It's Not Easy Being Green: Plant Structures and Processes

Grade Level or Special Area: 5th Grade Science
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Length of Unit: Six Lessons (10-11 days, 50 minutes each day)

I. ABSTRACT

A. It is not easy being green! Through photosynthesis, plants must do all the work to make their food. Some plants, like algae, live the lonely road of asexual reproduction, not to mention that the poor algae are non-vascular. Thus, they have no tube-like structure, which severely restricts relocation possibilities. Although their vascular cousins are able to reach for the sun, they too cannot just up and move to more desirable locations. However, one benefit to plant parenthood is the release of duty from the "birds and the bees" talk. For the most part, the birds and the bees simply take care of it themselves.

II. OVERVIEW

A. Concept Objectives
   1. Students will gain an appreciation for the complex structures of living things.
   2. Students will understand the importance of photosynthesis.
   3. Students will understand the characteristics, structure, and functions of organisms.

B. Content from the *Core Knowledge Sequence*
   1. Plant Structures and Processes
      a. Structure: Non-vascular and vascular plants
         i. Non-vascular plants (for example, algae)
         ii. Vascular Plants
            1. Vascular plants have tube-like structures that allow water and dissolved nutrients to move through the plant.
            2. Parts and functions of vascular plants: roots, stems and buds, leaves
      b. Photosynthesis
         i. Photosynthesis is an important life process that occurs in plant cells, but not animal cells (photo = light; synthesis = putting together). Unlike animals, plants make their own food, through the process of photosynthesis.
         ii. Role in photosynthesis of: energy from sunlight, chlorophyll, carbon dioxide and water, xylem and phloem, stomata, oxygen, sugar (glucose)
      c. Reproduction
         i. Asexual reproduction
            1. Example of algae
            2. Vegetative reproduction: runners (for example, strawberries) and bulbs (for example, onions), growing plants from eyes, buds, leaves, roots, and stems
         ii. Sexual reproduction by spore-bearing plants (for example, mosses and ferns)
         iii. Sexual reproduction of non-flowering seed plants: conifers (for example, pines), male and female cones, wind pollination
         iv. Sexual reproduction of flowering plants (for example, peas)

1. Functions of sepals and petals, stamen (male), anther, pistil (female), ovary (or ovule)
2. Process of seed and fruit production: pollen, wind, insect and bird pollination, fertilization, growth of ovary, mature fruit
3. Seed germination and plant growth: seed coat, embryo and endosperm, germination (sprouting of new plant), monocots (for example, corn) and dicots (for example, beans)

C. Skill Objectives

1. Students will be able to follow directions to conduct experiments on vascular and non-vascular plants.
2. Students will record observations on the changing colors of vascular plants.
3. Students will demonstrate how non-vascular plants absorb nutrients through the leaves.
4. Students will compare and contrast the interrelationship between xylem and phloem.
5. Students will describe how vascular and non-vascular plants absorb nutrients and water.
6. Students will demonstrate their understanding of photosynthesis by answering questions.
7. Students will observe an experiment on asexual reproduction through the use of a potato.
8. Students will record observations and knowledge gained by completing the experiment.
9. Students will develop their ability to gather pertinent information during class discussion to assist in implementing the experiment.
10. Students will follow instructions to conduct the dissection of a flower.
11. Students will label and identify the different parts of a flower.
12. Students will explain and draw the different stages from pollination to fruit.
13. Students will identify the various ways pollination occurs among flowering and non-flowering plants.
14. Students will compare and contrast seeds based on similarities and classify them into groups.
15. Students will summarize the various ways in which plant seeds are dispersed.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. *What Your Fifth Grader Needs to Know*, E.D. Hirsch
2. *Microorganisms, Fungi, and Plants: Annotated Teacher's Edition,* Holt Science and Technology
3. *Plants,* Milliken Publishing Company
4. *Flowers and Seeds*, Carson-Dellosa Publishing Company, Inc.

B. For Students from the *Core Knowledge Sequence*

1. Science: Plants and Plant Growth (Kindergarten, p.19)
2. Science: The Human Body – Cells (2nd Grade p. 60)
3. Science: Cells – Structures and Processes (5th Grade p. 127)

IV. RESOURCES

A. *Bill Nye the Science Guy: Plants* (Video)
B. *Bill Nye the Science Guy: Flowers* (Video)
C. *Flowers & Seeds,* Ramona Bates
D. *Plants,* Milliken Publishing Company
E. *Teacher Resources for Microorganisms, Fungi, and Plants*, Holt Science and Technology
F. *Thrilling Experiments: Plants* (Video), Teacher's Video Company
G. *What Your Fifth Grader Needs to Know,* E. D. Hirsch

V. LESSONS

Lesson One: Vascular Plants

A. *Daily Objectives*
   1. Concept Objective(s)
      a. Students will gain an appreciation for the complex structures of living things.
      b. Students will understand the characteristics, structure, and functions of organisms.
   2. Lesson Content from the *Core Knowledge Sequence*
      a. Plant Structures and Processes (p. 127)
         i. Structure: Vascular Plants
            1. Vascular plants have tube-like structures that allow water and dissolved nutrients to move through the plant.
            2. The parts and functions of vascular plants: roots, stems and buds, and leaves.
   3. Skill Objective(s)
      a. Students will be able to follow directions to conduct experiments on vascular plants.
      b. Students will record experiment observations on the changing colors of vascular plants.

B. *Materials*
   1. 3 straws (diameter needs to vary in size for each straw)
   2. 11 beakers (8 with water)
   3. carnations
   4. celery
   5. copies of Appendices B, C
   6. food Coloring (red, blue, yellow, green, and orange)
   7. KWL chart - Appendix A
   8. Queen-Anne's Lace flowers

C. *Key Vocabulary*
   1. vascular – a plant that has specialized tissues called xylem and phloem, which move materials from one part of a plant to another
   2. xylem – a specialized plant tissue that transports water and minerals from one part of a plant to another
   3. phloem – a specialized plant tissue that transports sugar molecules from one part of a plant to another
   4. glucose – a sugar in plant saps and fruits
   5. roots – a leafless underground part of a plant that stores food and holds the plant in place

6. stem – the main stalk of a plant that develops buds and sprouts and usually grows above ground
7. buds – a small growth at the tip or on the side of a stem that later develops into a flower or branch
8. leaves – usually flat green parts that grow from a plant stem

D. *Procedures/Activities*

1. Begin by distributing 5 sticky notes to each student. Access prior knowledge by having them write 1 fact about plants they already know on 3 of their post-it notes. On the remaining 2, students will write 2 questions or inquiries about what they would like to learn during this unit. Display KWL (appendix A) on the board, poster or overhead projector and have students place their facts in the K(nowledge) column, and their inquiries in the W(hat I want to learn) column.
2. Categorize similar responses on the KWL chart into groups and review student responses with the class. (**Teacher Note: Continually refer to student inquiries throughout the unit in order to provide answers to student questions. Add to the L(earned) portion after each lesson and review previous concepts.)
3. Pass out the vocabulary log for this unit (Appendix B). Review basic parts of a plant: roots, stems, buds, and leaves and have them define them on their vocabulary log. Introduce vascular plants through the use of a picture slide show and/or live specimens. Pictures and x-ray pictures of plants are available on the following websites: http://www.uhrad.com/kids/plants.htm and http://www.hort.purdue.edu/ext/senior/senior.htm. Describe and define the term vascular plant and have students record this information in their vocabulary log. Vascular plants have tissue that deliver needed materials to different parts of a plant, much like pipes deliver water in your home. Because vascular tissue can carry needed materials long distances within the plant body, vascular plants can be almost any size.
4. There are two kinds of vascular tissue – xylem and phloem. Xylem transports water and minerals up from the roots through the plant, while phloem transports sugar (glucose) down to the roots and fruits. In order to help the students remember, chant "xylem zooms up (thumbs up) and phloem flows down (thumbs down)." Discuss the relationship of xylem and phloem in vascular plants. If available read with students the section "Stem Functions and Structures" on page 90 and 91 of the *Microorganisms, Fungi, and Plants* textbook.
5. In order to demonstrate that not all plants carry nutrients through the xylem and phloem at the same rate, have 3 volunteers join the teacher at the front of the classroom. Give each student a different sized straw (diameter of each straw needs to vary). On a table, in front of each child, needs to be one beaker full of water and an empty beaker. Student volunteers will be timed for 30 seconds to demonstrate how different plants with varying sized vascular tubes (straws) transport nutrients through the plant. Ask student volunteers to transfer water from one beaker to another using only their straw. After 30 seconds measure the amount of water transferred to each empty beaker. Discuss possible reasons for varying amounts of transferred liquid. This experiment demonstrates how different plants consume varied amounts of nutrients and water for survival.
6. Students will now explore the process of how vascular plants such as Queen Anne's Lace flowers, carnations, and celery transfer water through the xylem of the plant. Divide your class into five equal groups to perform the experiment in Appendix C. Each group should be given one beaker of colored water: red, blue, yellow, green, or orange. Each group should use a different color to complete the

