Wow, Plants Are So Cool!

Garden Based Education for Kindergarten, First, Second and Third Grades

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WASATCH COMMUNITY GARDENS

Made available by the Salt Lake City School District
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Sept.

1. Let's Get Growing

K

Objective: This is the first lesson of the school gardening season.

- Introduction to the garden
- Introduce good listening skills.
- Set up the class Garden Club
- Introduce good observation skills
- Introduce Garden Rules, Discovery Journals, and The Question Book
- Understand that plants need room to grow well.
- Practice sorting.
- Prepare the garden beds for fall planting

Materials

- 3x5 index cards
- Markers, crayons
- Heavy clothes pins
- "Discovery Journals"
- "The Question Book"
- "Rules" poster (inside and outside rules)
- Leaf size garbage bag
- One raised bed garden box previously chosen and labeled

Preparation

- Have each student choose a Garden Name. *See instructions with "Choosing a Garden Name"*
- Make nametags. *See nametag template.*

Procedure

- Students tell their Garden Names
- <u>*Question:*</u> *What do you know about gardens?*
    - Take several answers.
    - Repeat the answers back to the class to model good listening.
    - After taking several answers, have the students repeat what the answer that the person before them said before they can give their answer.
- <u>*Question:*</u> *What does a scientist do?*
    - Take several answers.
    - Let the students know that they are going to become plant scientists. They will learn a lot about plants and do plant experiments.

- *<u>Question:</u> What is a plant scientist called?*
    - Write "Botanist" on the board.
- Introduce "Discovery Journals" that they will use as they become plant scientists (botanists).
    - They can write their names on the cover and decorate the cover during the week.
    - They will get journal pages to fill out after each weekly lesson starting with the next week's lesson.
- Introduce "The Question Book"
    - This is a book for all plant and nature related questions that come up spontaneously during classes and that cannot be answered immediately. Perhaps an experiment or some research will be necessary to get the right answer. **Always encourage questions.**
- Introduce the Garden Club
    - Tell them to think of and vote on a name for their Garden Club during the week.
    - Introduce names tags.
        - They will get nametags that they will wear each garden club class.
        - Clip them on with the clothespins.
    - Introduce "Indoor Garden Rules".
        - If there are students who read well, have these students read each rule out loud to the class.
- Tell the students to quietly line up to go outside.
    - Bring the Garden Rules poster.
    - Once they are in the garden, have them stand in a quiet group so that they can listen for instructions.
    - Go over the Outdoor Garden Rules.
    - Move the group to their class planting area.
    - Explain that they will be planting some seeds in this area during the next few weeks, but that they must do something first to get the area ready.
    - Have the students come and stand very close in a tight group.
    - Ask them to pretend as if they are plants. Have them try to stretch as if they were growing.
    - Ask them if they think that they have enough room to grow. (No!) Now have them look at the growing box that is full of weeds.
- *<u>Question:</u> Do these look like plants that are good to eat? Do you think that new plants would have enough room to grow here? What can we do to fix this?*
    - No, these are not plants for us to eat and there is not enough room. They need to pull out the weeds.
    - Demonstrate how to pull weeds out.
        - Hold the plant close to the soil line, wiggle it back and forth several times, and pull the plant out ("Wiggle, wiggle, pull!").
        - Point out the roots and let them know to try and get the roots out each time they pull out a plant so that the plant will not grow back.
        - Have the students pull up as many weeds as they can and put them in 3-4 designated piles.
- Take the time to let the children really observe the plants that they are pulling out. Note how they feel, smell, and look. Particularly notice the roots.

- Put all of the weeds in the garbage bags.

Let's Review

- What is a botanist?
- Why did you take the weeds out of the growing beds?

Keep Exploring

- Put the weeds in separate piles according to their characteristics.
- Identify other weeds in the garden area and clean them out.
- Ask for any questions that came out of today's activities and write them down in the Question Book

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Choosing a

Garden Name

A Garden Name is the student's first name plus the name of something in the garden (plant, insect, animal) that starts with the first letter of the student's name. Some examples are "Jonathan Jack O' Lantern, Dana Daisy, and Thomas Tomato". If a student needs help, have the rest of the group lend a hand. Here are some suggestions:

A Apple, Arugula, Asparagus, Artichoke, Acorn, Allium, Avocado, Almond

B Basil, Broccoli, Beet, Brussel Sprout, Bean, Begonia, Blueberry, Bok Choy, Banana, Bee, Butterfly, Bell Pepper, Beetle, Bird

C Cucumber, Cauliflower, Corn, Cilantro, Chard, Carrot, Celery, Cherry, Citrus, Chives, Coriander, Cumin, Carnation, Caterpillar, Cayenne Pepper, Cinnamon, Compost

D Dill, Date, Dandelion, Delicata Squash, Daisy, Dragonfly, Dig

E Eggplant, Echinacea, Elderberry, Endive, Escarole, Eucalyptus, Earthworm

F Fig, Fennel, French Sorrel, Fern, Ficus, Filbert, Forsythia, Fava Beans

G Garlic, Grape, Guava, Gooseberry, Gourd, Grains, Ginger, Grasshopper, Garden

H Horseradish, Hosta, Honeydew Melon, Hibiscus, Hydrangea, Hyacinth, Hummingbird

I Ivy, Iris, Impatiens, Ice Plant, Icicle Radish, Iceberg Lettuce

J Jalapeño, Jicama, Jack O' Lantern, Jerusalem Artichoke, Juniper, Jumping Bean, Jasmine

K Kale, Kiwi, Kumquat, Kohlrabi, Kniphofia, Katydid

L Lettuce, Leek, Lemon balm, Lemon, Lavender, Lily, Lupine, Lobelia, Lychee, Lime, Ladybug, Lemongrass

M Morning Glory, Mint, Mushroom, Melon, Mango, Macadamia Nut, Marigold, Maple, Maple Leaf, Magnolia, Mallow, Mustard, Mizuna

N Nasturtium, Nectarine, Nut, Napa Cabbage, Nandina, Nerine Lily

O Onion, Oregano, Okra, Oak, Orange, Oxalis

P Pumpkin, Pea, Parsnip, Potato, Pepper, Parsley, Plum, Poppy, Phlox, Pecan, Peanut

Q Quince, Quinoa, Quercus, Queen Anns's Lace

R Radish, Rutabaga, Rosemary, Raspberry, Rhubarb, Radicchio

S Spinach, Squash, Sage, Strawberry, Savory, Sweet Pepper, Sunflower, Swiss Chard, Sweet Potato, Spider

T Tomato, Turnip, Tomatillo, Thyme, Tulip, Tarragon, Turmeric, Tree

U Ulmus Elm, Ugni Evergreen, Umbrella Pine

V Violet, Vinca, Verbena, Vine, Viola, Veronica

W Watermelon, Wallflower, Wheatgrass, Wisteria, Woolly Thyme, Walnut, Wildflower, Willow, Wasp, Watercress

X Xeric, xylem, Xeriscaping

Y Yarrow, Yucca, Yew, Yam

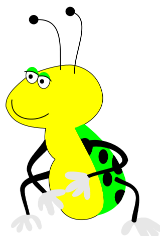
Z Zebra Plant, Zoysia Grass, Zucchini, Zelkova, Zinnia, Zipper Iris

My Garden Journal

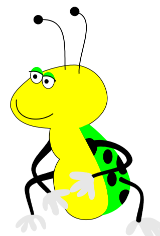
NAME___________________________________

THE QUESTION BOOK

Garden Club Member



Garden Club Member



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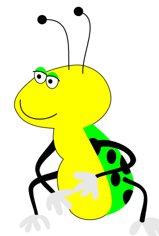

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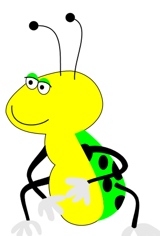

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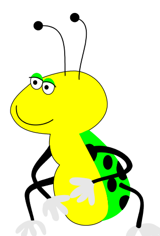

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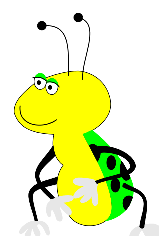

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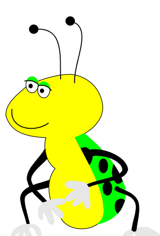

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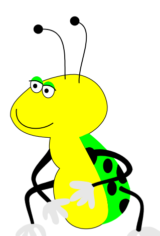

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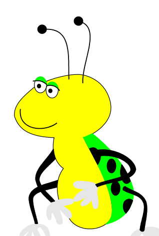


Garden Rules

Indoor Rules:

1. Respect yourself, those around you, and the garden activities.
2. Stay in the circle or group.
3. Sit on your pockets.
4. Be involved 100% in each activity.
5. Use a quietly raised hand, and wait until you are called on before answering a question.
6. One person speaks at a time during group discussions.

Outdoor Rules:

1. Respect yourself, those around you, and the garden.
2. Eat and pick only what you are invited to eat and pick.
3. Keep your feet on the pathways.
4. Do not kill or harm any bugs, insects, or animals in the garden.
5. Trash, recycling, and food scraps go in their own homes.

Oct.

2. Our First Experiment

K

Objectives:

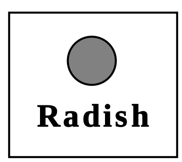
- Sort by characteristics
- Sharpen observation skills
- Make and understand predictions.
- Observe seed germination
- Follow multi-step directions
- Learn to label
- Practice group cooperation

Materials

- 10-15 different types of seeds with a good variety of sizes and shapes. Add in several types of seeds that are small and look very similar. The students need to observe more carefully to separate these and their eyes become sharper as the class progresses.
- 8 3x5 index cards
- Roll of paper towels
- Water for moistening towels. A squeeze bottle works well.
- Glue: hot glue or cold like Elmer's
- 1 small zip lock sandwich bag for each student plus 1 more
- Six 20 oz. <u>clear</u> plastic glasses
- 1 small towel for each table for water spills.
- Journal sheets (attached)
- Sharpie

Preparation

- Make a seed card for each type of seed (3 for each table)
    - Cut index card in half
    - Glue on seed
    - Write name of seed



- Put a paper towel, a cup, extra towels, and a water source on each table
- Put several of each type of seed in a sandwich bag for each student

Procedure

Today we will start our plant experiments!

<u>Observation:</u>

- *Have everyone sitting in a circle with his or her eyes closed.*
- *Tell them to keep their eyes closed as you give them each a bag with the seeds.*
- *Have them carefully feel the seeds inside the bag trying to figure out what they are.*
- *Have them open their eyes and take a look at the variety of seeds*

The students return to their group tables.

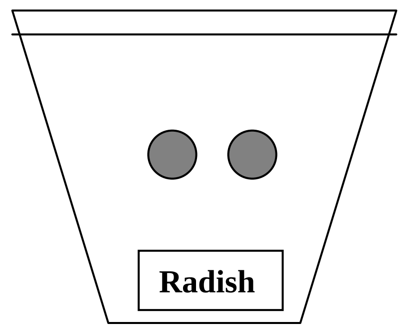
- Have each student separate and match the seeds from his or her bag
- To help them get started, give them some examples of characteristics such as rough and smooth, large and small, brown and black.
- Check their progress and help, when needed, with closer observation so that they can separate and match the more difficult seeds.

Question: *Do you think that all of these different types of seeds will grow into different plants? Are these seeds alive? Let's try some experiments with these seeds to see if they will grow.*

- Pass out three seed cards to each table.
- Have the students look at all of their seeds on the table, pick out two seeds of each example on the seed card and put those seeds on the cards. These are the seeds that they will use for the seed cups.
- Explain the process to make the seed cups letting one person at a time in each group do a step. The process will work more smoothly if you write the directions on the board and have the students repeat each step back to you before doing the task

Making Seed Cups:

1. Fold the paper towels.
2. Put the towels in a clear plastic cup and moisten the paper towels.
3. Put the two seeds on each of the seed cards between the cup and the towel so that they can be seen. Place them half way down the cup.
4. Write the name of the seeds on the lower part of the cup below the seeds.
5. Put the cups in a warm part of the room, but not in direct sunlight.
6. Keep the paper towels moist, but not soggy. Do not let them dry out.



