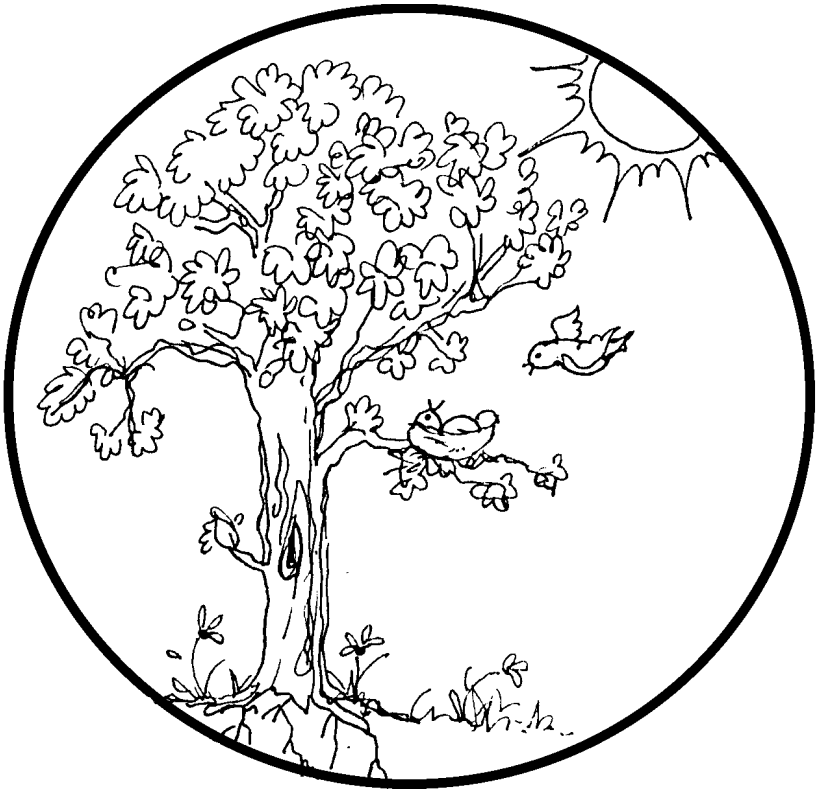
Life Cycle

Diversity in a Balance

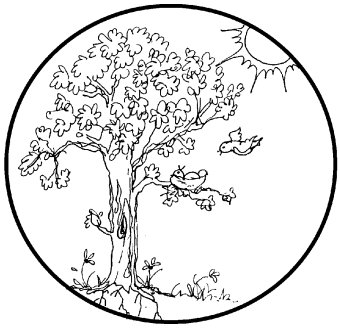
THIRD GRADE

PLANT LIFE



2 weeks
LESSON PLANS AND
ACTIVITIES

LIFE CYCLE
OVERVIEW OF THIRD GRADE



ORGANISMS

WEEK 1.
PRE: *Comparing and contrasting invertebrates and vertebrates.*
LAB: *Learning about different marine invertebrates.*
POST: *Exploring where marine invertebrates live.*
WEEK 2.
PRE: *Comparing marine and terrestrial invertebrates.*
LAB: *Classifying different types of arthropods.*
POST: *Investigating metamorphosis.*

HUMAN BIOLOGY

WEEK 3.
PRE: *Comparing human organ systems.*
LAB: *Exploring external signs of internal systems.*
POST: *Analyzing components of the respiratory system.*
WEEK 4.
PRE: *Comparing the different sensory organs.*
LAB: *Analyzing how we taste.*
POST: *Investigating the digestive system.*

PLANT LIFE

WEEK 5.
PRE: *Investigating requirements of growth.*
LAB: *Designing an experiment testing two variables.*
POST: *Comparing how plants reproduce.*
WEEK 6.
PRE: *Exploring plant characteristics.*
LAB: *Comparing cellulose from different plant products.*
POST: *Investigating the importance of plants.*

NATURAL ENVIRONMENT

WEEK 7.
PRE: *Comparing the world's biomes.*
LAB: *Comparing locations of plant and animal biomes.*
POST: *Identifying the local vegetative biome.*
WEEK 8.
PRE: *Comparing how organisms obtain food.*
LAB: *Comparing herbivores and carnivores.*
POST: *Analyzing the importance of natural environments.*