experiment. After plants have been able to sit in the water for twenty-four hours students need to record their observations (for five consecutive school days) and complete response questions on Appendix C. Discuss results as a class and reiterate how vascular plants have tube-like structures to carry nutrients to each part of the plant.

E. *Assessment/Evaluation*
   1. Verify that students understand the difference between xylem and phloem and basic structure of vascular plants through the completion of Appendix C.
   2. Ensure students complete Lesson One's portion of the vocabulary log accurately (Appendix B).

Lesson Two: Non-Vascular Plants

A. *Daily Objectives*
   1. Concept Objective(s)
      a. Students will gain an appreciation for the complex structures of living things.
      b. Students will understand the characteristics, structure, and functions of organisms.
   2. Lesson Content from the *Core Knowledge Sequence*
      a. Plant Structures and Processes (p. 127)
         i. Structure: Non-vascular
            1. Non-vascular plants (for example, algae)
   3. Skill Objective(s)
      a. Students will be able to follow directions in conducting experiments on non-vascular plants.
      b. Students will compare differences between non-vascular and vascular plants.
      c. Students will demonstrate how non-vascular plants absorb nutrients through the leaves.

B. *Materials*
   1. Appendix B (from previous lesson)
   2. beaker – which can hold a cup or more (1 per every 2-3 students)
   3. copies of Appendix D
   4. colored water and regular water
   5. eye droppers – 1 per every 2 or 3 students
   6. KWL chart (from previous lesson)
   7. leaves (a variety of fresh leaves, i.e. household plants leaves, lettuce, tree leaves, etc.)
   8. paper towels – 1 per every 2 or 3 students
   9. scale (to measure weight of moss)
   10. Spanish Moss or Sphagnum Moss – enough for a small handful for every 2-3 students

C. *Key Vocabulary*
   1. non-vascular – a plant that depends on the processes of diffusion and osmosis to move materials from one part of a plant to another
   2. diffusion – transportation of materials or chemicals
   3. osmosis – the passage of water from a region of high water concentration through a semi-permeable membrane to region of low water concentration

4. semi-permeable – membranes are very thin layers of material which allow some things to pass through them, but prevent other things from passing through (much like a colander or strainer)
5. moss – an example of a non-vascular plant which is small and usually live in places that are always wet; mosses grow on soil, the bark of trees, and rocks
6. liverwort – an example of a non-vascular plant which usually lives in damp, moist places

D. *Procedures/Activities*

1. Begin today's lesson by reviewing how vascular plants take in nutrients.
2. Have students pull out their vocabulary log (Appendix B) they were given in the previous lesson.
3. Introduce non-vascular plants (mosses and liverworts) through the use of pictures from http://www.perspective.com/nature/plantae/bryophytes.html and/or live specimens. Spanish Moss, Natural Accents Moss, or Sphagnum Moss (can be purchased at local craft stores) work well to introduce non-vascular plants.
4. Describe and define non-vascular plants and have students record this information in their vocabulary logs. Non-vascular plants have no "pipes" to transport water and nutrients. They must absorb water directly from the environment. This is possible because non-vascular plants are small.
5. Describe and define different types of non-vascular plants, mosses and liverworts. If possible, read p. 78-79 of the *Microorganisms, Fungi, and Plants* textbook with students.
6. Divide students into groups of 2-3 and perform as a class the experiment on Appendix D. If enough supplies are not available for group experiments then conduct the experiment as students observe.
7. Through the use of a paper towel and an eye dropper filled with colored water, demonstrate how non-vascular plants absorb water and nutrients directly from the environment. Ask Students to predict the outcome of water being dropped on the paper towel. Then, allow students to watch as you drop the water on the paper towel. Ask: Were your predictions correct? Next, take a small handful of dry moss and place in a beaker. Pour one cup of water over moss. Ask students to predict the outcome of water being poured on the moss. Then ask after completion of experiment if their predictions were correct. **Note: The paper towel experiment clearly demonstrates how water and nutrients are taken in to a non-vascular plant. Where it is not as easily seen in the moss experiment, the same process does occur.
8. Take several leaves from different vascular plants and repeat same procedure. Ask students to predict the outcome of water being dropped on leaves. Using an eye dropper, place a few droplets of water on each leaf and allow students to observe what happens. Ask: Were your predictions correct? Why or why not? How did the leaf differ from the moss? Due to the structure of vascular plant leaves, they do not need to absorb water and nutrients. Thus, the leaves from vascular plants did not absorb the water. However, non-vascular plants are dependent on their leaves to absorb nutrients because they have no xylem and phloem.
9. Discuss as a class the results of the experiment and connect to the real-world by relaying the following information. "Sphagnum moss, a primary component of peat bogs, was used during World War I as an absorbent dressing for wounds. Its hollow cells enable it to absorb up to twenty percent of its own weight in water.

In earlier times, it was also used for diapers, lamp wicks, and bedding. Today gardeners often use sphagnum moss to protect fragile plants during shipment."

10. Review and add to the KWL chart.

E. *Assessment/Evaluation*

1. Verify students understand differences between vascular and non-vascular plants through class discussion.
2. Check for understanding during moss experiment (Appendix D).
3. Ensure students complete Lesson Two's portion of the vocabulary log accurately (Appendix B).
4. Observe student responses when adding to the KWL chart.

Lesson Three: Photosynthesis

A. *Daily Objectives*

1. Concept Objective(s)
   a. Students will understand the importance of Photosynthesis.
   b. Students will understand the characteristics, structure, and functions of organisms.
2. Lesson Content from the *Core Knowledge Sequence*
   a. Plant Structures and Processes
      i. Photosynthesis is an important life process that occurs in plant cells, but not animal cells (photo = light; synthesis = putting together). Unlike animals, plants make their own food, through the process of photosynthesis.
      ii. Role in photosynthesis of: energy from sunlight, chlorophyll, carbon dioxide and water, xylem and phloem, stomata, oxygen, sugar (glucose)
3. Skill Objective(s)
   a. Students will demonstrate their understanding of photosynthesis by answering questions.