Question: *What do you think will happen to your seeds?*

Let's Review

- Do all plant seeds look alike?
- Do you think that each plant has its own type of seeds?

Keep Exploring

- Go outside to look for more seeds on plants in the garden and pond areas.

2. Seeds In A Cup - K

Name:________________________Date:__________

What did we do? Draw a picture of one of the cups.

What happened to the seeds in a week? Draw a picture:

What Happened in a Week?

Date: _________________

Draw one of your favorite seeds:

This seed <u>sprouted</u>!

Oct.

3. Do Plants Hibernate Too?

K

Objectives:

- Learn about what plants need to survive.
- Learn about plants that "hibernate".
- Learn about taking responsibility for the plants in the garden.
- Learn to cooperate and share garden tasks.
- Learn to plant two types of plants.
- Learn different measuring methods.

Materials

- White board and markers
- Journal pages (attached)
- Spinach seeds
- Garlic bulbs
- Small bowl with mashed, raw garlic
- Trowels
- Box with filled with soil-clear plastic shoe box size works well
- 8 plant tags marked with a line at 1, 2, 3, 4, and 5 inches
- Unmarked plant tags
- Black Sharpie
- Straw to cover the raised bed planter about 3-4 inches.
- Large garbage for the straw

Preparation

- Gather supplies
- Put straw into the garbage bag
- Mash garlic and put in bowl
- Mark plant tags with one inch measurements

Procedure

<u>Observation:</u>

- *Students close their eyes*
- *Pass around a garlic bulb to feel and then a garlic clove.*
- *Pass around the mashed garlic to smell. This often works best if the teacher holds it.*
- *Students open eyes. Ask the class, "What did I just pass around?"*

We are going to plant garlic and also spinach in our garden this week.

- Most plants like to be planted when it is getting warmer, but some like to be planted and “hibernate” or “overwinter” when it gets cold.

Question: What is hibernation? Do any animals hibernate too?

- Spend a few minutes getting answers to these questions.
- Read Don’t Wake Up The Bear by Marjorie Dennis Murray or other book on the list below.

Let’s discover if some plants can really hibernate during the winter.

- We are going outside in a few minutes to plant some spinach seeds and some garlic. These plants should be able to hibernate here through the winter and produce plants in the spring if we protect them.
- In the box with soil, show the seed planting procedure for planting spinach seeds (1/8 inch deep, sprinkled in a row, then covered with “fairy fingers”) and garlic cloves (2-3 inches deep with the pointed side up and 4-6 inches apart).
- Show how to measure with markers and then with their fingers. Compare the plant tags with the 1-5 inch markings to the sizes of the students’ fingers. Let several students come up and help with the demonstration.

Go outside to the garden.

- Plant spinach seeds and garlic cloves, reviewing the procedure, and dividing up the jobs:
    - Divide the students into teams of three. Four teams can plant at one time as the other teams observe.
    - Line the students up in four straight lines with the first teams to plant in the front. As each student completes a task, have him or her move to the side to watch the next team member.
    - Each team plants two spinach seeds in one hole and one garlic clove in another.
    - Show the area in which the cloves and seeds will be planted.
    - Assist each team to place their seeds and clove where they will plant them before starting the procedure.
    - One student makes the hole (the others must agree that it is the correct depth).
    - One student drops in the two seeds or clove and covers them.
    - The last student waters.
    - Mark the plantings with the plant tags on which you write the type of seed planted and the date.
    - Have the students in the first teams move quietly to the back of the line and watch the next team.
    - After all of the seeds are planted, have the students take turns spreading straw over the top of the plantings. Control this by having the students line up in one single file line and handing out a handful of straw to each student in turn.

Question: What will our plants need to grow?

- Spend a few minutes talking about sun, water, air, space, and any other ideas that the students have.

Let’s Review

- What seeds did we plant?
- What is hibernation?

Keep Exploring

- Look for more plants outside during the fall that might hibernate through the winter. Look for the same plants again in the spring.

Book Suggestions:

- Bear Snores On by Karma Wilson
- The Magic School Bus Sleeps for the Winter by Eva Moore
- Hibernation by Melvin & Gilda Berger
- Leaves by David Ezra Stein
- Silly Snowy Day by Michael Coleman
- Every Autumn Comes the Bear by Jim Arnosky
- Frederick by Leo Lionni
- Go To Sleep, Groundhog! by Judy Cox
- Wake Me in Spring by James Preller
- Don't Wake Up the Bear! by Marjorie Dennis Murray

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3. Do Plants Hibernate Too? – K

Name:__________________________Date:_____________

We planted ____.

Draw a picture of watering your seed and garlic clove after they are planted.

Draw a picture of your seeds and garlic cloves sleeping underground.

Oct.

4. Did You Just Eat a Root?

Plant Parts

K

Objectives:
- Gain a general knowledge of plant parts.
- Sharpen observation skills.
- Use reasoning skills.

Materials

- Seed cups from Lesson #1
- Real examples of plant parts that we eat. Include some that are not obvious such as cereal or peanuts. Some suggestions:
    - Root: carrot, beet, radish, jicama, sweet potato (not regular potatoes-they are stems)
    - Stem: asparagus, celery, broccoli (stem portion)
    - Leaf: lettuce, cabbage, spinach, kale
    - Flower: broccoli (top portion), cauliflower, edible flowers such as nasturtiums
    - Seed: dried beans, sunflower seeds, almonds, bread, cereal, rice
    - Fruit: apple, tomato, green bean, zucchini, orange, raisins, peanuts or other nuts in the shell (any part of the plant that contains the seeds is a fruit)
- Bowl to hold plant parts.
- White board or large paper
- Markers
- Journal and journal pages
- Plant parts cut out of construction paper to put together at tables *(see attached template)*
- One piece of construction paper for each table on which to "build" a plant.
- Scotch tape or glue for building plant.

Preparation

- Purchase plant part examples and put in a bowl.
- Cut out plant parts for each table to assemble

Procedure

- *Observation:*
    - Have the students look at the seed cups and observe and report on any changes
    - Have the students stand and follow you as you raise your hands, legs, and arms. Point to your head, nose, ears, mouth, elbows, and knees.
    - Have several students be the leader and follow them.
    - These are all parts of your body.

- *Question:* *I wonder if plants have different parts too. What do you think?*
    - Have students observe plants in seed cups again.

- *Question:* *Can you name some of these plant parts? I'll draw a plant on the board as we name the parts.*
    - Draw a simple plant outline on the board as the students name parts of the plant. You could also have an extra set of plant parts and tape them onto the board or large sheet of paper.
    - Give hints about the parts of the plant that they cannot see in the seed cups (flowers, fruit, seeds).
    - You can start to draw some of the parts in obviously wrong places such as the roots on top. You'll find out who is paying attention!
    - You all have cutout plant parts on your tables. Decide together how to put the parts together to make a whole plant.

- *Question:* *Do you eat plant parts? Do you eat all of them?*
    - Have the students move to a circle on the floor.
    - Bring out the bowl of plant part examples.
    - Pass around an example of each plant asking the students to try to figure out the plant part that each one is.
    - When all plants parts have been passed around, hold them up individually and ask them to identify each one and the part of the plant that it is.

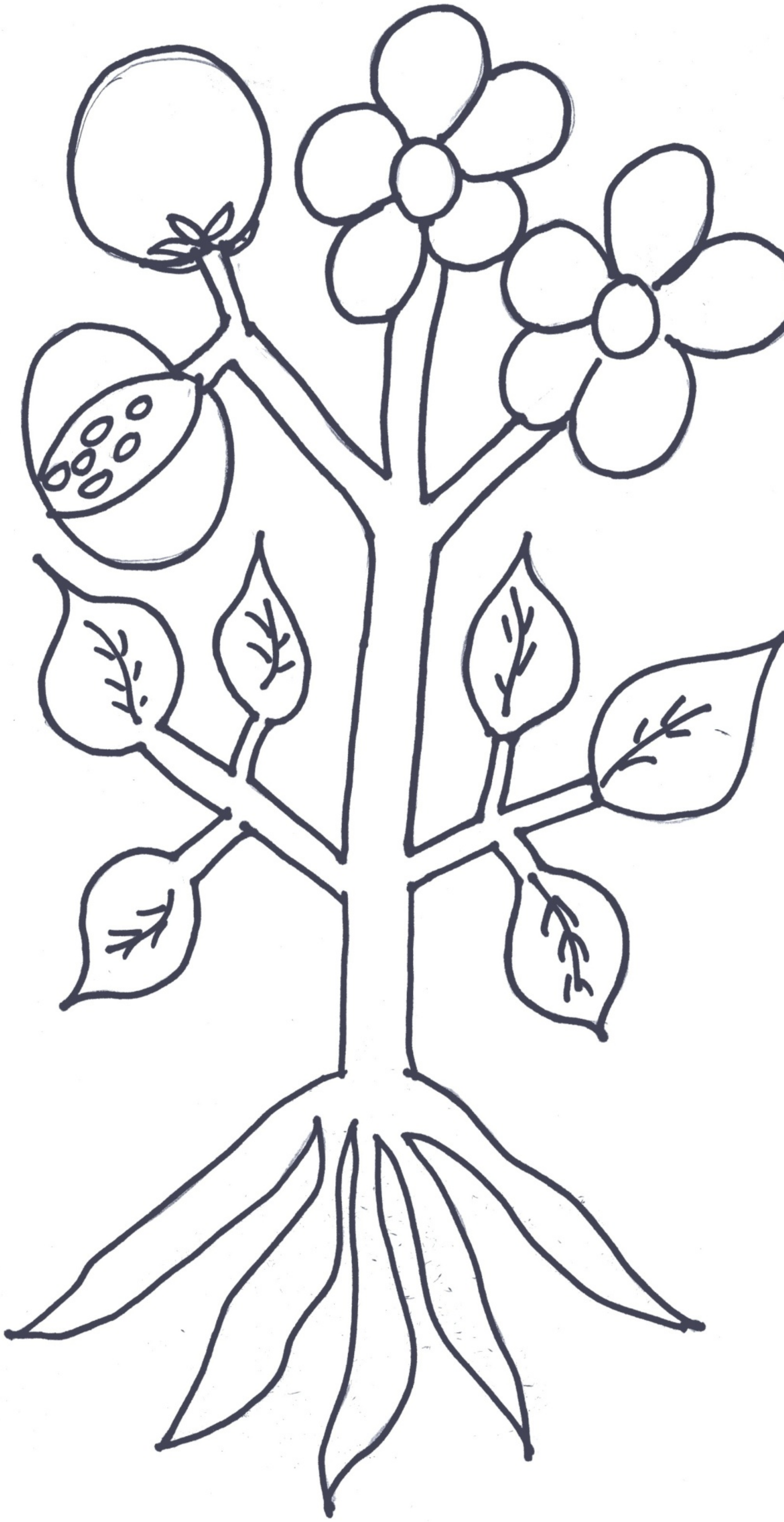
Let's Review

- Let's name all of the parts of a plant again.
- What is your favorite part to eat?

Keep Exploring

Let's explore our garden and schoolyard and identify plant parts as we go. Be very observant plant scientists.

- Divide the class into as many groups as there are adults.
- Each group goes in a different direction looking for plant parts.
- Spend time looking for all parts, especially the harder to find ones such as visible roots and small seeds.
- Spend time feeling, smelling, listening to, and looking at each plant.
- Bring the whole group back to the circle
- If there is time left, each group can show the others where they found a plant part.



