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Plant Morphology: Ideas for use in therapeutic recreation, horticultural therapy, adult education, and youth organizations

By co-authors Alan Eddy & Natalie M. Howe, PhD (with input from an Advisory Committee and a Test Audience)

This program provides:

- Explanations of plant structure that will enhance enjoyment of indoor and outdoor gardening, flower arranging, nature walks, nature or garden journaling, and plant identification
- Recreational and educational activities centered around botany
- Botanical trivia and interesting facts

The program can be used as a source of ideas, lessons, and trivia as enrichment to activities in therapeutic recreation and horticultural therapy. A therapist or educator is welcome to pull content from here to include in an activity or lesson. This can add a dimension of interest and intellectual challenge to an activity.

Foreword by Margaret (Meg) Lowman, PhD

Note about Sketching and Journaling

How you can find public-domain photographs, photomicrographs, drawings, and other images on the Internet (to use as illustrations for the text provided here in this program).

Part One. *Exploring the growth and form of plants: a six-week syllabus for beginner botanists of all ages*

Each Topic of Part One includes:

Botany lessons, with botany trivia that can be used independently and bonus material for those who are interested.

Intergenerational activities. These activities can be adapted to different kinds of groups in a variety of settings (or used in a pen-pal relationship).

Group activities and group inquiries.

Topic One: **From the First Plants to the Age of Dinosaurs.** This lesson covers algae, ocean plants, diatoms, fungi, lichens, mosses & liverworts, ferns, lycopodiums, cycads, equisetums, and ginkgos (including the first land plants and the first vascular plants).

Topic Two: **Gymnosperms and Angiosperms.** This section discusses the beginning of flowering plants and the interaction between flowers and pollinators such as insects and other animals. It also describes the co-evolution of seeds and fruits that attract animals in order to spread the seeds. This chapter includes some brief notes about biogeography, paleobotany, and palynology (the study of pollen).

Topic Three: **Monocots and Dicots.** This lesson covers the two main types of flowering plants (monocotyledons and dicotyledons). The former are grasses (including maize, sugarcane, and small grains), sedges (including papyrus), rushes, palm trees, banana trees, onions, garlic, leeks, chives, asparagus, ginger, lilies, daylilies, hostas, irises, flowering bulbs, orchids, bromeliads, and many indoor plants. The dicotyledons include most of the flowering plants we see every day. The plant with the greatest structural strength is not the mighty oak or a titan of the rainforest, but bamboo, which is a group of grass species (monocots). This lesson includes the game “Monocots vs. Dicots” about favorite foods and favorite garden plants (do you like monocots or dicots better?).

Topic Four: **Root, Stem, and Meristem.** Subjects covered include the germination, growth, and development of vascular plants. There are three areas of growth (three meristems in gymnosperm and dicot plants: shoot tip, root tip, and cambium around the circumference of the stem). The instructor can provide tree and shrub twigs cut in half, showing the pith — hollow, solid, diaphragmed, or chambered. Samples should be color-coded by species, with the names of the species revealed at the end of the lesson. This topic also includes revelations about prehistoric Ireland from the discipline of dendrochronology (the study of growth rings in tree trunks), a fascinating application of plant morphology.

Topic Five: **Complex Plant Structures.** This lesson discusses leaves and bracts, rhizomes and stolons, roots and tubers, leaf buds and branch buds. A tremendous variety of forms have evolved in the Plant Kingdom. Each participant can select a different type of specialized plant structure to study or sketch (the instructor will provide living examples or cuttings).

Topic Six: **Flowers and Fruits.** This section covers buds, petals, sepals, stamens, pistils, seeds, embryos, and cotyledons. Pollination and seed development are key factors in the evolution of flowering plants. Plant genetics and breeding are also covered. Look up these plant breeders, plant hunters, agricultural inventors, and agronomists in Wikipedia: Gregor Mendel, George Washington Murray, Henry Blair, Andrew Jackson Beard, Mary Ann Gilbert, John Bartram, George Washington Carver, Nikolai Vavilov, Barbara McClintock, Janaki Ammal, Frank Meyer, Liberty Hyde Bailey, Agnes Chase, Erna Bennett, Bent Skovmand, and Mark Shepard. This is not a complete list, just some of the authors' favorites.

Part Two. Four botanical activities

Activity One: **Jack and the Beanstalk.** From your local public library, the instructor will check out as many different versions as possible of *Jack and the Beanstalk* so you can review the illustrations of the magic bean plant. What do you think of the "botanical accuracy" of the drawings?

Drawing activity: This folk tale is from England, and the agricultural beans of the Old World are fava beans (also called broad beans, scientific name *Vicia faba*). Draw a fava bean plant as accurately as possible, and then re-draw it as a huge magic plant. Can the magic plant retain some botanical detail? What are the logical consequences of rapid growth? Enjoy!

Activity Two: **The Shape and Structure of Large Plants.**

Example #1: Sugar maple tree in winter

Example #2: Sugar maple tree in summer

Example #3: A tuliptree with "elbows" (in winter)

Example #4: A shagbark hickory tree (in winter)

Example #5: An indoor palm tree

Example #6: An outdoor palm tree

Drawing activity: Free-hand drawing exercises. This is the fun part of putting your botanical knowledge to use. As you take pen or pencil in hand, think about how the tree actually grows. If you have taken drawing

lessons before, then use what you know about perspective, tone (shading), light source (shadows), and the like.

Case Study: Examples of how impressionist and post-impressionist painters captured the effect of sunlight coming through the leaves of a tree.

1. Claude Monet *Bazille and Camille* 1865
2. Claude Monet *The Picnic* 1866
3. Pierre-Auguste Renoir *Picking Flowers* 1875
4. Pierre-Auguste Renoir *On the Terrace* 1881
5. Claude Monet *Bordighera* 1884
6. Georges Seurat *A Sunday Afternoon on the Island of La Grande Jatte* 1884-1886
7. Claude Monet *The Japanese Footbridge and the Water Lily Pond, Giverny* 1899
8. William Chadwick *Country Road in Summer* 1918

The William Chadwick painting is a dining room panel in the Florence Griswold house (now a museum) in Old Lyme, Connecticut.

Activity Three: **Plant Identification.** Plant identification is a course in itself, but what you have learned in this class can help you get started. It is possible to teach yourself plant identification with a hand lens and some botanical keys or polyclaves (either printed or online). Participants will have a chance to practice using several different kinds of keys and samples of plant material. We will also explore apps for plant ID.

Activity Four: **The Wide World.** The participants in this program may have an interest in the world as a whole. Botany, horticulture, and agriculture can be a window into interacting with issues, projects, and charities that play a significant role in our world. One of the authors worked as a volunteer in the Geriatric Extended Care Unit of the VA Medical Center in West Haven, CT, where we established a successful pen-pal relationship with an agricultural missionary in Peru.

The End

Appendix: Finding Information about Plants Poisonous to Humans