B. *Materials*

1. Appendix B (from previous lesson)
2. copies of Appendix E and F
3. KWL chart (from previous lesson)
4. healthy plant
5. pre-made mini greenhouse
6. paper towel (1 per student)
7. presoaked bean seed (1-2 per student)
8. Video: *Bill Nye the Science Guy: Plants*
9. Ziploc bags (1 per student)

C. *Key Vocabulary*

1. photosynthesis – the process by which green plants manufacture food. Sunlight is used by the plant to create glucose.
2. glucose – sugar, stored in roots and fruits
3. chlorophyll – a green pigment in chloroplasts that absorbs light energy for photosynthesis
4. chloroplast – an organelle found in plant and algae cells where photosynthesis occurs
5. organelle – a structure with specialized functions

D. *Procedures/Activities*

1. Write the word Photosynthesis on the board, and ask the students to share any information they know about the word. Encourage student responses and tell them that in today's lesson they will gain a greater understanding of photosynthesis.
2. Tell students that today they are further going to explore photosynthesis by watching the video, *Bill Nye the Science Guy: Plants*. During the video, students will listen and answer questions about plants and photosynthesis and its purpose using Appendix E.
3. After the video, discuss the process of photosynthesis. Define photosynthesis and record in vocabulary logs. Photosynthesis is the process by which green plants manufacture food. Plants need sunlight to produce food. During photosynthesis the energy in sunlight is used to make food in the form of the sugar (glucose) from carbon dioxide and water. Refer to page 74, 110- 111 in *Microorganisms, Fungi and Plants*. Review Appendix E with students and monitor students for understanding. Clarify any questions or misunderstandings.
4. Students will now have a chance to see photosynthesis in action. Have students create a mini green house by folding a presoaked bean seed inside a moist paper towel. Place the paper towel in a zip lock bag, seal it and set it in direct sunlight. Prior to the lesson, create your own mini greenhouse to use as an example as well as a demonstration. Place your sample in a dark cupboard where it is inaccessible to sunlight. Show students a green healthy plant and discuss its attributes and then place it in a dark place as well. After two days check the students' seedlings and the healthy plant that was placed in the dark. Chart seed growth through illustration on Appendix F throughout the rest of the unit. Have students compare their seedlings to the sample seedling placed in the dark. Differences should begin to appear. Due to lack of light, photosynthesis was not able to fully occur.
5. Review and add to the KWL chart.

E. *Assessment/Evaluation*

1. Verify student understanding of photosynthesis through questioning and class discussion.
2. Confirm student understanding through the completion of the video quiz (Appendix E).
3. Ensure students complete Lesson Three's portion of the vocabulary log accurately (Appendix B).
4. Observe student responses when adding to the KWL chart.

Lesson Four: Asexual Reproduction

A. *Daily Objectives*

1. Concept Objective(s)
   a. Students will gain an appreciation for the complex structures of living things.
   b. Students will understand the characteristics, structure, and functions of organisms.
2. Lesson Content from the *Core Knowledge Sequence*
   a. A. Reproduction (p. 127)
      i. Asexual reproduction
         1. Example of algae

2. Vegetative reproduction: runners (for example, strawberries) and bulbs (for example, onions), growing plants from eyes, buds, leaves, roots, and stems

3. Skill Objective(s)
   a. Students will observe an experiment on asexual reproduction through the use of a potato.
   b. Students will record observations and knowledge gained by completing the experiment.
   c. Students will develop their ability to gather pertinent information during class discussion to assist in implementing the experiment.

B. *Materials*
1. Appendix B (from previous lesson)
2. KWL chart (from previous lesson)
3. potato (with sprouted buds)
4. *Microorganisms, Fungi, and Plants* textbook

C. *Key Vocabulary*
1. asexual reproduction – reproduction which a single parent produces offspring that are genetically identical to the parent

D. *Procedures/Activities*
1. Tell students that today we will be discussing one way plants reproduce. One way is through asexual reproduction. The term "asexual" means non-sexual or reproduction without the use of male and female pollination.
2. Some flowering plants can produce asexually. Asexual reproduction occurs when a single parent produces offspring that are genetically identical to the parent. It simply makes a copy of itself through cell division. For example, in asexual reproduction, a part of a plant, such as a stem or root, produces a new plant. Plants can reproduce asexually through cuttings of the parent plant, budding, and budding from runners.
3. Have students add the definition of asexual reproduction to their vocabulary log (Appendix B).
4. Have prepared ahead of time, a potato in which buds have sprouted from the "eyes". Show students the potato and ask them if they have seen a potato like this before and if they know what those things growing on it are. Explain that "eyes" of potatoes are buds that can grow asexually into new plants.
5. If available, have students turn to p. 109 in *Microorganisms, Fungi, and Plants* and look at the picture of a strawberry plant. Explain how a strawberry plant produces runners, which are long stems that run horizontally along the ground. The plant also produces buds along the runners that grow into new plants.
6. If you feel so inclined and would like an experiment, then test different types of plants to see if they can reproduce asexually by cutting a portion of the plant and replanting it. You may choose to refer to this website for the experiment: http://wiki.ehow.com/Grow-Cuttings-from-Established-Plants.
7. Review and add to the KWL chart.

E. *Assessment/Evaluation*
1. Verify students understand the concepts covered about asexual reproduction through class discussion and questioning.
2. Ensure students complete lesson four's portion of the vocabulary log accurately (Appendix B).
3. Observe student responses when adding to the KWL chart.

Lesson Five: Sexual Reproduction – Flowering, Non-flowering and Spore-bearing Plants

A. *Daily Objectives*

1. Concept Objective(s)
    a. Students will gain an appreciation for the complex structures of living things.
    b. Students will understand the characteristics, structure, and functions of organisms.
2. Lesson Content from the *Core Knowledge Sequence*
    a. Reproduction (p. 127)
        i. Sexual reproduction by spore-bearing plants (for example, mosses and ferns)
        ii. Sexual reproduction of non-flowering seed plants: conifers (for example, pines)
        iii. Sexual reproduction of flowering plants (for example, peas)
            1. Functions of sepals and petals, stamen (male), anther, filament, pistil (female), ovary (or ovule)
        iv. Process of seed and fruit production: pollen, wind, insect and bird pollination, fertilization, growth of ovary, mature fruit
3. Skill Objective(s)
    a. Students will follow instructions to conduct the dissection of a flower.
    b. Students will label and identify the different parts of a flower.
    c. Students will explain and draw the different stages from pollination to fruit.
    d. Students will identify the various ways pollination occurs among flowering and non-flowering plants.

B. *Materials*

1. Appendix B (from previous lesson)
2. box cutter or razor knife (for teacher use only)
3. carnation or tulip (1 for every 1-2 students)
4. copies of the Parts of a Flower Worksheet (Appendix G)
5. copies of the Flower Dissection Grid (Appendix H)
6. copies of the Stages of Reproduction in a Flowering Plant (Appendix I)
7. KWL chart (from previous lesson)
8. flower model
9. fruits (i.e. cantaloupe, tomatoes, oranges, apple, peach, avocado, pumpkins, etc.)
10. magnifying glass
11. pine cones (if possible, gather both male and female cones)
12. transparency of the moss life cycle
13. tweezers (1 for every 1-2 students; fingernails may work)
14. Video – *Bill Nye the Science Guy: Flowers*
15. Video – *Thrilling Experiments: Plants*

C. *Key Vocabulary*

1. sexual reproduction – reproduction in which two sex cells (pollen and ovule) form a seed; sexual reproduction produces offspring which share characteristics of both parents
2. spore – a small reproductive cell protected by a thick wall; spores are light and are easily spread by the wind

3. spore-bearing plant – a plant which produces spores rather than seeds
4. perfect flower – a flower which has both male (stamen) and female (pistil) parts on one flower
5. imperfect flower – a flower which has only one male or female part; they will usually have a stamen but no pistil, or visa versa
6. pistil – the female part of a flower including ovary, ovule, style, and stigma
7. stamen – the male part of the flower including anther, filament, and pollen
8. petal – the colorful part of a flower (attracts insects and animals)
9. ovary – the swollen base of the pistil containing the ovule that will develop into fruit following fertilization
10. ovule – premature seed and will develop into a full seed when fertilization occurs and the ovary develops into a fruit
11. stigma – a flower part that is located at the tip of a pistil; often sticky or feathery
12. style – the long slender part of the pistil
13. anther – sack-like structures that produce pollen-like grains on the end of a filament
14. filament – part of the stamen consisting of a thin stock and topped by an anther
15. sepal – a leaf-like structure that covers and protects an immature flower
16. gamete – specialized male and/or female cells
17. conifer – name that means "cone carriers" i.e. pine tree
18. pollination – the transfer of pollen to the female cone in conifers or the stigma in flowering plants.