4. Did You Just Eat A Root? – K

Name________________________________Date__________

Draw your favorite fruit to eat.

Draw your favorite root to eat.

Oct.

5. From the Beginning

Seeds

K

Objectives:

- Learn about the parts of a seed
- Sharpen observation skills
- Learn to use a magnifying glass
- Follow multi-step directions

Materials

- One soaked lima bean for each student plus several extras for demonstration
- Plastic containers for outside seed collecting
- Diagram of seed parts (attached)

Preparation

- Soak beans the night before
- Collect samples of seeds from the garden area.

Procedure

Observation: *Close your eyes and imagine a world without plants. There are no trees, grass, flowers, or any other types of plants anywhere. What does that look like?*

- Open your eyes and share what that world looked like to you.
- Would you rather have a world with or without plants?

Question: *Where do plants come from? (Seeds)*

Just as plants have parts, seeds have parts too. Let's take a look some seeds and learn the names of the parts of the seeds.

- Hand out seeds to each student.
- Have each student carefully peel off the seed coats and open three types of the soaked seeds.
- Study the insides with a magnifying glass.
- Point out the baby plant inside
- Draw the outline of a bean seed on the board.

Question: *Who can name the different parts of the bean seeds?*

- Seed Coat
- Baby plant
- Food storage

Write the part names on the board and draw arrows to the parts on the drawing.
Look at the seed cups and observe how the plants have grown out of the baby plant inside the seed.

Let's Review

- Erase the names of the plant parts and have the students help to fill them in again.

Keep Exploring

- Show the students seeds collected from outside.
    - These are some seeds that we found outside around your garden area. Let's go outside and look for these and any others that we might find.
    - Go outside to find variety of seeds.
    - Look for as many different types as possible.
    - Carefully pick some, bring them inside and put them in a display area or glue them to cardboard to show.
- Look at the seeds with magnifying glasses.

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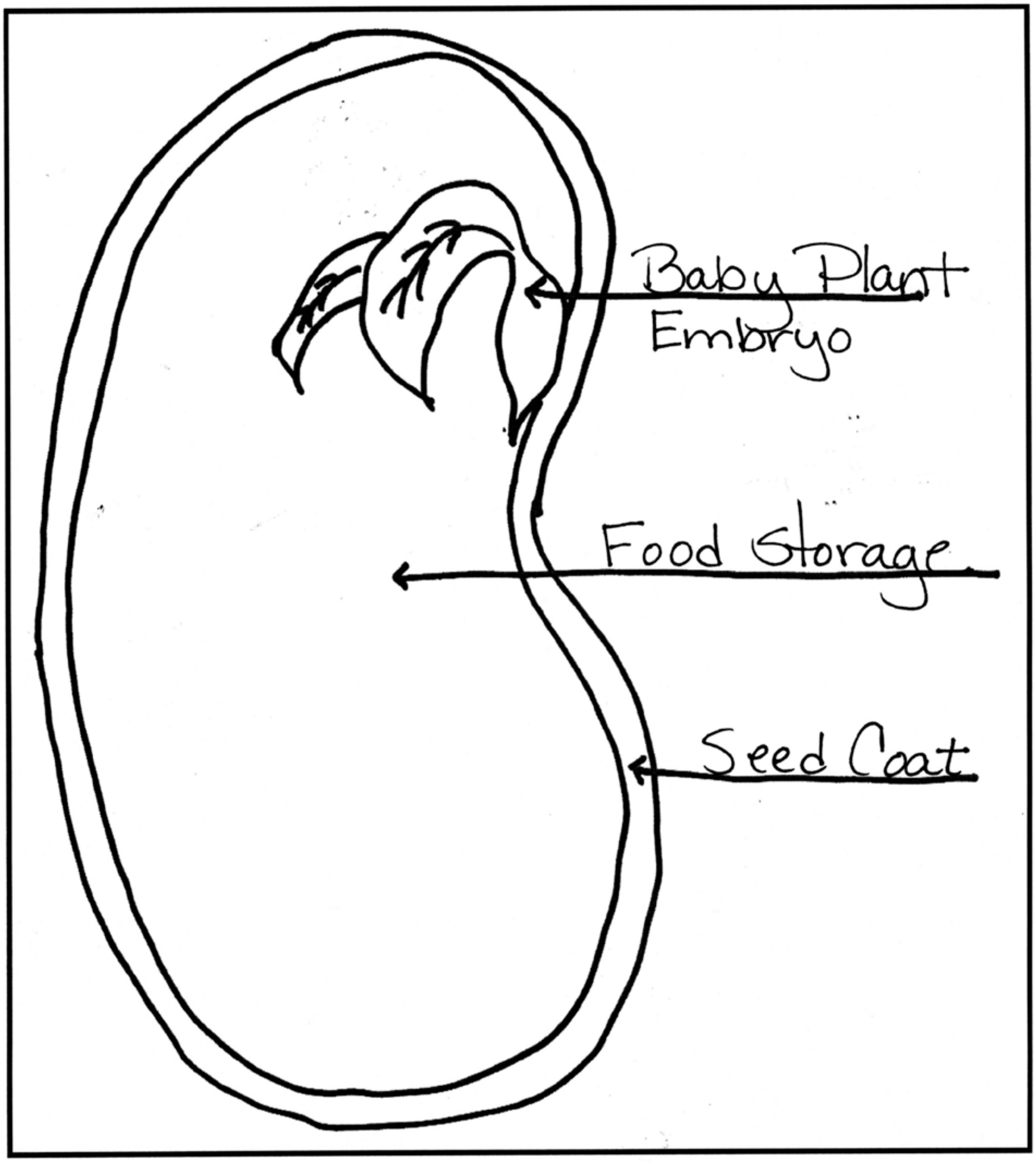

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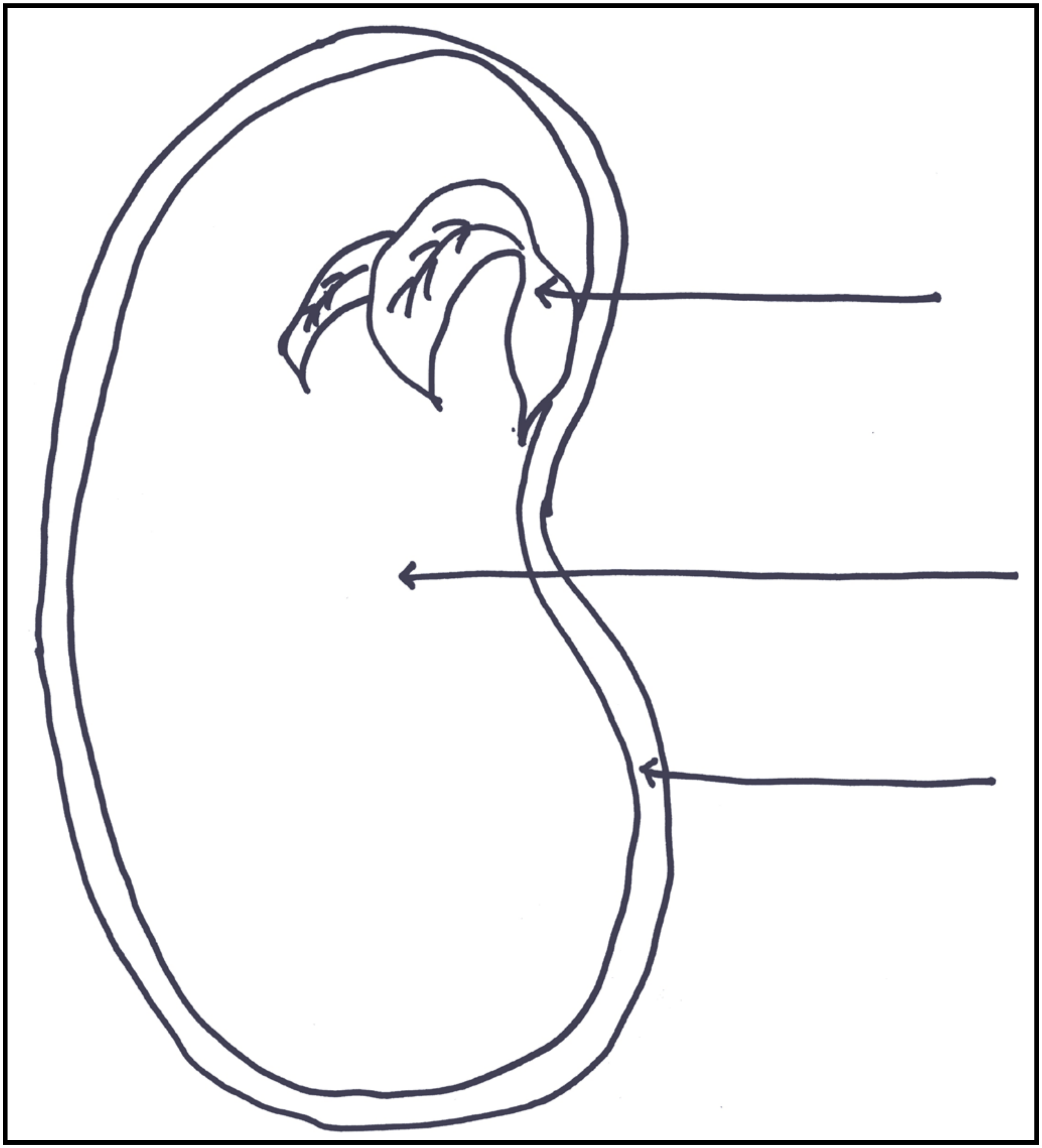
5. From the Beginning-Seeds-K

Name__________________________Date________________

Color this picture of a seed. Write the names of the parts.



Nov.

6. Hey, Where Are You Going?

Seed Dispersal

K

Objectives:

- Learn why seeds need to disperse
- Learn seed dispersal mechanisms
- Practice matching seed pictures to words describing dispersal mechanisms.
- Sharpen observation skills.
- Practice skills with magnifying glass

Materials

- Pictures of seeds that disperse in different ways (attached)
- Seed dispersal cards (see attached)
- 5-6 numbered containers (sandwich bags, small bowls, or plastic cups) each with seeds that are dispersed in similar ways
- Key for seed containers (example: bag #1 contains seed dispersed by wind, #1 on key says “Wind”)
- Magnifying glasses
- Book about seeds and seed dispersal (some suggestions)
  - A Seed Is Sleepy by Dianna Hutts Aston and Sylvia Long
  - Seeds: Pop, Stick, Glide by Patricia Lauber
  - Fruit is a Suitcase For Seeds by Jean Richards
  - The Tiny Seed by Eric Carle (always a big hit)
  - Seeds by Ken Robbins

Preparation

- Print out pages
- Choose a book to read
- Divide seeds into containers

Procedure

Introduction: *Mother Plant Activity*

- *Have the students stand in a tight group around the teacher who is the “mother plant”*
- *Dialogue: “I am the mother plant and all of you are the seeds with baby plants inside. It is time for you to grow into a big plant. Try to start growing by sending down your roots so that you are firmly planted (your feet can't move). Now spread out your leaves and branches (arms). Do you have room to grow? Will you be able to get enough water and nutrients? It seems very crowded! Now I am going to pretend as if I am a very smart seed. Watch what I do.”*

(Move far away from the circle).

"Watch me as I am able to spread out and grow very large. Will I have enough room, water, and nutrients? Yes! I am a smart seed and traveled away from the mother plant so that I could grow to be a big plant. Do you think that was a smart thing to do? Why? Now, all of you seeds, travel over and make a large circle on the floor."

Pass around seed containers for observation.