LIFE CYCLE - PLANTS (3A)

PRE LAB

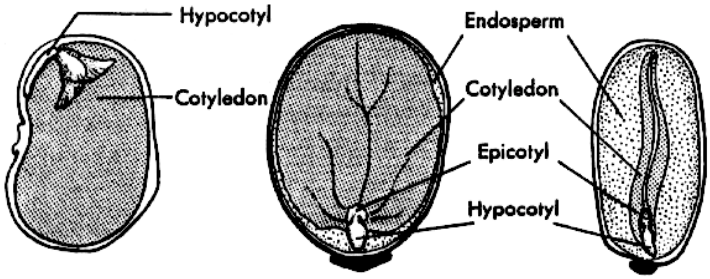
Students use a worksheet to compare how different seeds grow.

OBJECTIVES:

1. Investigating the requirements for plant growth.
2. Comparing different stages of germination.

VOCABULARY:

germination
photosynthesis
transpiration



KIDNEY BEAN CASTOR BEAN

MATERIALS:

worksheet

BACKGROUND:

The life cycle of a plant varies depending on the individual species. There are, however, certain requirements for life that most plants need. The growth of a plant is dependent upon light, water, oxygen, carbon dioxide, minerals in the soil, temperature and microbes in the soil. Light, water, and carbon dioxide are needed for photosynthesis which produces food for the plant. Oxygen is needed when it is dark, because the plant then needs oxygen to maintain itself. The correct temperature, soil, and minerals are all needed when the plant first germinates and subsequently grows. Soil helps bind the roots so the plant can anchor itself. Microbes in the soil include a number that are beneficial to plants. Microbial activity helps bring about the decay of organic material (dead plant material and animals) necessary for the production of soil. Temperature or light intensity varies for each type of plant, and this helps explain global plant distribution; light intensity or temperature also effects the rate of photosynthesis in plants; the time at which a plant flowers and the rate at which water loss occurs in a plant (transpiration.)

When these requirements are static for a seed, it will begin to grow or germinate. Sufficient food and minerals are stored in almost all seeds, so that these factors do not limit germination. As water is absorbed by a seed, the inner tissue swells more rapidly than the seed coat. The penetration of water allows the tissues to become hydrated and enzyme activity increases. The food that is stored in the cotyledons or the endosperms are now digested and used.

PROCEDURE:

1. Instruct students to list some uses of plants: food, drink (cola, wine), lumber, clothes (cotton), medicine (aspirin) and paper (trees). Plants also release oxygen into our atmosphere which is then used by animals for respiration.

2. Ask students to name some plants. There are hundreds of thousands of species of plants throughout the world. There are small plants and large plants; plants that live in water or land; and even plants that can survive and live in environments without soil.

3. Plants utilize seeds for reproduction. The seed is dormant until the right conditions allow it to grow. Review the diagram of the seed on the preceding page and discuss once more the requirements for plant growth.

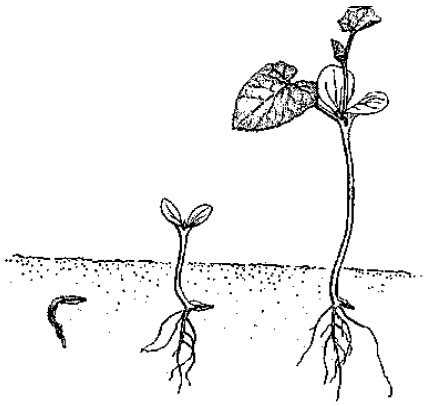
4. On the worksheet, have the students examine the different germinating seeds, including the squash, garden bean, pea seed, and corn grain. Instruct students to compare the 4 seeds and write down the differences and similarities that they observe.

In the squash, the cotyledons are lifted out of the ground and function as green leaves for a brief period. Garden beans have cotyledons which are lifted out of the soil, but they are bulky storage organs and do not function as leaves. In pea seeds the cotyledons remain in the soil. A germinating corn grain is really a fruit in which the seed coat is fused with the ovary wall.