D. *Procedures/Activities*

1. **Day 1** – Tell students that today we will be discussing another way, besides asexual reproduction, in which plants reproduce. Plants can also reproduce through sexual reproduction. Sexual reproduction is reproduction in which two sex cells (pollen and ovule) form a seed; sexual reproduction produces offspring which share characteristics of both parents. Add definitions to vocabulary log (Appendix B).
2. Some plants such as mosses and liverworts reproduce by making spores. Spores are formed by bringing a male and female cell together. Refer to *What Your Fifth Grader Needs to Know* p. 344 to see a drawing of the moss's lifecycle. Display a transparency of the moss's lifecycle.
3. State: The spore lands in a moist nutrient-rich spot where it will grow into a special moss plant much like a thread. Over time the green-like thread (moss) develops buds that grow into small plants, some will be male and others will be female. Each plant produces gametes, which are specialized male or female cells. When a male and female plant are close enough together and water is present the male gamete will swim to the female gamete and fertilize it. The fertilized egg will then grow spores; mature spores will fall to the ground and the process repeats itself.
4. Although mosses and liverworts are small and have spores, some of the larger plants reproduce in similar ways. Show students a pine cone and state, "You have probably seen a pine cone." Ask: Have you wondered what it is for? It is the reproductive part of a conifer or pine tree. The name conifer means "cone carriers." There are two kinds of cones, male and female, usually found on the same plant. Small cones carry the small male cells called pollen. Pollen from the male cones is carried by the wind and stick to the ovules (eggs) inside the larger female pine cones. When this occurs it is called pollination. Each

fertilized egg grows into a seed which drops to the ground when the cone opens. The seed grows into a new tree if enough food and water are present. Refer to *What Your Fifth Grader Needs to Know* p. 345.

5. **Day 2** – So far we have discussed two ways plants reproduce, asexually and sexually. Today, we will further explore sexual reproductions, but this portion focuses on flowering plants.
6. We are familiar with many of the plants including many trees, shrubs, vines, grasses, and garden plants, all of which produce flowers. Refer to p. 346-347 from *What Your Fifth Grader Needs to Know.*
7. Using overhead transparency #9 of the parts of a flower from *Plants*, describe the function and parts of a flower. Be sure students add important definitions to their vocabulary log throughout this lesson.
8. First, tell about the role of petals and sepals in a flower. Petals are broad, flat and thin and vary in size, shape, and color. Petals may attract insects or other animals to the flower. These animals help plants reproduce by transferring pollen from flower to flower. The sepal(s) make up the bottom ring of a flower. They are often green, like leaves, and cover and protect the immature flower when it is a bud.
9. Show students the other main "parts of a flower" and have them locate and label the parts on Appendix G as you discuss them. If available, use a flower model.
10. Just above the petals is a circle of stamen, which are the male reproductive parts of a plant. To help students remember that the stamen is the male part of the flower, emphasize the word men in sta-MEN. The stamen consists of thin stalks called filaments and each stamen is topped by an anther. The anthers are sack-like structures that produce pollen grains. Refer to page 94 and 95 of *Microorganisms, Fungi and Plants*.
11. In the center of most flowers is the pistil, the female reproductive part of a flower. The tip of a pistil is called the stigma. Pollen grains from the anther collect on stigmas, which are sticky or feathery. The stigma is on top of a long slender part of the pistil called the style. The rounded base of the pistil is the ovary. The ovary contains one or more ovules.
12. In order for fertilization to occur, pollen must be transferred from the anthers to the stigma. Wind, insects, and/or animals all contribute in the pollination of a flower. These pollen grains then stick to the stigma and descend down the style into the ovary where the ovule develops into a seed and the ovary develops into a fruit. Draw stages of fruit development from pollination to mature seeds with the class using Appendix I. Refer to p. 348 of *What Your Fifth Grader Needs to Know.*
13. Teacher demonstration: Provide several samples of an enlarged ovary with seeds (i.e. cantaloupe, tomato, orange, apple, peach, avocado, pumpkin, etc.). Cut and display the ovary (fruit) with seeds showing. Extension - You may choose to plant the seeds and see what happens.
14. **Day 3** – As a review of day 2 show the video: *Flowers*, from Disney's Bill Nye the Science Guy series.
15. Time to dissect a flower!!! Provide each group of students with a tulip, and/or carnation. Give each group of students copies of Appendix H – Flower Dissection. Show video clip on flower dissection (experiment #4) from *Thrilling Experiments: Plants* to show students the procedure to follow during the experiment. **In the event that the Thrilling Experiments video is unavailable, the procedures go as follows:

a. Gently pull the petals free from the sepal.
b. Look inside the center of the flower, the thick part is called the pistil. The long tall structures next to the pistil are the stamen. The stalk of the stamen is called the filament. The tip of the stamen is called the anther.
c. As each group is ready, the teacher will carefully cut the flower in half, length wise, starting at the base of the flower right up to the top of the pistil.
d. Using a magnifying glass, you can see the inner organs of the pistil, the ovary and ovule (the female organs).

16. Place the different parts of the flower on the flower dissection grid (Appendix H). If different flowers are used, allow students to view the various kinds of flower parts.
17. Review and add to the KWL chart.

E. *Assessment/Evaluation*

1. Verify students understand the concepts covered about parts of flowers through the completion of Appendix G.
2. Observe student recognition of flower parts through proper placement of each part on the grid during the flower dissection experiment (Appendix H).
3. Check for understanding on the Stages of Reproduction in a Flowering Plant (Appendix I).
4. Ensure students complete lesson five's portion of the vocabulary log accurately (Appendix B).
5. Observe student responses when adding to the KWL chart.

Lesson Six: Seeds – Monocot & Dicot

A. *Daily Objectives*

1. Concept Objective(s)
   a. Students will gain an appreciation for the complex structures of living things.
   b. Students will understand the characteristics, structure, and functions of organisms.
2. Lesson Content from the *Core Knowledge Sequence*
   a. Seed germination and plant growth: seed coat, embryo and endosperm, germination (sprouting of new plant), monocots (for example, corn) and dicots (for example, beans)
3. Skill Objective(s)
   a. Students will compare and contrast seeds based on similarities and classify them into groups.
   b. Students will summarize the various ways in which plant seeds are dispersed.