Question: *Do seeds have feet? How about wings? If not, how do they travel away from the mother plant so that they can grow? (wind, water, sticking to animals, being eaten and deposited by animals, explosively, buried by animals, dropping and/or rolling with gravity)*

- Let the students come up with some answers and write them on the board. They may need some prompting.
- Introduce the phrase "seed dispersal" for traveling seeds.
- Read a book on seed dispersal.
- Now ask the question again and note if the students come up with more ways that seeds travel.

Question: *Do you think that you can tell how a seed travels just by looking at it?*

- Tape pictures of seeds on board in a vertical row. Tape up the seed dispersal cards in another row. Have the students match the mechanisms to the pictures and arrange the cards in the correct order next to the pictures. Ask how they figured out the answer (it looks like something an animal eats, it has wings, it has hooks, etc.).

Divide the class into 3 groups and have them stand in their groups on one side of the room. Have each group travel to the other side of the room as a seed would. Wind, water, and sticking to an animal (one student will be the animal) work well. Divide into more groups and do other dispersal methods, such as rolling, if this works for your class. This part of the class is also fun to do outside.

Let's Review

- Why do seeds need to travel?
- What is your favorite type of seed dispersal?

Keep Exploring

- Each group opens the bags, spreads out the seeds, looks at the seeds and decides how they are dispersed. After all the students at the tables are ready (have them sit with arms crossed when ready), one person from each table reports on the dispersal method for their seeds. Have the students put the seeds back in the bags and give the matching plant dispersal card from the board to the group to put with the bag.
- Spend some time at their tables looking at seeds with magnifying glasses.
- Go outside and look for more seeds. Carefully pick them from the plants, bring them inside and try to figure out how they are dispersed

Carried By Water

Carried By Wind

Explodes From Seed

Eaten and Deposited By Animals

Sticks To Animals

Drops and Rolls

Fire

1. Eaten and deposited by animals 2. Sticks to animals 3. Wind 4. Gravity-drops and rolls 5. Released by heat	1. Eaten and deposited by animals 2. Sticks to animals 3. Wind 4. Gravity-drops and rolls 5. Released by heat	1. Eaten and deposited by animals 2. Sticks to animals 3. Wind 4. Gravity-drops and rolls 5. Released by heat
1. Eaten and deposited by animals 2. Sticks to animals 3. Wind 4. Gravity-drops and rolls 5. Released by heat	1. Eaten and deposited by animals 2. Sticks to animals 3. Wind 4. Gravity-drops and rolls 5. Released by heat	1. Eaten and deposited by animals 2. Sticks to animals 3. Wind 4. Gravity-drops and rolls 5. Released by heat

Coconut Float

Once a young seed said to its big Mother plant,
"I want to stay with you!" She said, "I'm sorry, seed—you can't."

"You need your own piece of earth, a place where you can grow."
Then the trees began to rustle and strong winds began to blow.

The seed was pulled far away and carried by the winds.
It fell lonely to the ground, but soon it made some friends.

A squirrel scampered by with some seeds in his cheeks.
It buried seeds all over, to hide them for a week.

The squirrel forgot about them and they began to sprout.
Those plants were growing strong when they heard a bird call out.

That bird squawked, "Watch out!"—earlier he'd been eating berries,
And now the bird was dropping droppings his body could no longer carry.

The droppings landed with a "SPLAT" in the open field.
From the seeds in that pile sprouted a plant that grows there still.

Soon a cat trotted by with stickers in its tail.
It stopped and scratched to get them out and on the ground they fell.

Those stickers were seeds that sprouted, now a huge bush grows there.
So if you walk in that area, be sure to take great care.

6. Seed Dispersal - K

Name_____________________Date__________

Draw a seed that blows in the wind:

Draw a seed that sticks to an animal:

Nov.

7. Growing a Foundation

Roots

K

Objectives:

- Sharpen observation skills.
- Practice gross motor skills
- Learn functions of plant roots
- Learn about the concepts of “above” and “below”

Materials

- Magnifying glasses
- Drinking straw
- Small container of fruit juice
- Plastic glove
- Small container of water for pouring
- Small pot with soil
- Plant in a pot
- Cut stem (with leaves) of plant in the pot
- Varieties of roots that include tap roots and fibrous roots. Some good sources include pulled up weeds, house plants, 6packs from nurseries, plants growing in clear containers, and vegetables such as carrots and beets with their leaves still on.
- 1 large and 1 small carrot or beet

Preparation

- Gather weeds, stem, potted plant and other materials

Procedure

Observation: *Pass around a variety of roots for the students to look at, feel, and smell.*

Question: *Does anyone know what we are passing around? Are these parts of plants?*

- Once the students identify the roots, go to the board and tell them that you want to draw a plant. Start with a line for the soil and a simple picture of a plant with a flower.

Question: *Where should I draw the roots? Should I draw them in the sky? Should I draw them beneath the soil?*

- Demonstrate by bending both arms in front of your body with one forearm parallel to the ground and the other perpendicular to it with your wiggling fingers pointing up for “roots in the sky” or down for “down below the soil”.
- Let the students answer and then have a student come to the board to draw where the roots should go.

Question: *Do plants really need roots? Do you have some ideas about how roots help out your plants?*

- Choose four students to come up and help with the demonstration.
- Roots absorb water and minerals (like vitamins)
  - Demonstrate by drinking juice through a straw
- Roots support the plant and keep it in the ground
  - Demonstrate by first gently pulling and pushing a plant in a pot (it stays in the pot) and then doing the same with the cut plant stem that is just stuck into the soil (it comes right out)
- Roots provide food storage for the plant.
  - When a plant has made more food than it can use for now it needs to save it. This is similar to our saving left over food after a meal so that we can eat it later. Demonstrate (using two students) by using water in a pourable container to represent the extra food and filling up a plastic glove for storage. Foods like carrots and radishes are storage roots that we eat. Show two sizes of carrots or beets. The larger one is storing more food.

Have the students sit in their chairs and pretend to be plants. The chair is the soil level and their roots will grow below. Have them stomp their feet as their "roots" grow strongly into the ground. Gently push several of them to make sure that they have grown strong roots and won't fall over. Then have them pull water and nutrients from their soil making a sound like sucking through a straw. Send the water and nutrients to the rest of the plant by stretching their arms up high. Now tell them that they need to save some of their food by sending it back down to the roots. They can bend over and show with arm motions that their roots are filling up and getting bigger. Now have them stand tall again and pretend as if their roots have disappeared. Have them put their feet close together. Can they be pushed more easily? What happens to their plants if they can't get any more water? Slowly "wilt" to the ground.

Go outside, find some weeds that need to be pulled, pull them up and look carefully at their roots.

- Demonstrate the "wiggle, wiggle, pull" pulling method.
- Have small groups stay together in a circle and pick the weeds one at a time.

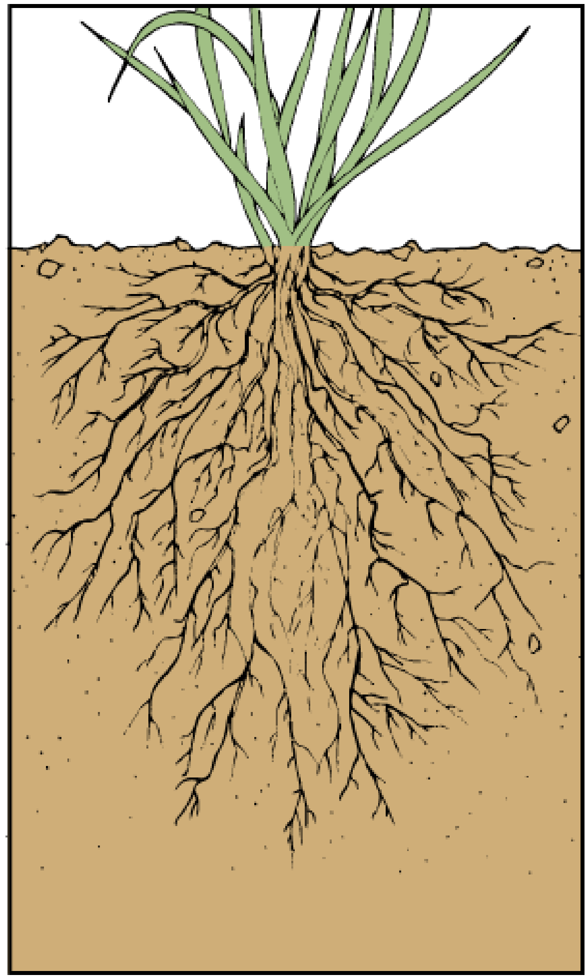
Let's Review

- Name the three jobs that plants do for plants.

Keep Exploring

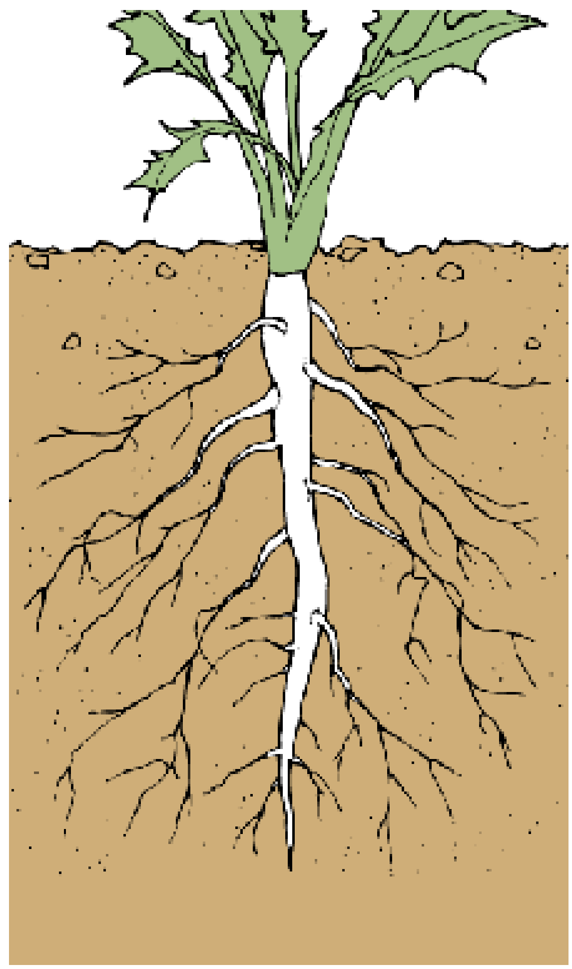
- Bring some of the weeds back to the class, carefully clean off the roots, and look at them with the magnifying glasses.
- Read a book about roots such as What Do Roots Do? by Kathleen V. Kudlinski.

FIBROUS ROOTS



◀ Back to roots
This ancient temple in Cambodia was made of huge blocks of stone hundreds of years ago. The roots of a tree have torn the temple apart.

TAP ROOTS



7. Growing a Foundation: Roots- K

Name___________________________Date______________

Draw some plants that have a lot of roots.

Nov.

8. What's Holding This Thing Up?

Stems

K

Objectives:

- Learn the functions of plant stems
- Practice observation skills
- Practice hypothesizing
- Review the concepts of "above" and "below"

Materials

- Drinking straw
- *1 white carnation
- 10-15 assorted woody and herbaceous (green) stems
- Red and blue food coloring
- 3 plastic cups
- Tape
- Celery stalk with leaves
- Plant in a pot or root cups from food storage experiment

Preparation

- Cut and collect stems from outside
- Collect other materials

Procedure

Question: Last week you learned about a very important part of a plant. Who can tell me what it was (roots)? Now who can tell me what three important jobs roots have?

- Pulling up water and minerals
- Food storage
- Support for the plant

Draw the soil line on the board explaining that the soil is *below* the line. Have a student come up and draw a root below the line. Explain that the rest of the plant is *above* the soil. Have another student come up and draw a plant above the soil line.

Observation: This week you will learn about another part of the plant.

