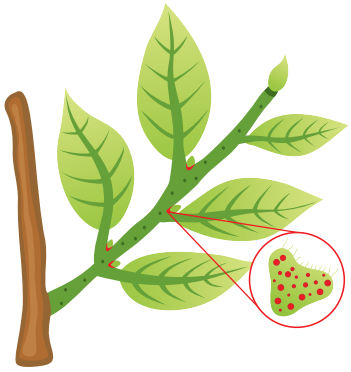


The Stem

The Nodes



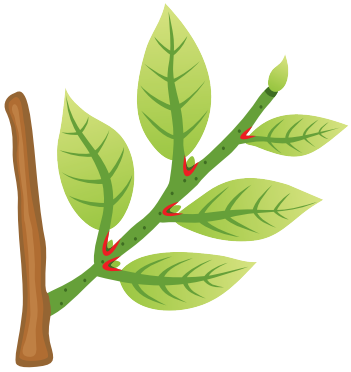
The Leaf Scar



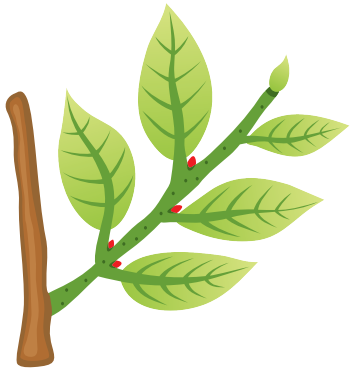
The Vascular Bundle Scars

The Internodes

The Lenticels



The Leaf Axil



The Axillary Stem Buds

The Terminal Stem Bud

The Shoot Tip

The Terminal Bud Scale Scars

THE TYPES OF STEMS

Material

- An example of a woody stem (oak), an herbaceous stem (flower), a specialized aerial stem (ivy), and a specialized underground stem (ginger 'root') collected by the teacher and/or the children
- Botany nomenclature cards #35 - #39
- Magnifying glasses
- 3 x 5 cards, blank labels, black pen

Note: Specialized Stems are covered in the Botany II Manual.

Group Presentation: Levels I - III

1. Ask the children to observe their stems using the magnifying glasses. Share your types of stems with the children.
2. Refer to 'The Plant' wall chart, pointing to the stem.
3. Ask the children if they can name or describe the types of stems: woody and herbaceous. The specialized stems are either aerial or underground.
4. Name the types of stems. Write the title on a blank label. Label the types of stems. Ask the children to describe and define the types of stems and write the definitions on 3 x 5 cards.
5. Discuss the functions of the types of stems:
   A. The Types of Stems - The types of stems support different needs of the leaves, the flowers, and the fruits of the plant. Some stems need to be strong in order to support large growth. Some stems do not need to support large growth. Some stems are modified to perform special functions for the plant. The types of stems are

woody and herbaceous. The specialized stems are either aerial or underground.

B. The Woody Stems - The woody stems are thick and hard. The woody stems typically are not green. Woody stem plants are perennials and live for more than two years. Woody stem plants can be trees such as maple and pine. Woody stem plants can be shrubs such as rosemary and roses. Woody stem plants can be vines such as grapes, blackberries, and climbing roses.

C. The Herbaceous Stems - The herbaceous stems are soft and green. The herbaceous stems are usually annuals that complete their life cycle in one year, or biennials that complete their life cycle in two years. Grasses, zinnias, and tomatoes are examples of herbaceous stem plants.

D. The Specialized Aerial Stems - The specialized aerial stems are stems that grow above ground and are modified for special functions. Thorns, runners, stolons, climber stems with roots, twining stems, tendril stems, cacti stems, and cladophyll stems are specialized aerial stems. The English ivy is an example of a climber stem with roots.

Latin: aer - air

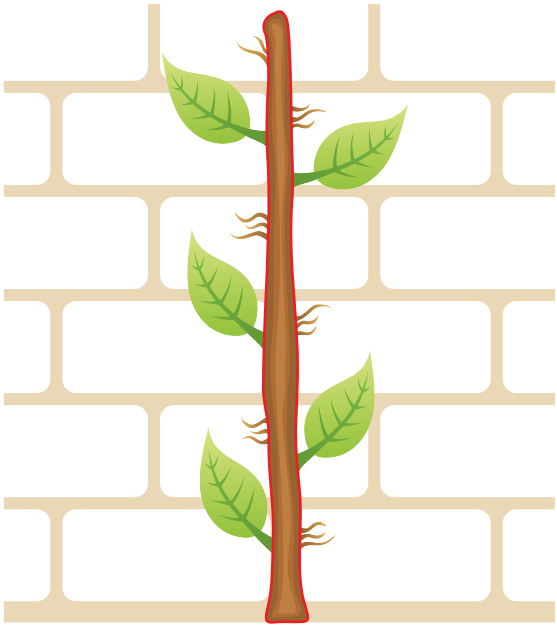
E. The Specialized Underground Stems - The specialized underground stems are stems that grow under the ground. Specialized underground stems are stems modified for storing food, or for supporting the storage of food. Rhizomes, corms, stolons, and tubers are specialized underground stems.
The ginger plant is an example of a rhizome.