B. *Materials*

1. Appendix B (from previous lesson)
2. cocklebur and coconut seeds
3. copies of Appendix J
4. KWL chart (from previous lesson)
5. maple, cottonwood, and/or dandelion seeds
6. soaked beans (enough for every student)
7. variety of seeds (arranged in 5 packets for 5 groups)

C. *Key Vocabulary*

1. cotyledon – a seed leaf found inside a seed
2. monocot – a type of seed with one cotyledon (i.e. grasses, orchids, onions, lilies, corn, etc.)
3. dicot – a type of seed with two cotyledons (i.e. roses, sunflowers, peanuts, beans, peas, etc.)
4. germination – when a seed begins to grow
5. embryo – the beginning of new plant
6. endosperm – stored food inside the seed
7. seed coat – protective covering of the seed

D. *Procedures/Activities*

1. Begin by reviewing how a majority of plants begin with seeds. View the mini greenhouse started in lesson one. Discuss what has happened to the seed. The seeds should have swollen and sprouted. Explain how seed germination has occurred and under the ideal conditions will develop into a mature plant.
2. **Note to Teacher: Prepare ahead of time – soak enough bean seeds, at least one per student, in water for a minimum of 4 hours. Distribute one soaked and one dry bean seed to every child. Allow them to compare the differences of the seeds. Soaked seeds should be softer and swollen. Tell students to look for a line running the length of the seeds. Demonstrate how to use their fingernails to gently pull the soaked bean seed apart at the line. Help students locate the seed coat, cotyledons, and embryo using an overhead of the diagram found on p. 349 of *What Your Fifth Grader Needs to Know*. The seed coat protects the embryo. Instruct students to remove the seed coats if they have not already soaked off. The beans consist of two halves called cotyledons that contain the endosperm which provide food and serve as the "seed leaves" of the seedling plant. Bean seeds are dicots because they have two cotyledons (di = two). Corn seeds have only one cotyledon and are called monocot seeds (mono = one).
3. Once seeds and fruits mature they must disperse from the parent plants. Competition, sunlight, and soil nutrients make it difficult for new seedlings to survive. A seedling increases its chance for survival by traveling away from the parent. There are five basic means of seed dispersal: winds, animals, mechanical means, water and humans. Many seeds are dispersed by wind. Maple, dandelion and cottonwood seeds all have the ability to be carried by the wind. Animals also play an important role in seed dispersal. Animals carry seeds in their digestive tracks as well as their fur/feathers. Humans can transport seeds like animals; however, they also intentionally plant seeds in new areas. Some seeds are dispersed mechanically. For example, there are fruits that dry out and eventually become so dry that they explode, sending out their seeds. Some plants use water for transportation like the coconut. Coconuts may travel the ocean by floating. Other seeds may attach to logs or chucks of soil which float to far away shores. Note: If available show samples of seeds to demonstrate how different seeds are dispersed (i.e. cocklebur, maple, coconut, etc.).
4. Give each group of students a packet containing a variety of seed types and a seed classification chart (Appendix J). Students will examine each seed and organize them into three groups according to similarities. Students will create and write a specific and unique title for each of the three groups. Allow students to share with classmates their criteria for the classification of seeds. Have a class discussion about how similar seeds can be classified differently.
5. Review and add to the KWL chart.

E. *Assessment/Evaluation*

1. Verify students understand the concepts covered about seeds through the classification activity Appendix J.
2. Ensure students complete lesson six's portion of the vocabulary log accurately (Appendix B).
3. Observe student responses when adding to the KWL chart.

VI. CULMINATING ACTIVITY

A. Seed Candy – *Note: Prepare ahead of time equipment and ingredients for five groups including a mixing bowl, spoon, tablespoon, measuring cup (1 cup) and wax paper, plus enough ingredients listed for each group's recipe (Appendix K). Not all recipes are identical. Divide students into groups of five and assign each student one of the following specific roles for the activity. They are: director, supply coordinator, mixer, scribe, foreign diplomat.

1. Director – The director is responsible for maintaining control and order throughout the activity. The director will also distribute evenly the seed candy donated from the other groups. The director will conduct all inquiries between group and teacher.
2. Supply Coordinator – The supply coordinator will collect all the necessary supplies and ingredients for the seed candy. They are also in charge of returning excess ingredients and cleaning equipment.
3. Mixer – The mixer is in charge of following the recipe in combining all the ingredients. The mixer will form the seed candy into 9 ball (5 to keep and 4 to trade) and place on wax paper.
4. Scribe – The scribe is responsible to complete the Seed Candy Assessment with the required help of peers in the group. They are responsible to keep paper clean of debris and hand in the assessment when finished.
5. Foreign Diplomat – The foreign diplomat will conduct all external affairs with the other four groups. The diplomat will deliver one seed candy to each group to sample and collect a sample from each of the other groups for his/her group to taste.

B. Monitor students during the activity and grade assessments for understanding.

VII. HANDOUTS/WORKSHEETS

A. Appendix A – KWL chart
B. Appendix B – Vocabulary Log
C. Appendix C – Vascular Plant Experiment
D. Appendix D – Moss Experiment
E. Appendix E – Photosynthesis Video Questions
F. Appendix F – Charting Seed Growth
G. Appendix G – Parts of a Flower
H. Appendix H – Flower Dissection Activity
I. Appendix I – Stages of Reproduction in a Flowering Plant
J. Appendix J – Classification Activity
K. Appendix K – Seed Candy Activity

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APPENDIX A

Know	*Wonder*	*Learn*

APPENDIX B, page 1

Vocabulary Log

Name: _____
Date: _____

1. vascular – _____
   _____
2. xylem – _____
   _____
3. phloem – _____
   _____
4. glucose – _____
   _____
5. roots – _____
   _____
6. stem – _____
   _____
7. buds – _____
   _____
8. leaves – _____
   _____
9. non-vascular –_____
   _____
10. moss – _____
    _____
11. liverworts – _____
    _____
12. photosynthesis – _____
    _____
13. glucose – _____
    _____
14. chlorophyll – _____
    _____

15. asexual reproduction – _____

_____

16. sexual reproduction – _____

_____

17. spore – _____

_____

18. pistil – _____

_____

19. stamen – _____

_____

20. petal – _____

_____

21. ovary – _____

_____

22. ovule – _____

_____

23. stigma – _____

_____

24. anther – _____

_____

25. filament – _____

_____

26. sepal – _____

_____

27. gamete – _____

_____

28. conifer – _____

_____

29. pollination – _____

_____

30. cotyledon – _____

_____

31. monocot – _____

_____

32. dicot – _____

_____

33. germination – _____

_____

34. embryo – _____

_____

35. endosperm – _____

_____

36. seed coat –_____

_____

APPENDIX B, page 2

Vocabulary Log - Key

1. vascular – a plant that has specialized tissues called xylem and phloem, which move materials from one part of a plant to another
2. xylem – a specialized plant tissue that transports water and minerals from one part of a plant to another
3. phloem – a specialized plant tissue that transports sugar molecules from one part of a plant to another
4. glucose – a sugar in plant saps and fruits
5. roots – a leafless underground part of a plant that stores food and holds the plant in place
6. stem – the main stalk of a plant that develops buds and sprouts and usually grows above ground
7. buds – a small growth at the tip or on the side of a stem that later develops into a flower or branch
8. leaves – usually flat green parts that grow from a plant stem
9. non-vascular – a plant that depends on the processes of diffusion and osmosis to move materials from one part of a plant to another
10. moss – an example of non-vascular plants which are small and usually live in places that are always wet; grow on soil, the bark of trees, and rocks
11. liverworts – an example of non-vascular plants which usually live in damp, moist places
12. photosynthesis – the process by which green plants manufacture food. Sunlight is used by the plant to create glucose.
13. glucose – sugar
14. chlorophyll – a green pigment in chloroplasts that absorbs light energy for photosynthesis
15. asexual reproduction – reproduction which a single parent produces offspring that are genetically identical to the parent
16. sexual reproduction – reproduction in which two sex cells (pollen and ovule) form a seed; sexual reproduction produces offspring which share characteristics of both parents
17. spore – a small reproductive cell protected by a thick wall; spores are light and are easily spread by the wind
18. pistil – the female part of a flower including ovary, ovule, style, and stigma
19. stamen – the male part of the flower including anther and filament
20. petal – the colorful part of a flower (attracts insects)
21. ovary – the swollen base of the pistil containing the ovule that will develop into fruit following fertilization
22. ovule – premature seed and will develop into a full seed when fertilization occurs and the ovary develops into a fruit
23. stigma – a flower part that is located at the tip of a pistil; often sticky or feathery
24. anther – sack like structures that produce pollen like grains on the end of a filament
25. filament – part of the stamen consisting of a thin stock and topped by an anther
26. sepal – a leaf like structure that cover and protect an immature flower
27. gamete – specialized male and/or female cells
28. conifer – name that means “cone carriers” i.e. pine tree

29. pollination – the transfer of pollen to the female cone in conifers or the stigma in flowering plants
30. cotyledon – a seed leaf found inside a seed
31. monocot – a type of seed with one cotyledon i.e. grasses, orchids, onions, lilies, corn, etc.
32. dicot – a type of seed with two cotyledons i.e. roses, cactuses, sunflowers, peanuts, beans, peas, etc.
33. germination – when a seed begins to grow
34. embryo – the beginning of new plant
35. endosperm – stored food inside the seed
36. seed coat – protective covering of the seed

APPENDIX C

Vascular Plant Experiment

Name: _____
Date: _____

Materials: For each group of 4-5 students

*100 milliliter beaker
*water
*food coloring – 1 color (each group should have a different color)
*celery
*carnations
*Queen Anne's Lace flowers

Procedures

1. Fill beaker with about 50 milliliters of water.
2. Drop 5 drops of food coloring into water.
3. Take flowers such as Queen Anne's Lace flowers, carnations, celery and other types of flowers and cut the ends off of the stems.
4. Place stems of plants in the beaker of colored water.
5. Allow plants to stand in water for twenty-four hours before you write down your observations.