- Pass around woody and herbaceous stems.
- Look at them carefully using feel, sight, and smell.

<u>Question:</u> What part of the plant are these parts (stems)? Do they all look alike?

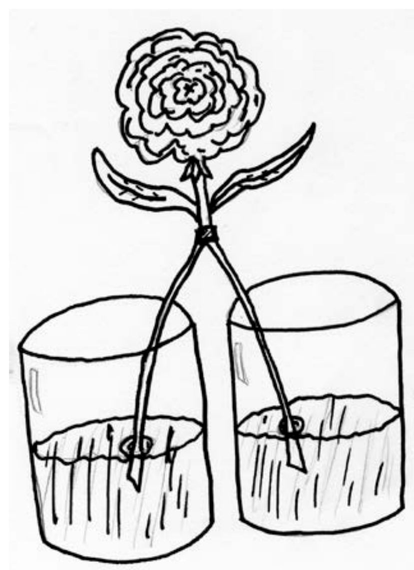
- Have the students describe some differences.
- Hold up a plant in a pot or one of the experiment cups with seedlings and have a student come up to point out the stems.

<u>Question:</u> What would happen to these leaves if the stems disappeared (fall down)? So, what is an important stem job?

<u>Question:</u> Remember the water that was pulled up by the roots? Where does that water go after it gets pulled up (through the stems to the rest of the plant)?

- Stems act like straws (demonstrate with a straw).
- Have the students stand up to be plants and act out drawing water up through the roots to the rest of the plant. Use the sound of sucking through a straw.
- Have the students pretend as if their stems have melted. Act out what happens to their leaves.

<u>Experiments:</u> Let's do some experiments to discover whether or not stems really do pull water up from the roots to the leaves and to the flowers. I'll need several helpers who have been listening quietly to come up and help.



- Carnation experiment:
    - Put ½ cup of water in each of two cups. Add about 10 drops of blue food coloring to one and 10 drops of red to the other.
    - Teacher only: With very sharp scissors or a knife, cut the stem of a white carnation off so that it is 5-8" long, then cut it up the middle to within about 1 ½ inches of the flower so that the stem is split in two. Do not break the stem, as the experiment won't work.
    - Tape the area where the split ends.
    - Put one end in the blue water and one in the red water.
    - Put the experiment in a place where the students can watch what happens over the next few days, but tell them not to touch the flower, as the experiment will not work if the stems break.

- Celery Experiment:
    - Put ½ cup of water and 15 drops of red food coloring in a cup.
    - Cut a piece of celery, with the leaves attached, about 6" long.
    - Put the cut end in the colored water.
    - Place where the students can watch what will happen.

<u>Question:</u> What do you think will happen to the flower and the celery over the next day or so?

- Have the students come up with a hypothesis.

Let's Review

- What are the two important jobs that stems have on a plant?

Keep Exploring

- Go outside and look for stems with different characteristics such as rough, smooth, thin, thick, green, brown, thorny, stiff, and flexible.
- Spend time looking at stems under a magnifying glass.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District

Specialized Stems

TUBERS

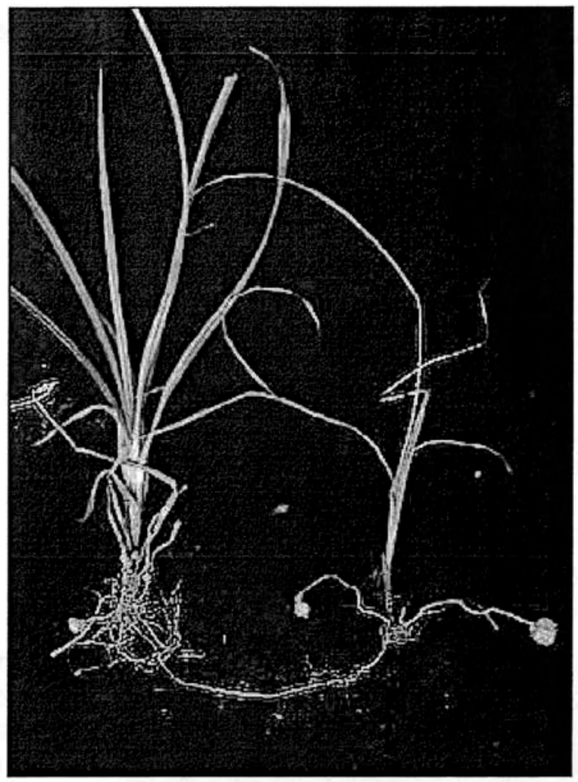
RHIZOMES

CORMS

STOLONS

MODIFIED STEMS

STOLONS



Stolons are slender stem-branches running horizontally away from the main plant, either above or below ground. In the picture at the right you see two plants of **Nut Grass**, *Cyperus esculentus*. It's not a grass at all, but rather a member of the Sedge Family, but that's a different story. Anyway, I just dug these two connected Nut Grasses from my garden and they tell a story.

The larger plant at the left in the picture (it's about 8 inches tall) is the "mother plant." It has issued a stolon that has grown about six inches through the soil, then the stolon budded and from the new bud arose the smaller, younger plant at the right in the picture. Note that some of the stolons end in roundish, potato-like tubers. There's more about tubers below.

The stolons you see in the picture arose from the same general area on the plant as the roots but, again, they aren't roots. They're stems because they sprout at their *nodes*, and real roots don't have nodes. (Nodes are explained at the bottom of our Stems Page.)

Bill Stringer, a forage agronomist at Clemson University in the US, says that in agronomy stolons are regarded as aboveground runners only, with rhizomes being their underground counterparts. Other

One reason that Nut Grass and some other weeds are so hard to get rid of in my garden is that they are very *stoloniferous* -- when you pull up the plants, you're bound to leave behind at least one stolon section, from which a whole new plant can arise. By the way, those tubers on the Nut Grass are only about the size of large peas. Nonetheless, to our ancestors such tubers often

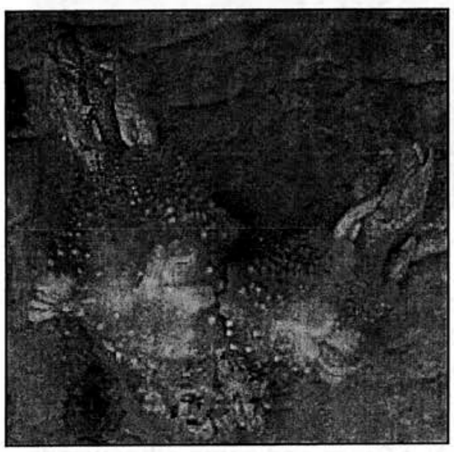
sources in basic botany, however, say that stolons can grow either above or below the ground's surface.

meant the difference between survival or starvation. The weedy Nut Grasses I try so hard to keep from my garden today may be the descendents of Nut Grasses that once saved my ancestors' lives!

TUBERS

Tubers such as those shown at the tip of some Nut Grass stolons above, as well as the ordinary potato shown at the right, are often thought of as roots. However, as we've just said, *roots don't have buds*, and that's exactly what you see sprouting on the potato, arising from the potato's "eyes." Tubers are actually swollen portions of underground stems (stolons) and, as we've seen, stems have nodes, and buds arise at nodes.

One reason it's hard to think of the potato with its sprouting eyes as an underground stem is that no nodes are obvious. If you were a scientist able to watch the potato's cells divide and grow from the very beginning you'd see



that in the very early stages of development the potato had recognizable nodes, and then you could watch the nodes develop slowly into the potato's eyes, and the eyes would have buds associated with them, just like a normal tree-branch node.

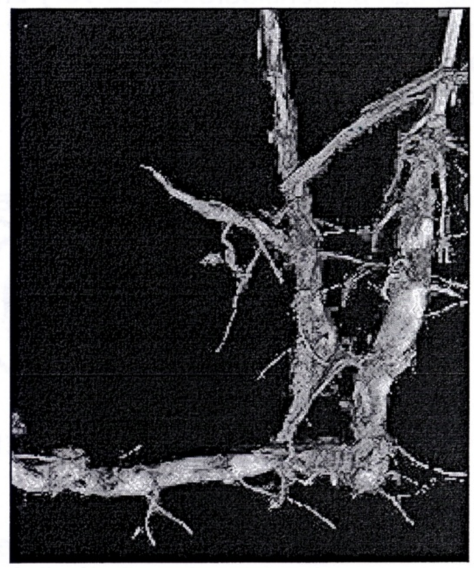
At the left you see a close-up of two sprouting buds in one of the above potato's eyes. Do you see the future leaves and stems at the top of the two sprouts? At the bottom of the egg-shaped sprouts you can see pale bumps that will develop into roots. Each of these sprouts has the potential for being an entire potato plant with its own potatoes.

By the way, you may have never even seen potatoes sprouting like the one in the picture. Usually potatoes

sold in stores are sprayed with chemicals to keep them from sprouting. That's one more reason to eat organically grown food when you can.

At the right you see a turnip from my garden. The large, purple part is a tuber producing roots only on the slender tap-root beneath it. The turnip-plant's stem is shortened into a kind of "neck" atop the tuber. When the plant matures more, a regular stem bearing flowers will arise from the "neck."

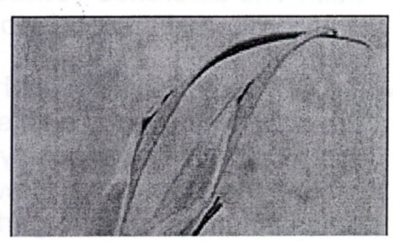
RHIZOMES



At first glance rhizomes are like underground stolons, but there's an important difference between them: Each stolon is just one of what may be several stems radiating from the plant's center. Rhizomes, in contrast, are *the* main stem. If a tree grew with its trunk horizontal below the ground, with its side branches emerging aboveground, the buried trunk would be a rhizome. The thick, fleshy "roots" of **irises, cannas**, and **water lilies** are actually rhizomes. So are the whitish, thumb-thick items at the right. What you see there are the succulent rhizomes of **Johnson Grass**, just dug from my garden. The horizontal part was growing about an inch below the ground's surface. In the picture you can spot the *nodes* in the horizontal section because the nodes are dark brown, while the *internodes* are mostly whitish.

CORMS

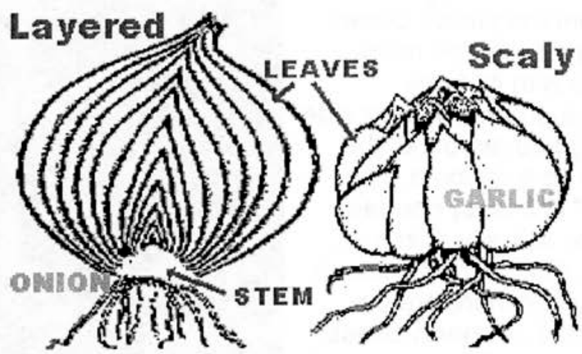
If you take a regular, aboveground, single, straight stem with its various nodes, and, keeping it standing vertically, squeeze it downward until it becomes wider than tall, and bury it underground, you'll have a corm. Corms, then, are unlike stolons and rhizomes because they usually grow *vertically*, instead of lying horizontally. They're unlike tubers in that tubers are typically attached to the main plant by a slender rootlike part of the stem, a sort of umbilical cord, while corms constitute the below-ground "heart" of the plant, the part



from which aboveground stems and leaves directly sprout. In the corm shown here, notice the horizontal band running across its middle. That's a node just like the nodes that are so conspicuous on the bamboo stem at the bottom of our Stem Page. Notice the roots emerging from the base of the corm. **Gladiolus, crocus**, and **tuberous begonias** all arise from corms.