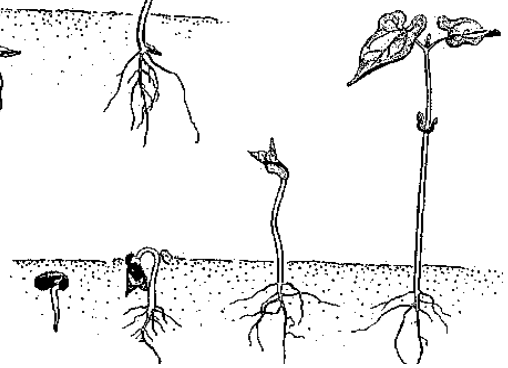
LIFE CYCLE - PLANTS (3A) PRE

DESCRIBE THE DIFFERENCES IN GERMINATION OF THE 4 SEEDS

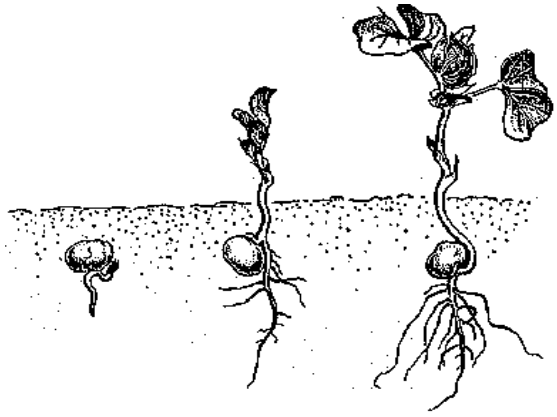
squash



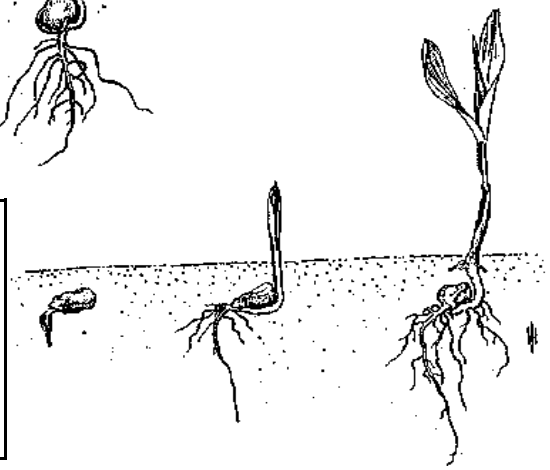
stringbean



pea



corn



LIFE CYCLE - PLANTS (3A)

LAB

Students determine the growth requirements of plants through experimentation.

OBJECTIVES:

1. Designing an experiment testing two variables.
2. Using controls in an experiment.

VOCABULARY:

control
requirement

MATERIALS:

4 test plants per group that will readily show problems when deprived of sun and water (i.e. lettuce seedlings or grass)

2 coffee cans per station

plant lab at The University of California at Davis

BACKGROUND:

All plants need light, water, air, moderate temperatures and most need soil. Some plants, such as mistletoe and duckweed, do not require soil for growth and life but they do not constitute the majority of plants. There are wide variations in the amount of light and water that plants require. A mature Joshua tree, for example can store enough water to last three years or until another rainy season.

Most plants, however, need water on a more regular schedule. Some plants require a full day's hot sun, and others cannot be taken out of deep shade. Temperature tolerance also varies tremendously. Tundra and lichens can survive near the Arctic, but many tropical plants cannot survive being carried from the store to a car when it is near freezing.

PROCEDURE:

1. In this experiment you will introduce the idea of an experimental control. As part of an experiment a control determines what the outcome would be if no alterations or changes occurred. In essence, a control serves to detect a change that occurred independent of the experiment. In this experiment, for example, if there were no controls used, it would be difficult to prove that not watering or placing a plant in darkness had any effect. Any plant that died could have been sick before you got it, or maybe this kind of plant did not like classrooms or children!

2. Ask the students to bring in 4 similar plants from home. The plants may be grass, weeds, or anything growing around the house. If your school is near a grassy or

weedy area, you can have the students collect 4 specimens before you complete this lab.