Observations and Questions:

*Each day write down any observations you notice about the plant. Make notes on any changes that occur in color, if any.

Day 1	Day 2	Day 3	Day 4	Day 5

1. Through your observations, what can you conclude about vascular plants?

_____

_____

_____

_____

APPENDIX D

Moss Experiment

Name: _____

Materials:

*Spanish or Sphagnum Moss
*paper towel
*colored water and regular water
*variety of vascular plant leaves (i.e. houseplant leaves, lettuce, tree leaves, etc.)

Procedures:

1. Take a small handful of dry moss and weigh it on a scale. Then place it in a beaker. Pour one cup of water over the moss. Write a prediction of what might happen to the moss in the beaker. Allow to sit for at least five minutes.
2. While the moss sits in water, write a prediction of what might happen when the leaves of a vascular plant have water dropped on them.
3. Drop water on the leaves. Allow the water to sit on the leaves for five minutes.
4. Drop colored water on the paper towel. Observe what happens and record the outcome.
5. Record the outcome of the water on the vascular leaves.
6. The paper towel absorbed the colored water. Make a hypothesis of what is happening to the moss in the beaker based on what happened to the paper towel.
7. In order to see if the hypothesis is correct, drain and remove the moss from the beaker and weigh it. Record outcome.

Predictions

1. What will happen to the moss in the beaker? _____

_____

2. What will happen to the water on the vascular plant leaves? _____

_____

Outcomes

1. What happened to the colored water on the paper towel? _____

_____

2. What happened to the water on the vascular plant leaves? _____

_____

3. What happened to the moss in the beaker? Why? _____

_____

Photosynthesis Video Questions

Name: _____
Date: _____

Directions: As you watch the video about plants, answer the following questions. Pay extra attention to the information on photosynthesis.

1. Where do plants get there food?

   _____

2. Plants breathe _____ and give off _____.
3. What is photosynthesis?

   _____

   _____

4. What substance in plants makes them green?

   _____

5. What are some ways plants protect themselves?

   _____

   _____

6. What types of plants do not need a root system to grow?

   _____

7. What are some ways we use plants?

   _____

   _____

8. Why do some plants eat insects?

   _____

   _____

9. Why do leaves change color in the fall?

   _____

   _____

10. Could humans live without plants? Why or why not?

    _____

    _____

Photosynthesis Video Questions - Key

Directions: As you watch the video about plants, answer the following questions. Pay extra attention to the information on photosynthesis.

1. Where do plants get there food?
   They make their food through a process called photosynthesis.
2. Plants breathe Carbon Dioxide and give off Oxygen.
3. What is photosynthesis?
   Photosynthesis is the process by which green plants manufacture food. Sunlight is used by the plant to create glucose.
4. What substance in plants makes them green?
   Chlorophyll
5. What are some ways plants protect themselves?
   Cacti use needles, Poison Oak use oils, Stinging Nettle has spines and stingers
6. What types of plants do not need a root system to grow?
   Plants that grow near or on water do not need a root system to grow.
7. What are some ways we use plants?
   People use plants for medicines, ointments, food, oxygen, etc.
8. Why do some plants eat insects?
   Plants eat insects to gain nutrients that they cannot find in the soil.
9. Why do leaves change color in the fall?
   The plant stops producing chlorophyll and the other colors in the leaves are now visible.
10. Could humans live without plants? Why or why not?
    No – Answers may vary.

APPENDIX F

Charting Seed Growth

Name: _____
Date: _____

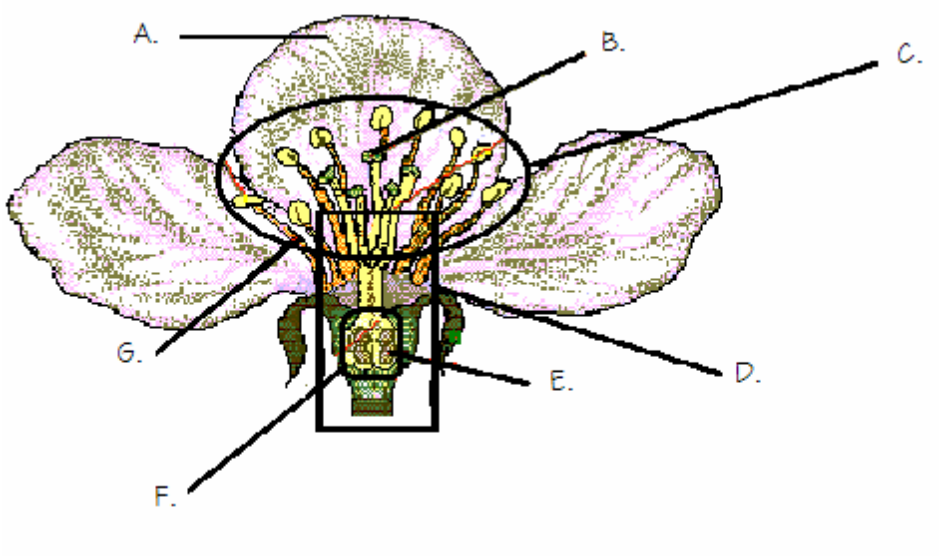
Directions: Observe your seedling and draw a picture of the seedling as you observe changes.

Day _____	**Day _____**	**Day _____**
Day _____	**Day _____**	**Day _____**
Day _____	**Day _____**	**Day _____**