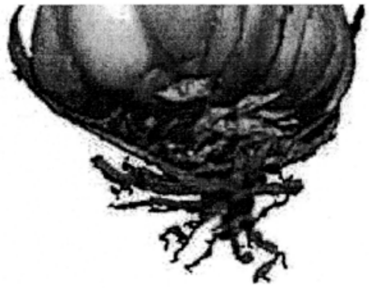
BULBS

Bulbs can be considered to be **very short stems encased in thickened, fleshy *bulb scales*** (which are *modified leaves*). As the drawing below shows, the two basic bulb types are *layered* and *scaly*:



- *LAYERED BULBS* are composed of a series of fleshy scales that form concentric rings when the bulb is cut in cross-section. In the picture at the right, *both* the **onion** bulb on the left and the **garlic** bulb on the right are layered bulbs. Well, the onion bulb is easy to recognize as a layered bulb but the garlic bulb is tricky because it looks like a scaly bulb. The difference between a garlic bulb and a scaly bulb is explained in the following section.

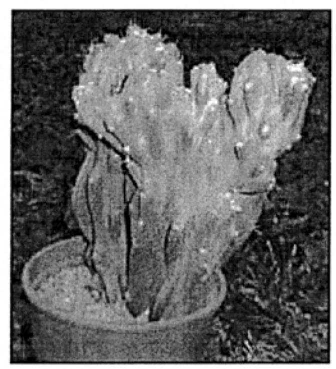
- *SCALY BULBS*, such as the **lily** bulb at the right, have fleshy bulb scales, which are *modified leaves* loosely clustered around the stem base. How are scaly bulbs different from the garlic bulb shown



above? Each of the garlic bulb's *cloves* (the smaller bulb sections in the picture) is itself a small layered bulb. Visualize garlic as having a very short, flattish stem, same as the onion in the drawing above, and imagine buds forming in the leaf axils of that squashed stem, exactly as on a normal, much longer stem. Those buds then enlarge to form the garlic's cloves, which obliterate the leaf petioles as they grow larger. Therefore, the garlic's cloves are actual bulbs developed from **buds**. In contrast, each section or "scale" of a scaly bulb is a modified thick and fleshy ***leaf***. The scales serve as sites of *food accumulation*. In the spring when the lily stem shoots up from the center of the scale cluster, it will draw its food from the scales.

WATER-STORING STEMS

These stems, you might guess, are stems specializing in storing water for the plant's use between rains. Instead of being woody, like tree stems, usually they are fairly soft and uncommonly thick, or "bloated-looking." The most famous such stems are those of the **cacti**, one of which is shown at the right. Another common potted plant with water-storing stems is the **Jade Plant**. Backyard weeds with water-storing stems include **spurge, purslane**, and **milkweed**.



Return to the PLANT MENU
Return to the HOME PAGE

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8. What's Holding This Thing Up? Stems- K

Name_____________________Date______________

Draw the flower experiment:

What does it look like the next day? Did it change?

Nov.

9. Do Plants Eat Breakfast?

Leaves

K

Objectives:

- Learn the structure and function of leaves
- Sort by characteristics
- Practice observation skills

Materials

- Bowl with salad made up of all edible leaves such as lettuce, spinach, cabbage (red is best), young kale and beet greens, small chard leaves
- Wide assortment of leaves of all sizes and shapes (50-75) divided between 5 bags
- 10-15 assorted leaves for observation
- 8x11" printing paper cut in halves crosswise (one for each student)
- Crayons or colored pencils

Preparation

- Collect leaves and gather materials.
- Divide assorted leaves into 5 groups, put in bags, and place on student's tables.
- Place paper on tables (one for each student)

Procedure

Question: *What parts of plants are in my bowl of salad? (Leaves)*

Observation: *Pass around assortment of leaves (including some of the salad leaves) to observe by feeling, looking, and smelling.*

Have the students go back to their tables.

- When everyone is sitting quietly, one student can empty the leaves out of the bag onto the table.
- Explain that as a group they will sort the leaves by characteristics. You will call out a characteristic and they will arrange the leaves.
- Have them sit with their arms folded when they are done. Check each table for accuracy and assist them if necessary.
- Call out at least 3 characteristics including ones such as size, color, and shape.
- To finish the activity, have each student pick out a leaf from the group, cover it with a piece of the halved paper, and make a rubbing with a crayon or colored pencil. Turn leaves face down so that the veins face up. You will need to demonstrate the steps one at a time for them to follow. The rubbing can be glued onto a paper in their journals.

Have the students return to the circle on the floor.

Read Leaves by David Ezra Stein

Let's Review

- Where is the food factory in a plant?
- What color is chlorophyll?

Keep Exploring

- Go outside to observe all of the different types of leaves.
- Note ones that have fallen and those that are still on the tree.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District

9. Do Plants Eat Breakfast? Leaves- K

Name______________________Date___________________

Glue your leaf rubbing here:

What plant part did we learn about today?

____

Nov.

10. Do Plants Eat Breakfast?

Food Factories

K

Objectives:

- Learn that leaves are food factories for plants.
- Learn the food making process in leaves.
- Set up an experiment connecting light and plant health.
- Make a prediction.
- Observe the results of the experiment and compare to the prediction.

Materials

- Small mixing bowl
- Mixing spoon
- Approximately ½ cup each of sugar, oil
- Approximately 1 cup of flower
- Any other cookie ingredients for demonstration such as raisins, nuts, or chocolate chips
- Baked cookie (or one for each student!)
- One moist green leaf for each student (baby spinach works well)
- Signs to use for photosynthesis "line-up"
  Photosynthesis=water+air+sunlight+chlorophyll➔food (sugars)+oxygen
- 2 plants in 3-6" pots. They should be the same type and size.

Preparation

- Gather materials

Procedure

<u>Question:</u> *Why do we eat food? (Vitamins, minerals, and proteins for growing, energy for activities.)*

• Have a discussion about why we need food to survive

<u>Question:</u> *So, food is important to plants. Did you share your breakfast with your plants this morning? Have you ever fed them pizza or cookies? Do they have a "Plant Grocery Store" or a "Plant Food Factory" somewhere in the plant? Who can tell me how plants get their own food?*

• Students can give some answers to this.

Give each student a moist leaf. These leaves are a plant's food factories! Have the students put the leaves on the floor in front of them.

- When you make your breakfast or perhaps make a sandwich, you need ingredients. Plants need several things to make their food too.
- Compare the factory operation to making cookies.
    - Various ingredients (sugar, butter, flour, etc.) go in, they are measured, mixed up and put in an oven and baked.
    - Demonstrate by mixing the cookie ingredients in a bowl.
    - Leave some of the ingredients out to demonstrate "leftovers".
    - After mixing these ingredients in a bowl, we put them on a cookie sheet and bake them in a hot oven.
    - The cookie that comes out looks and tastes quite different from the ingredients that went into the mix. Show a baked cookie.
    - Now we have cookies to eat plus few left over ingredients.

List the plant's food factory "ingredients" on the board.

- Photosynthesis=water+air+sun+chlorophyll→sugars (food)+oxygen
- When you get to chlorophyll (the "magic ingredient). Have the students pick up their leaves, crumple them up and rub them on their palms so that their hands are green. Do this with them and act excited about their green hands!
- We breathe the oxygen that the plants make.

Do a food factory "line up":

- Choose 13 students to stand in the front of the room.
- Give them each one of the photosynthesis cards.
- Have them, one at a time, stand next to each other in the correct order to represent the photosynthesis process. Arrange them in the same order that you wrote on the board.

<u>*Question:*</u> *Do plants need light to make food and to be healthy?*

- Use 2 plants that are alike.
- Put one plant in a sunny spot and one in a dark closet.
- Water both plants as needed (when the top of the soil is dry about ¼ to ½ inch down or about to your first knuckle).

<u>*Question:*</u> *Which plant do you think will grow bigger and healthier?*

- Take a vote on the prediction and record it for future reference.
- Observe any changes in growth, color, and health of the 2 plants over the next few months.
- Compare the results to the class's prediction.

Let's Review

- Where is a plants' food factory?
- What color is chlorophyll?

Keep Exploring

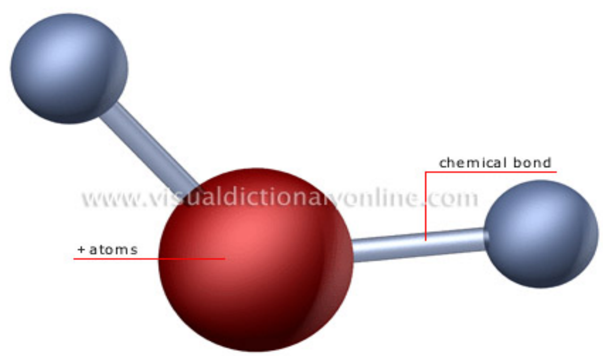
- Spend time outside looking for the greenest leaves or the ones with the most chlorophyll.
- Make cookies in the class with each ingredient representing a part of the photosynthesis process. The students could wear signs with parts of the process or the ingredients could be labeled “air”, “water”, and so on.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District