6. Encourage each child to repeat the functions of the types of stems.
7. Have the children observe or collect specimens from nature that depict these morphological features.
8. Allow the children to draw or in other ways render what they observe. They may label the types of stems and write the definitions in their own words.
9. Lay out the pictures of the types of stems from left to right. (#35 - #39)
10. Distribute the labels for the children to match to the pictures.
11. Display the wall chart.
12. When the children know the definitions of the types of stems, distribute the definitions for the children to read and to match to the pictures.
13. Check the definitions with the booklet.
14. Place The Types of Stems classified nomenclature material on the shelf.
15. Place The Types of Stems booklet on the shelf.
16. Follow-up activities for the child:
    A. Match the picture and the label (simple nomenclature).
    B. Match picture, label, and definition (classified nomenclature).
    C. Make a booklet of the Types of Stems.
    D. Make a chart of The Types of Stems.

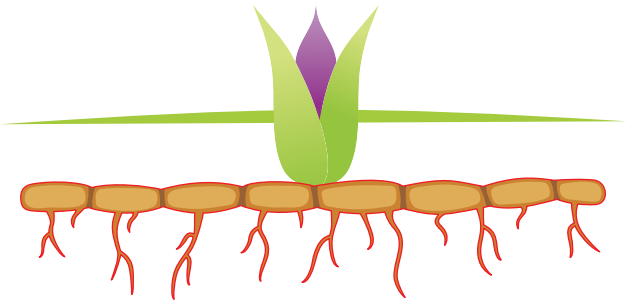
THE TYPES OF STEMS

The Woody Stems

The Herbaceous Stems



The Specialized Aerial Stems



The Specialized Underground Stems

THE STEM LENGTH

Material

- An example of each stem length: normal (oak branch) and sessile (dande lion), collected by the teacher and/or the children
- Botany nomenclature cards #40 - #42
- 3 x 5 cards, blank labels, black pen

Group Presentation: Levels I - III

1. Share the stem lengths with the children.
2. Refer to 'The Plant' wall chart pointing out the stem.
3. Ask the children if they can name or describe the types of stem length: normal and sessile.
4. Name the types of stem lengths. Write the title on a blank label. Label the stem lengths. Ask the children to describe and define the stem lengths and write the definitions on 3 x 5 cards.
5. Discuss the functions of the types of stem lengths:
   A. The Stem Length - The stem length describes the distance on the stem from the root to leaf growth. Plants may have normal stem length or sessile stem length.
   B. The Normal Stem Length - The normal stem length is long branching stems with the leaves growing along the stem.
   Most plants have normal stem length. The oak tree is an example of a plant with normal stem length.

C. The Sessile Stem Length - The sessile stem length is a very short, disc-shaped stem between the root and the leaves. The leaves appear to grow directly from the root. The new leaves grow from the center of the stem. The internodes are not visible because they are so short. Bulbs have sessile stem length. The dandelion is an example of a plant with sessile stem length.

Latin: sessile - sitting upon

6. Encourage each child to repeat the functions of the types of stem lengths.
7. Have the children observe or collect specimens from nature that depict these morphological features.
8. Allow the children to draw or in other ways render what they observe. They may label the stem lengths and write the definitions in their own words.
9. Lay out the pictures of the types of stem lengths from left to right. (#40 - #42)
10. Distribute the labels for the children to match to the pictures.
11. Display the wall chart.
12. When the children know the definitions of the types of stem lengths, distribute the definitions for the children to read and to match to the pictures.
13. Check the definitions with the booklet.
14. Place The Stem Length classified nomenclature material on the shelf.
15. Place The Stem Length booklet on the shelf.
16. Follow-up activities for the child:
    A. Match the picture and the label (simple nomenclature).
    B. Match picture, label, and definition (classified nomenclature).
    C. Make a booklet of The Stem Length.
    D. Make a chart of The Stem Length.

THE STEM LENGTH

The Normal Stem Length

The Sessile Stem Length