APPENDIX G

Parts of a Flower

Name: _____
Date: _____



A. _____: What is its purpose? _____

_____

B. _____: What is its purpose? _____

_____

C. _____: What is its purpose? _____

_____

D. _____: What is its purpose? _____

_____

E. _____: What is its purpose? _____

_____

F. _____: What is its purpose? _____

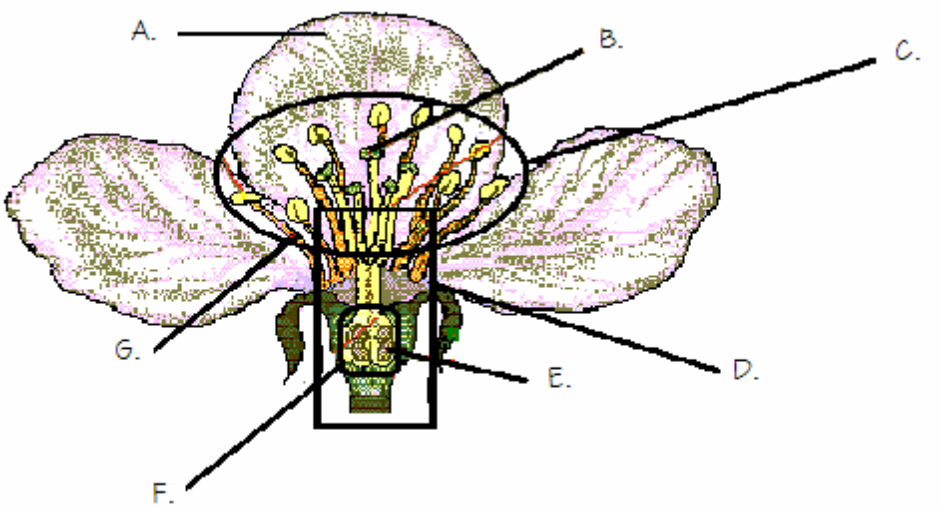
_____

G. _____: What is its purpose? _____

_____

APPENDIX G

Parts of a Flower - Key



A. Petal: What is its purpose? Its purpose is to attract insects and animals.

B. Anther: What is its purpose? Its purpose is to create pollen in the flower.

C. Stamen: What is its purpose? It is the male part of the flower.

D. Pistil: What is its purpose? It is the female part of the flower.

E. Ovule: What is its purpose? It is the immature seed or egg of a potential fruit.

F. Ovary: What is its purpose? Its purpose is to protect and insulate the ovule. Also it stores sugars that help seeds grow.

G. Filament: What is its purpose? It is the part of the stamen that holds the anther high so pollen can fertilize the plant.

APPENDIX H

Flower Dissection Activity

Petals	Sepal	Stigmas/Style
Filament/Anther	**Stem**	**Ovary and Ovules**

APPENDIX I

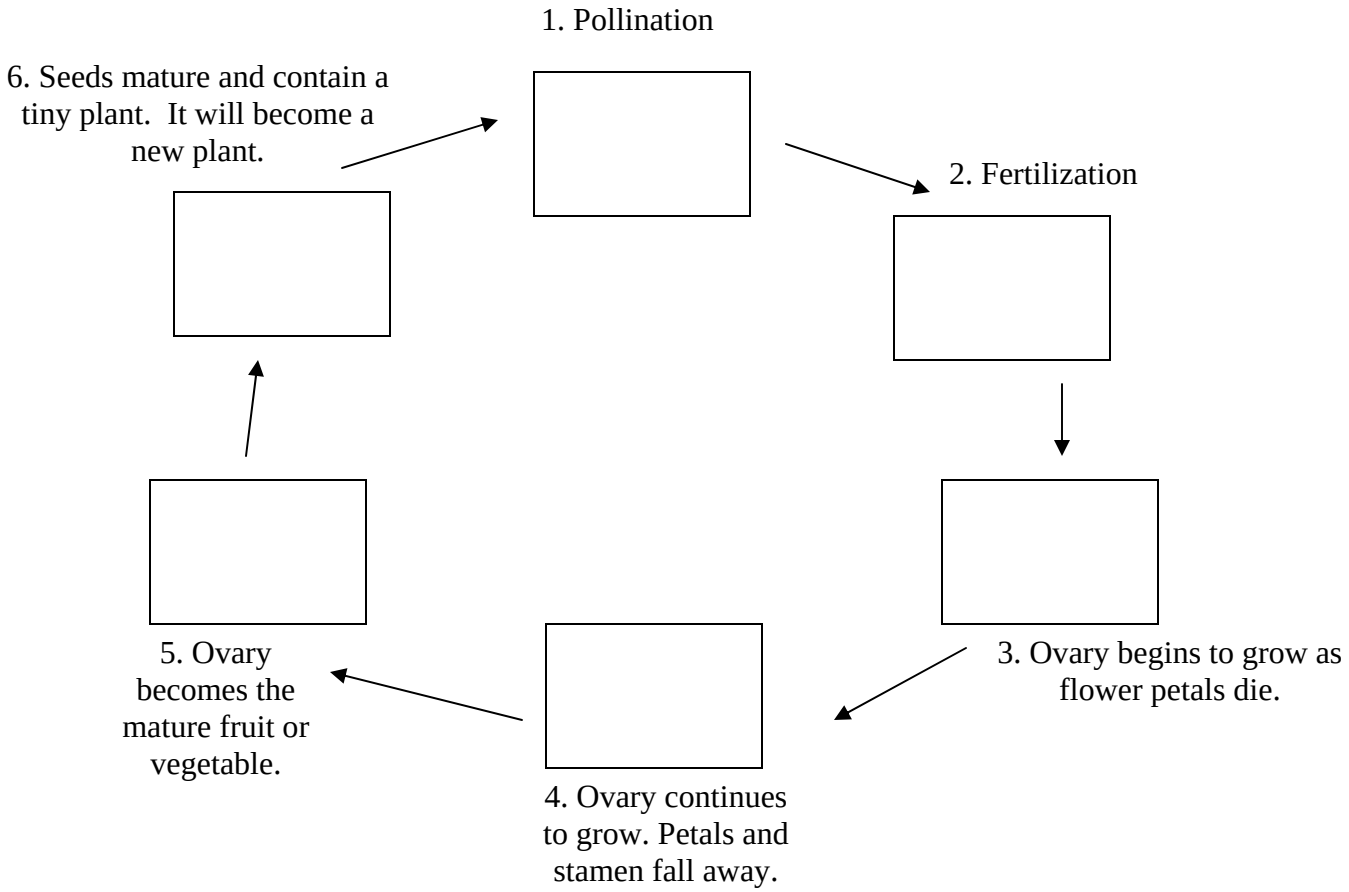
Stages of Reproduction in a Flowering Plant

Name: _____
Date: _____

What are the six stages from flower to fruit?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Draw the six stages from flower to fruit?