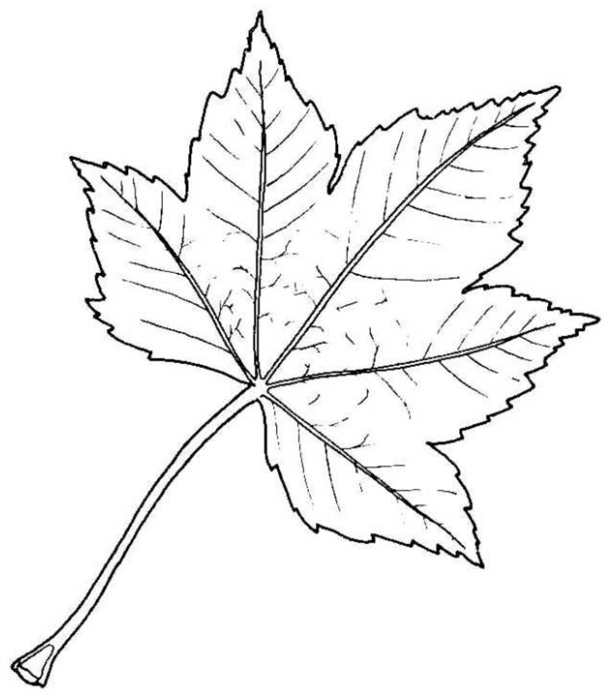
AIR

CARBOHYDRATES

CARBON DIOXIDE

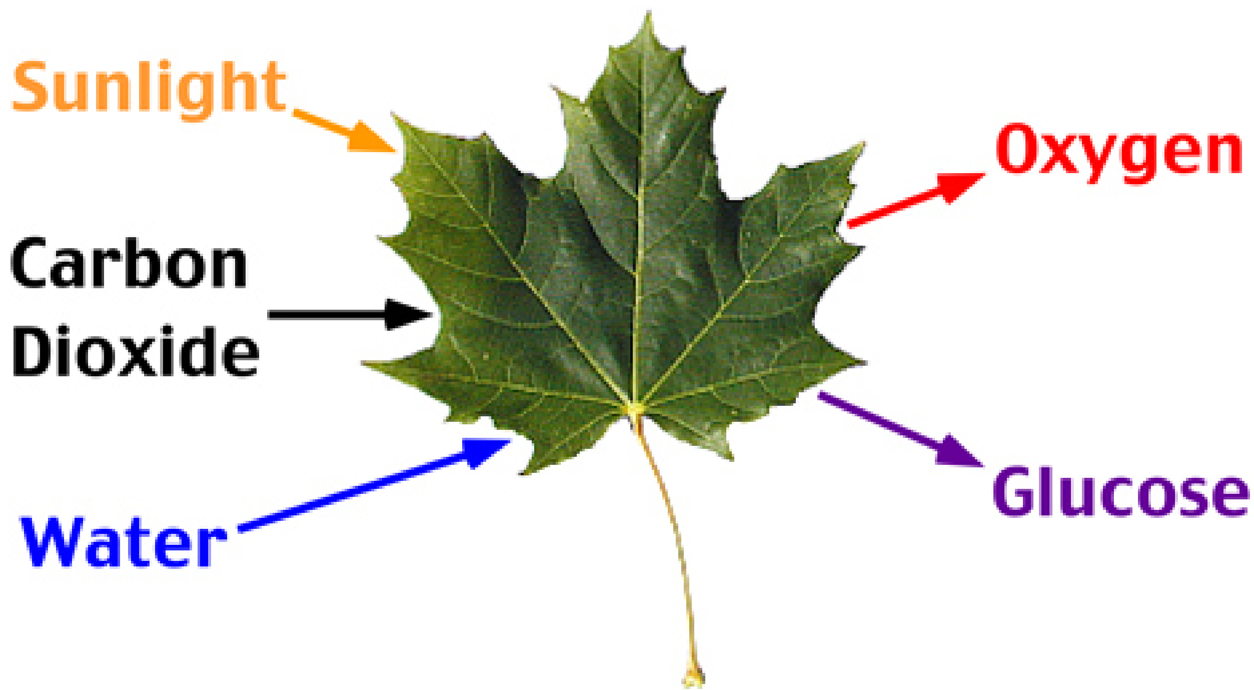


Chlorophyll



OXYGEN

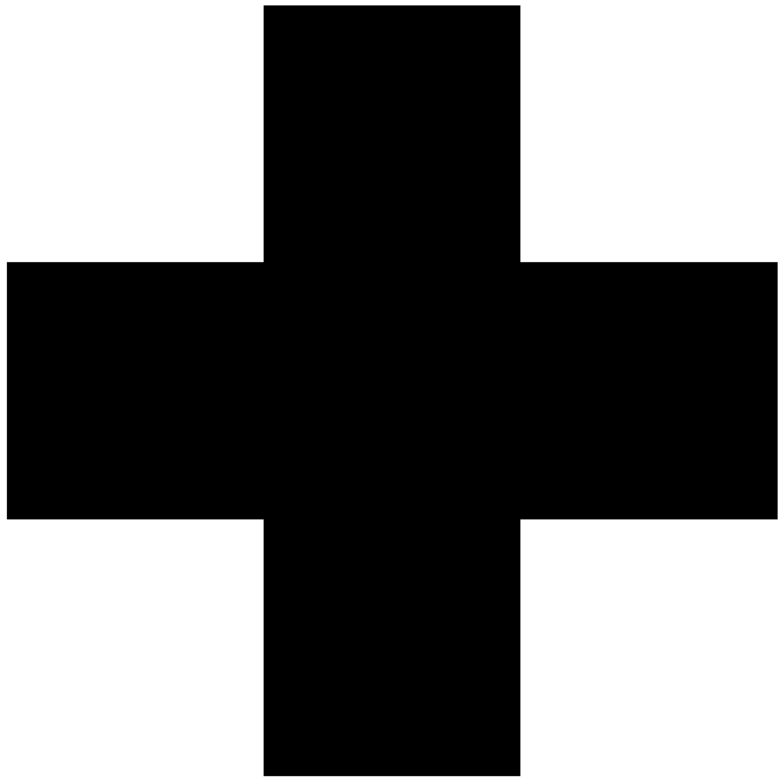
Photosynthesis

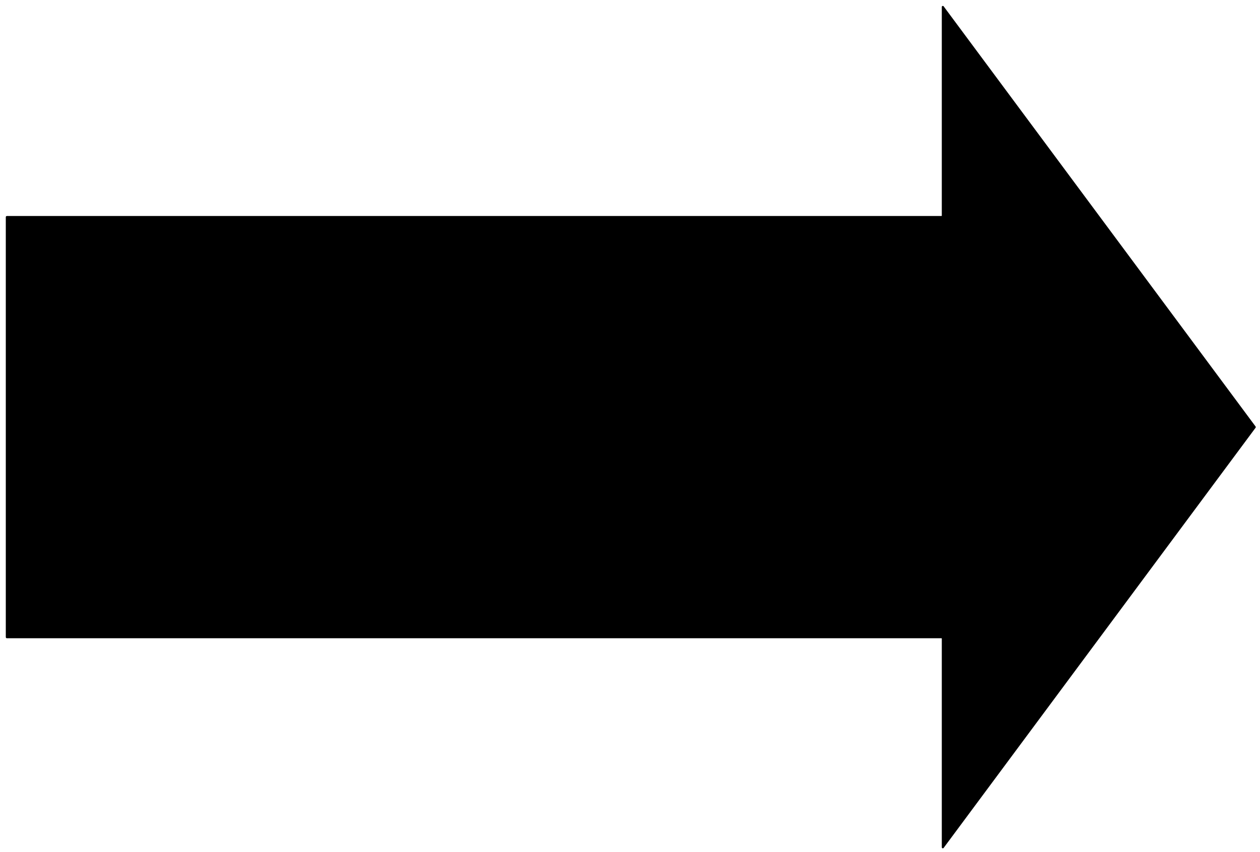


SUGARS

SUN

WATER





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[redacted]

10. Food Factories - K

Name_____________________Date______________

Draw what your two plants look like today:

Light

Dark

Draw what you think your plants will look like in 2 months:

Light

Dark

What happened?

Draw how your plants look now, 2 months after setting up the experiment:

Light	Dark

Circle what leaves need to make food:

WATER PIZZA SUN

FLOWERS AIR PEOPLE

Dec.

11. Flowers and Pollinators

K

Objectives:

- Learn about the basic parts of flowers
- Learn about pollination and pollinators
- Sharpen observation skills
- Practice using small motor skills
- Practice counting skills
- Practice color recognition skills

Materials

- One real flower of the same type for each student (alstroemerias or Peruvian lilies work well)
- One each of a variety of other flowers (5-10) to pass around
- Parts of a flower cut out of contrasting colors of construction paper (see attached)
- Cut outs of names of the flower parts and names of the parts (flower, petal, pistil, stamen, baby seeds)
- Tape or magnets to attach cut outs to board
- Several artificial flowers such as lilies that show the flower parts clearly
- Artificial bee at least 2 inches long

Preparation

- Purchase flowers and cut off blossoms
- Prepare cut outs
- Collect other materials

Procedure

Today we will talk about a very special part of a plant. It is usually the part of a plant that is very colorful. Does anyone know what it is? (Flower)

Question: *Do all flowers look the same? Name some colors that flowers come in. What are some of your favorites?*

Observation: *Pass around several types of flowers. Tell the students to look carefully at each one.*

- Flowers come in all kinds of shapes and sizes, but they all have some of the same parts.
- Tape or use magnets to put the flower parts together on the board. Compare the flower diagram (a flower cut in half) that you are creating to the inside of an apple that has been cut in half.
- Put up the names of the parts and have the students sound out the words.

Question: Why do you think that flowers are important? Do they have a job? (The part of the plant where seeds are made, attracting pollinators)

- Take several answers.
- There is something on a flower that sometimes gets on your hands or clothes. It is usually yellow. What is it? (pollen)
- There is something yummy inside of a flower that bees and butterflies like to drink. What is it? (nectar)
- Point out where the pollen and nectar are located. (Pollen on the ends of the stamens and nectar at the bottom of the petals.)
- Demonstrate how pollination works with the model flowers and pollinators.
    - Put a small amount of cornmeal on the ends of the stamens to represent pollen. Choose several students who can answer a flower part question to assist.
    - The pollinators drink nectar from a flower and move the pollen that catches on their bodies to other flowers. "Fly" the model pollinators from flower to flower.
- Have the students name other pollinators (bees, flies, butterflies, moths, animals, bats, wind, water, people, hummingbirds). Find out what are some of their favorite ones.

Observation: Dissect real flowers.

- Give out one blossom to each student along with a piece of black paper.
- Have them put the paper on the floor in front of them or on their desks.
- Demonstrate how to take apart their flowers one step at a time.
- Assist with opening the ovaries to locate the baby seeds.