3. In lab, the students will decide if plants need sun and water to live. The lab content is simple because the main emphasis of the lab should be on designing a good experiment. Show them the experimental set-up using their 4 plants as follows:

Plant A: the control
Plant B: sun, no water
Plant C: water, no sun
Plant D: no sun, no water

4. Look at all the plants and enter the first day's (and subsequent) observations into the appropriate place on the chart as follows: + = alive and growing; - = dying, or looking unhealthy; and 0 = dead. If there is more information the students should write it on the back of the lab sheet or on a separate piece of paper.

Place the plants in their appropriate locations. The students can cover the plants with a coffee can to simulate lack of sunshine. It is a good idea to tilt the cans slightly so that air can circulate through the cans. Continue making observations on the chart for 2 weeks. You may want to work on Plants 3A - Post LAB lab so students can study two experiments at once.

LIFE CYCLE - PLANTS (3A)

PROBLEM: Do plants need sun and water to live?

PREDICTION:

MATERIALS: 4 plants, 2 cans

PROCEDURE: Record a description of your 4 plants before you start the experiment, then place the plants where they belong.

PLANT A:

PLANT B.

PLANT C.

PLANT D.

RECORD OF EXPERIMENT				
	A	B	C	D
1st Day				
2nd Day				
5th Day				
8th Day				
14th Day				

CONCLUSION: Summarize your results.

LIFE CYCLE - PLANTS (3A)

POST LAB

Students grow a plant from cuttings.

OBJECTIVES:

1. Comparing how plants reproduce.
2. Contrasting the growth rate of different plants.

VOCABULARY:

leaf
stem

MATERIALS:

potting soil
glasses with water
containers for rooting plants
plant cuttings
plastic wrap

Sugarcane fields with palm trees in the background.

BACKGROUND:

Many plants can reproduce either sexually (seeds) or vegetatively (asexual), utilizing other plant parts. Whole plants can be grown from stems, leaves or roots, if the right plant is chosen. The following are some suggestions that can be used to illustrate vegetative reproduction.

Stems: Ivy, potato tubers, bamboo and iris rhizome, bulbs of various kinds (bulbs are actually modified shoots), crocus or gladiolus, corn, Philodendron, Monstera (split-leaf philodendron), strawberry and spider plant offsets. (Many others will grow, even hardwoods, but they take a lot of time and effort.)

Roots: Japanese anemone, Oriental poppy, trumpet creeper, blackberry, raspberry, lily of the Nile, and any other plant that produces sprouts from roots. (The roots you plant will show no visible growth buds, the buds develop after the root cutting is planted.)

Leaves: Begonias, African violets, various succulents, sansevieria, piggy back plant (if leaf has plantlet), and Bryophyllum.

PROCEDURE:

1. Instruct the students to bring a variety of plant parts from home to demonstrate vegetative reproduction. Have a few plants on hand yourself for kids who do not contribute and so that you have a few that you know will work (see list above). Plant the parts in soil or water and keep them moist, but not soggy as to avoid rotting the plant part. Remember that not all parts of a plant can sprout. So try and instruct students to bring in stems that

look like they may be sprouting “air” roots (i.e. ivy).

2. Sprouting can take anywhere from a few days (some kinds of leaves or stems in water) to a few weeks (some tubers and rhizomes). It is best to keep the plants out of direct sunlight. Instruct the children to guess which will be first and keep a record of all the plants, since all the plants may not sprout. In most cases, with the exception of stems, do not make the cuttings "sit" in stagnant water, aeration will help promote growth.

3. Use plastic wrap to cover the roots, to keep plants and soil from drying out.

LIFE CYCLE - PLANTS (3B)

PRE LAB

Students learn about xylem and phloem using celery.

OBJECTIVES:

1. Exploring plant characteristics.
2. Determining which plants have a vascular system

VOCABULARY:

nonvascular
vascular
phloem
xylem

Rice plants are surrounded by water, but they still have to move water to its leaves. .