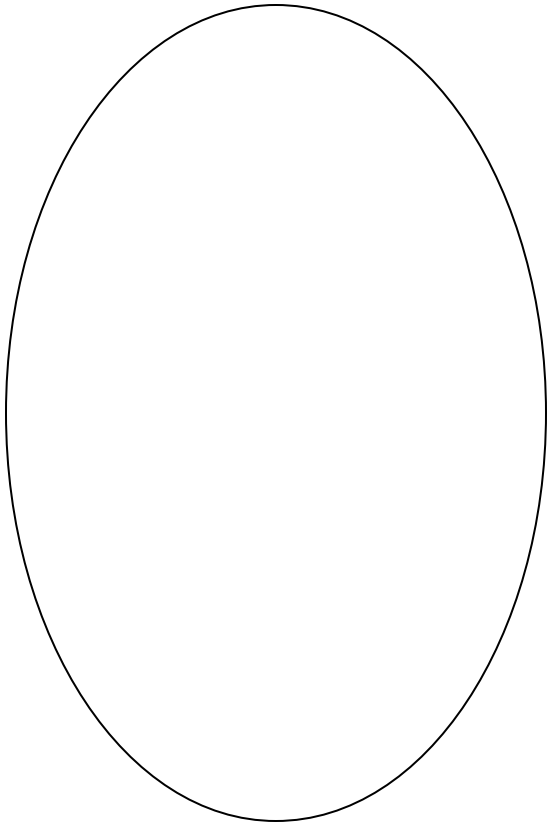


APPENDIX J

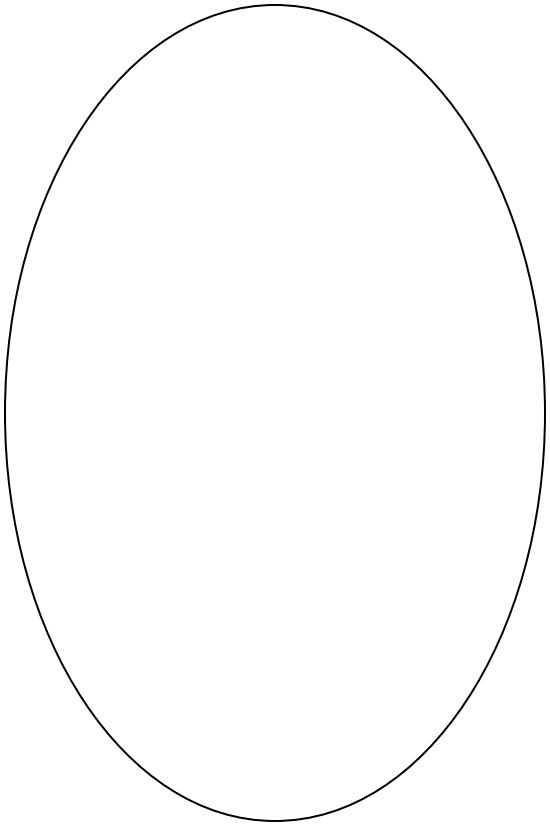
Classification Activity

Name: _____
Date: _____

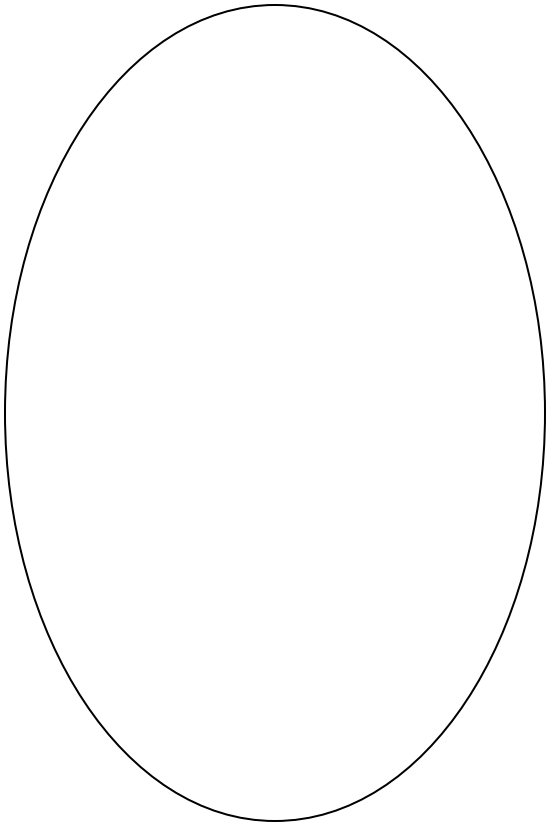
Directions: Arrange your seeds into 3 groups. You decide on a classification system using similar characteristics of the seeds to divide them into groups. Write down the seed characteristic under each group to identify your classification system.



_____
Characteristic



_____
Characteristic



_____
Characteristic

APPENDIX K, page 1

Seed Candy Group #1

Group Member's Names: _____

Mix together: 1 ½ cup of coconut
1 ½ cup of sunflower seeds
3 tablespoons peanut butter
3 tablespoons honey

Directions: Form seed candy into 9 balls and place on wax paper, let sit until firm, and enjoy!

1. What plants were used in the recipe?

_____

2. Where do seeds come from?

_____

_____

3. Coconut, sunflower seeds, peanuts, and corn (corn syrup used in some recipes) are all seeds. What type of seeds are they? (Hint: There are two types of seeds.)

_____

_____

4. Which ingredient, if any, does NOT come from a seed? From what part of the plant does it come?

_____

_____

5. Humans cannot create their own food. How do plants create their own food (glucose)?

_____

_____

APPENDIX K, page 2

Seed Candy Group #2

Group Member's Names: _____

Mix together: 1 ½ cup of coconut
1 ½ cup of sunflower seeds
3 tablespoons peanut butter
3 tablespoons powdered sugar
2 tablespoons coconut milk

Directions: Form seed candy into 9 balls and place on wax paper, let sit until firm, and enjoy!

1. What plants were used in the recipe?

_____

2. Where do seeds come from?

_____

_____

3. Coconut, sunflower seeds, peanuts, and corn (corn syrup used in some recipes) are all seeds. What type of seeds are they? (Hint: There are two types of seeds.)

_____

_____

4. Which ingredient, if any, does NOT come from a seed? From what part of the plant does it come?

_____

_____

5. Humans cannot create their own food. How do plants create their own food (glucose)?

_____

_____

APPENDIX K, page 3

Seed Candy Group #3

Group Member's Names: _____

Mix together: 1 ½ cup of coconut
1 ½ cup of sunflower seeds
3 tablespoons peanut butter
3 tablespoons Karo Syrup (corn syrup)

Directions: Form seed candy into 9 balls and place on wax paper, let sit until firm, and enjoy!

1. What plants were used in the recipe?

_____

2. Where do seeds come from?

_____

_____

3. Coconut, sunflower seeds, peanuts, and corn (corn syrup used in some recipes) are all seeds. What type of seeds are they? (Hint: There are two types of seeds.)

_____

_____

4. Which ingredient, if any, does NOT come from a seed? From what part of the plant does it come?

_____

_____

5. Humans cannot create their own food. How do plants create their own food (glucose)?

_____

_____

APPENDIX K, page 4

Seed Candy Group #4

Group Member's Names: _____

Mix together: 1 ½ cup of coconut
1 ½ cup of sunflower seeds
3 tablespoons peanut butter
3 tablespoons pure maple syrup

Directions: Form seed candy into 9 balls and place on wax paper, let sit until firm, and enjoy!

1. What plants were used in the recipe?

_____

2. Where do seeds come from?

_____

_____

3. Coconut, sunflower seeds, peanuts, and corn (corn syrup used in some recipes) are all seeds. What type of seeds are they? (Hint: There are two types of seeds.)

_____

_____

4. Which ingredient, if any, does NOT come from a seed? From what part of the plant does it come?

_____

_____

5. Humans cannot create their own food. How do plants create their own food (glucose)?

_____

_____

APPENDIX K, page 5

Seed Candy Group #5

Group Member's Names: _____

Mix together: 1 ½ cup of coconut
1 ½ cup of sunflower seeds
3 tablespoons peanut butter
3 tablespoons molasses

Directions: Form seed candy into 9 balls and place on wax paper, let sit until firm, and enjoy!

1. What plants were used in the recipe?

_____

2. Where do seeds come from?

_____

_____

3. Coconut, sunflower seeds, peanuts, and corn (corn syrup used in some recipes) are all seeds. What type of seeds are they? (Hint: There are two types of seeds.)

_____

_____

4. Which ingredient, if any, does NOT come from a seed? From what part of the plant does it come?

_____

_____

5. Humans cannot create their own food. How do plants create their own food (glucose)?

_____

_____

APPENDIX K, page 6

Seed Candy Group - Key

Mix together: 1 ½ cup of coconut
1 ½ cup of sunflower seeds
3 tablespoons peanut butter
3 tablespoons honey

Directions: Form seed candy into 9 balls and place on wax paper, let sit until firm, and enjoy!

1. What plants were used in the recipe?

   Coconut Tree, Sunflower, Peanut Plant, #1-Bees use nectar from flowers to make honey, #2-Sugar Cane, #3-Corn, #4-Maple Tree, #5 Molasses comes from Sugar Cane

2. Where do seeds come from?

   Seeds come from the mature fruits of a plant.

3. Coconut, sunflower seeds, peanuts, and corn (corn syrup used in some recipes) are all seeds. What type of seeds are they? (Hint: There are two types of seeds.)

   Coconut and corn are monocot seeds. Sunflower seeds and peanuts are dicot seeds.

4. Which ingredient, if any, does NOT come from a seed? From what part of the plant does it come?

   #1-honey comes from plant nectar, #2-powdered sugar comes from sugar cane, #3-everything comes from a seed, #4-maple syrup comes from maple trees, #5-molasses comes from sugar cane

5. Humans cannot create their own food. How do plants create their own food (glucose)?

   Plants create their own food through the process of photosynthesis. Plants use the sunlight to convert water and carbon dioxide into sugar (glucose).