MATERIALS:

celery stalks or carnation
beakers
food coloring
knife

BACKGROUND:

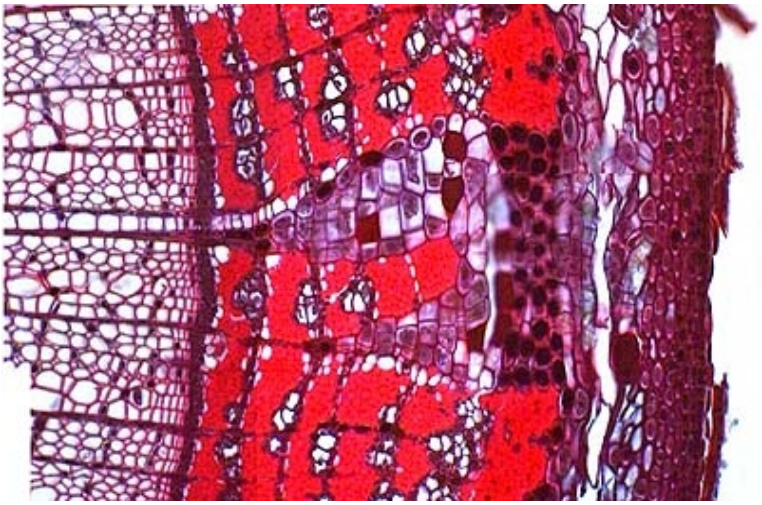
Vascular plants are plants that have specialized conducting tissue and are usually grouped as tracheophytes and include the ferns, horsetails, angiosperms (flowering plants) and gymnosperms (pine-like trees). Thallophytes (water type plants) and bryophytes (mosses) do not have true roots, stems, and leaves and possess no specialized system for the conduction of food and water from one part of the plant to another. Plants that have a vascular system are larger and able to cope with a "land situation." There are no plants with a vascular system in a total water environment because the water provides the nutrients the plants require, so they do not have to "conduct" these substances.

Woody stems are mostly secondary xylem (wood) surrounded by bark. The xylem may include heart-wood and sap-wood. Heart-wood is dead and non-functional. The sap wood is functional and has living parenchymal cells.

PROCEDURE:

1. Give each group of children a piece of celery (cross section) and have them place a drop of food coloring on the top. The celery should show color only in small dots. These are part of the xylem tissue that is responsible for water transport.

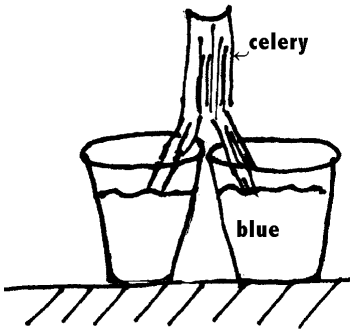
2. Discuss with the students the different types of specialized conducting cells of



The xylem is the structure to the extreme left; and the phloem is the center red area.

vascular plants namely, the phloem and the xylem. Explain to students that phloem tissue conducts food produced in the leaves to the rest of the plant while xylem tissue conducts water and mineral salts from the roots. The xylem tissue also gives strength to the stem.

3. You can dramatically demonstrate the "power" of xylem tissue by using a celery stalk and/or carnation. For the celery stalk cut the bottom of the stalk (as in the diagram) and place one end in one food color and the other in a different color. Within a day or so, the water with the color will migrate upward and the celery will be two colors. For the carnation, trim the stem and place it in colored water. The water will migrate upward through the xylem tissue and color the petals of the carnation.



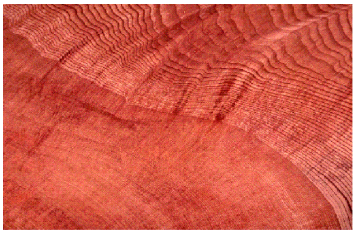
LIFE CYCLE - PLANTS (3B)

LAB

Students compare products made from cellulose.

OBJECTIVES:

1. Comparing cellulose from different plant products.
2. Exploring the uses of plants.



VOCABULARY:

cellulose
wood

MATERIALS:

Life Cycle - Plants (3B)
Swift-GH Microscopes

BACKGROUND:

Cell walls are made primarily of cellulose but there are also other substances like hemicelluloses, minerals, tannins, resins, pigments, proteins, mucilages, and gums that can be found in plant cell walls. Cell walls are porous, allowing an exchange with substances outside the cell wall. Cellulose has a straight chain structure, forming strong fibers that are ideal cell-wall structural materials and useful in making products.

Cellulose is used commercially in making paper, rayon, explosives, cellophane, buttons, and many other materials. Cellulose comprises approximately 80 per cent of the dry weight of wood, and forests are the source of many valuable articles in addition to lumber. Plant fibers are twisted together to manufacture thread or yarn from which fabrics are woven. The fibers are obtained primarily from the cotton, flax, or hemp plants.

Lumber is mainly cellulose. There are two zones of wood on a tree, the sapwood, a light-colored outer zone and the heartwood, surrounding a generally darker-colored zone. The sapwood functions in sap conduction and food storage, the heartwood is used for mechanical support. Sapwood will eventually turn into heartwood. Heartwood is the more durable portion of lumber.

PROCEDURE:

1. In this lab, students will look at six different products made from cellulose and will determine if there are any characteristics that can help identify the items that came from plants. Students will need to look at the material with a microscope or good hand lens. You can either use the module or get six different specimens of materials made from plants.

2. Many specimens show evidence that they have been derived from plants. Cotton fibers or threads will show a twisting in the fiber which can be seen with a

microscope. Lumber shows portions of growth rings which are often visible to the naked eye. Dried moss, which is used as a decoration for artificial plants, still has a green color and has its structure except for the roots. Different types of hemp or rope-like decorations show elongated fibers. Paper, however, doesn't show much evidence that it can from plants, but that is mainly because the wood pulp from which it was derived has been pulverized and squashed to hide any connection to plants.

LIFE CYCLE - PLANTS (3B)

PROBLEM: How can you detect plant cellulose in a product?

PREDICTION: _____

MATERIALS: cellulose samples, microscope

PROCEDURE: Look at the samples at your table. Describe the characteristics that you think connect the sample with plants. Draw your specimen.

SAMPLE	DRAWING	CHARACTERISTICS

CONCLUSION: Are there any characteristics that can help you determine if a product is made from a plant? Explain.

_____

_____

_____

LIFE CYCLE - PLANTS (3B)

POST LAB

Students use the Internet to find information.

OBJECTIVES:

1. Exploring the uses of plants.
2. Investigating the importance of plants.

VOCABULARY:

photosynthesis
soil conservation
wood pulp

MATERIALS:

Internet
worksheet

BACKGROUND:

Plants form the basic food staple for all life forms. They are the major source of food and oxygen on earth, since no animal can supply these necessary components without plants. The cattle we eat as beef, feed on grasses and the fish we eat, consume algae and are therefore dependent on plants for well being. Other important uses of plants include, providing shelter for animals, providing materials for clothing (cotton fibers), paper products, medicines and other chemicals, producing coal from once living plant material, reducing wind speed and noise levels, and reducing soil erosion and water runoff.

There are many different types of cash crops that produce money for farmers. Olive oil comes from olives, corn oil comes from corn, and peanut oil comes from peanuts. Typical agricultural products like corn, wheat, rye, and rice are all considered cash crops. Coffee plants produce beans that are used to make coffee; coca plants give us chocolate; vanilla plants grow long thin beans that are used to produce vanilla flavoring. Many drinks and beverages, like cola and tea, come from plants. Rubber from trees is also a cash crop, as is lumber, fruit, vegetables, and cotton.

Plants are also used in agriculture to help reduce wind speed. Planting trees in a row prevents the wind from blowing away the valuable topsoil. In the forest, trees act as shelter for many organisms.

Plants are also important for the overall ecology of an area. Roots help to stabilize soil and prevent erosion by water run off (soil conservation). Plants are also important in our atmosphere because they use carbon dioxide and give off oxygen while they undergo photosynthesis.

Plants are also used in the urban setting to reduce noise, produce shade, and to beautify an area. Trees add value to homes and communities.

PROCEDURE:

1. Ask students if they know why plants are important. Review the information provided in the "Background" section. Discuss the worksheet before they start writing, especially if you want them to use the Internet or school library to do their work.

2. You may want to use the Internet to help students learn how to use a search engine. In some of the search engines like http://www.yahoo.com and http://www.snap.com go over some of the key words that might help them to search more successfully.

Words like: paper products, agriculture, fabrics, medicine, and food may produce a long list of sites students can investigate.

LIFE CYCLE - PLANTS (3B)

POST LAB

Using at least six of the key words listed below write a paragraph about why plants are important. Use reference material or the Internet to find information.

cash crops	shelter
soil conservation	reduce wind
photosynthesis	reduce noise
food	beautiful
water run off	raw materials