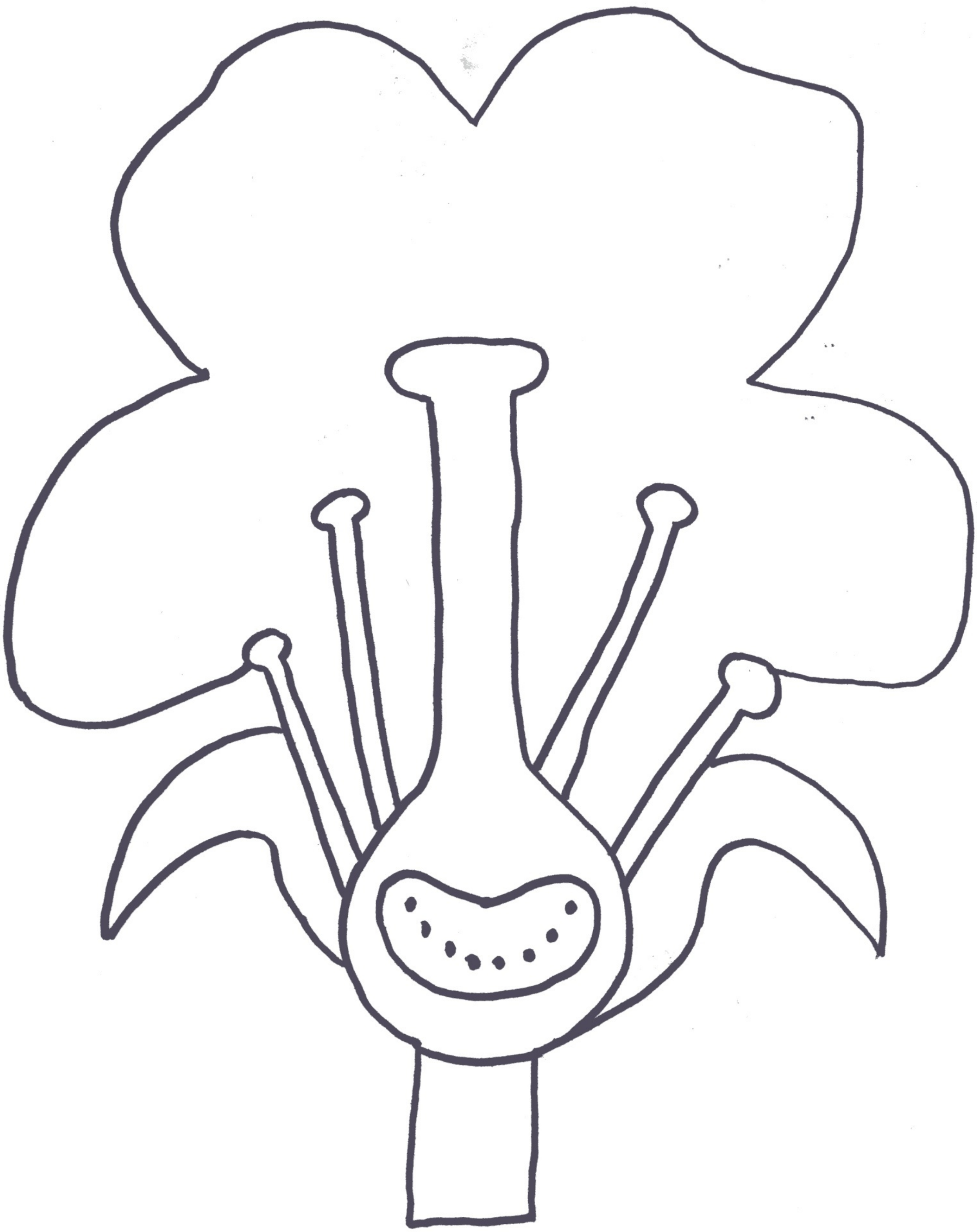
Let's Review

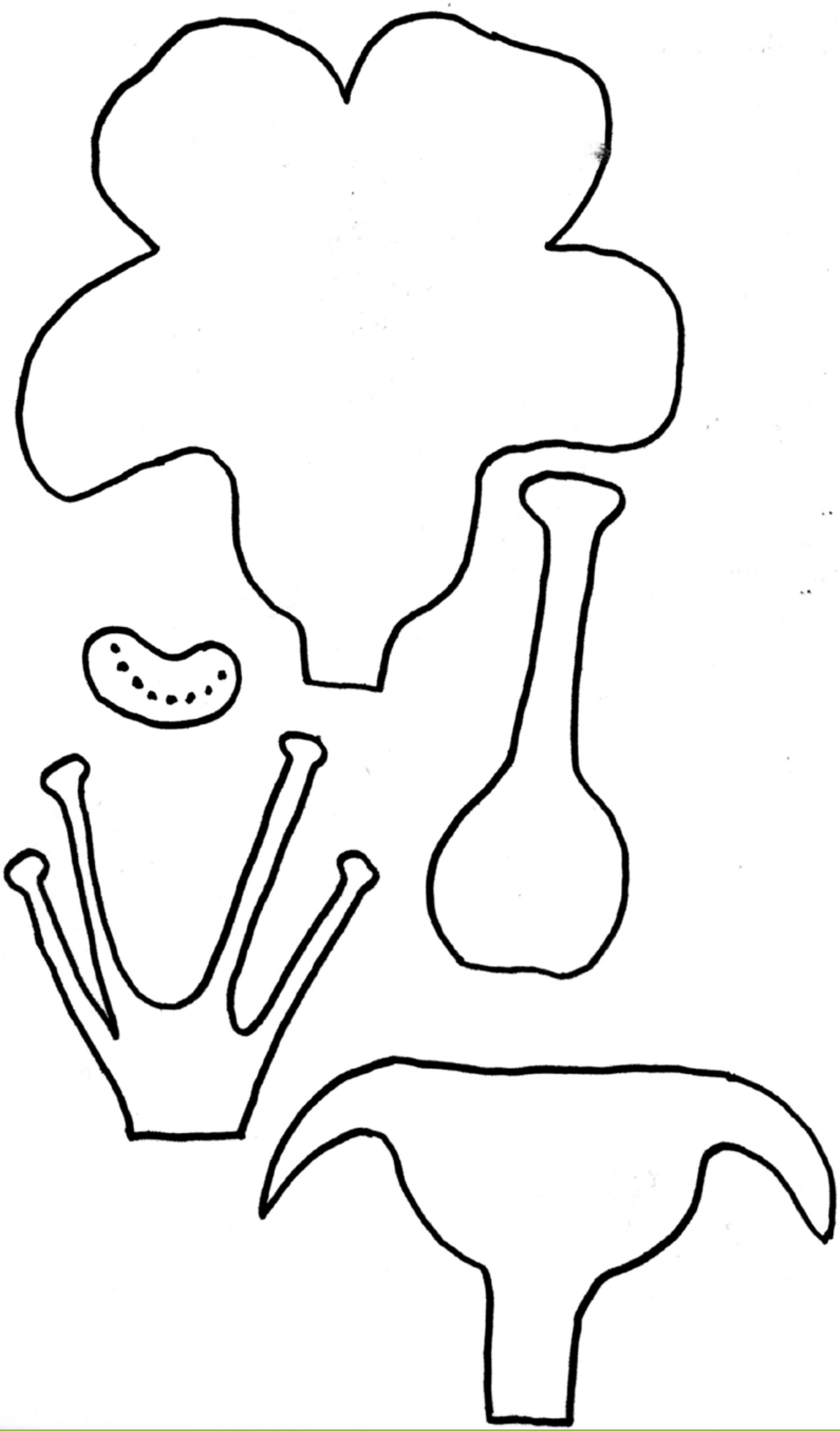
- Review the parts on the flower model and the board.

Keep Exploring

- Look at flower parts with magnifying glasses.
- Build a flower model with the class (directions attached from Plants by Janice Van Cleave)
    - Supplies for flower model:
        - Scissors
        - 3 sheets of construction paper: 2 green, 1 red
        - flexible straw (green if possible)
        - one hole punch
        - ruler
        - six 3 inch long pipe cleaners. 1 green, 5 yellow
        - ¼ tsp. cornmeal or flour
- Read Fran's Flower by Lisa Bruce

Curricula funding provided by the Daniels Fund for the Salt Lake City School District





PETAL

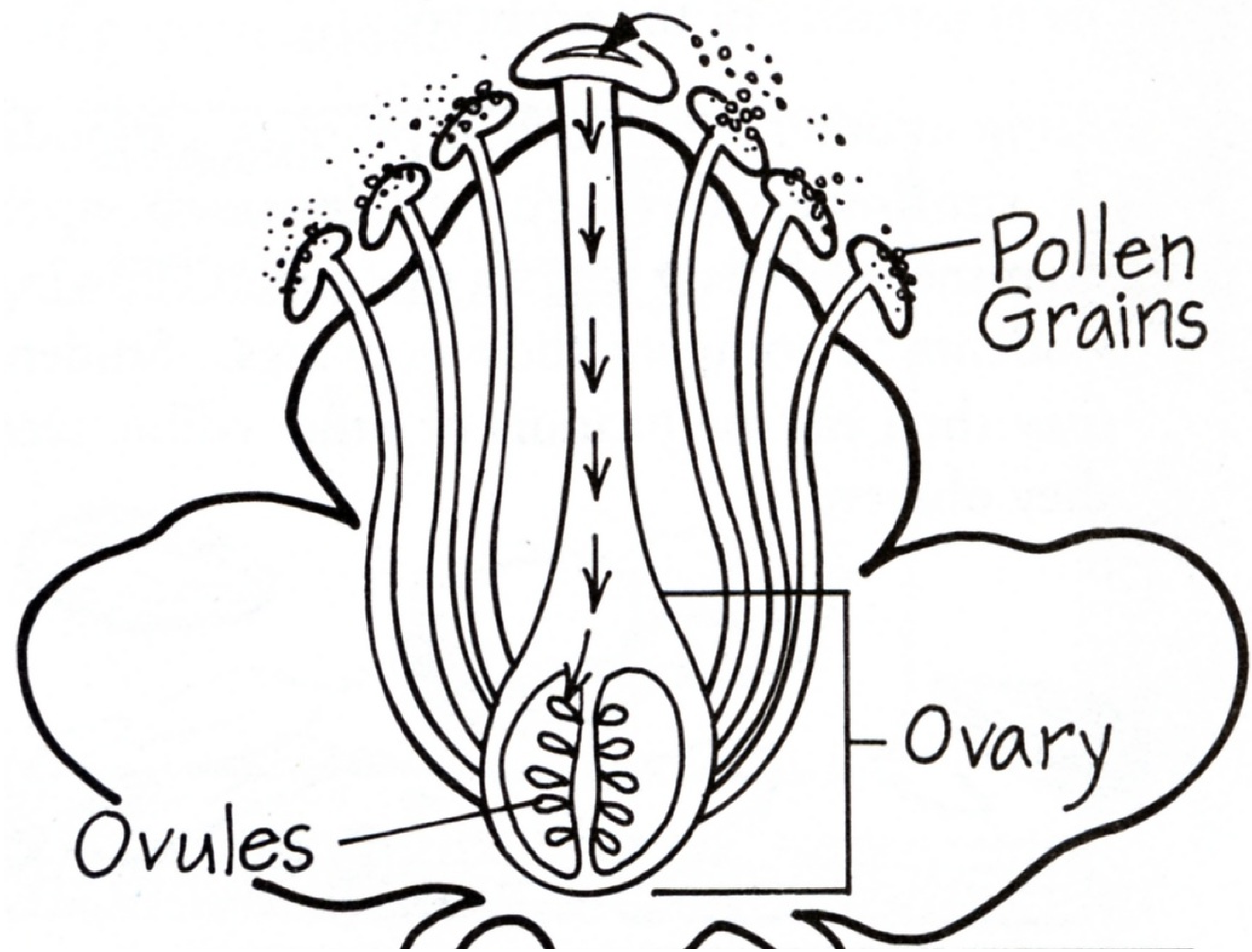
STAMEN

PISTIL

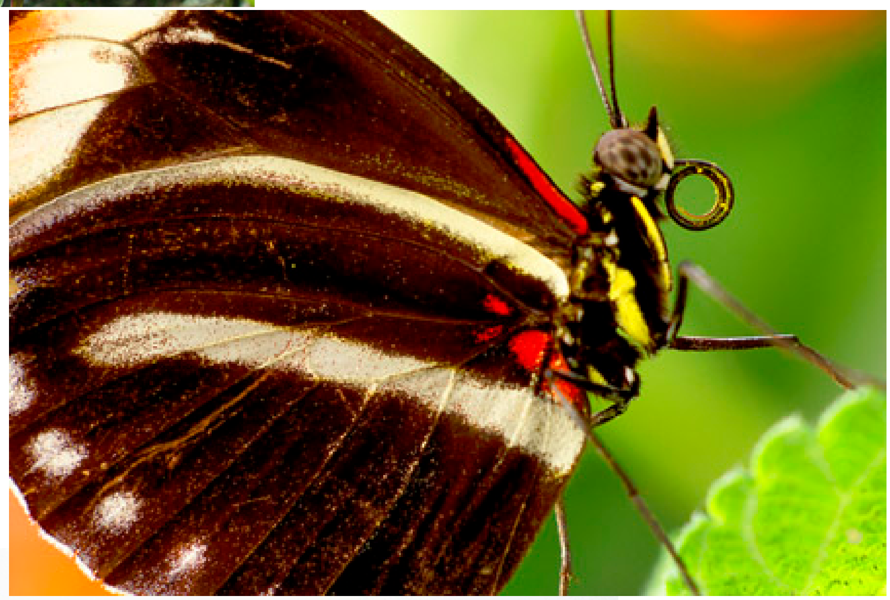
FLOWER

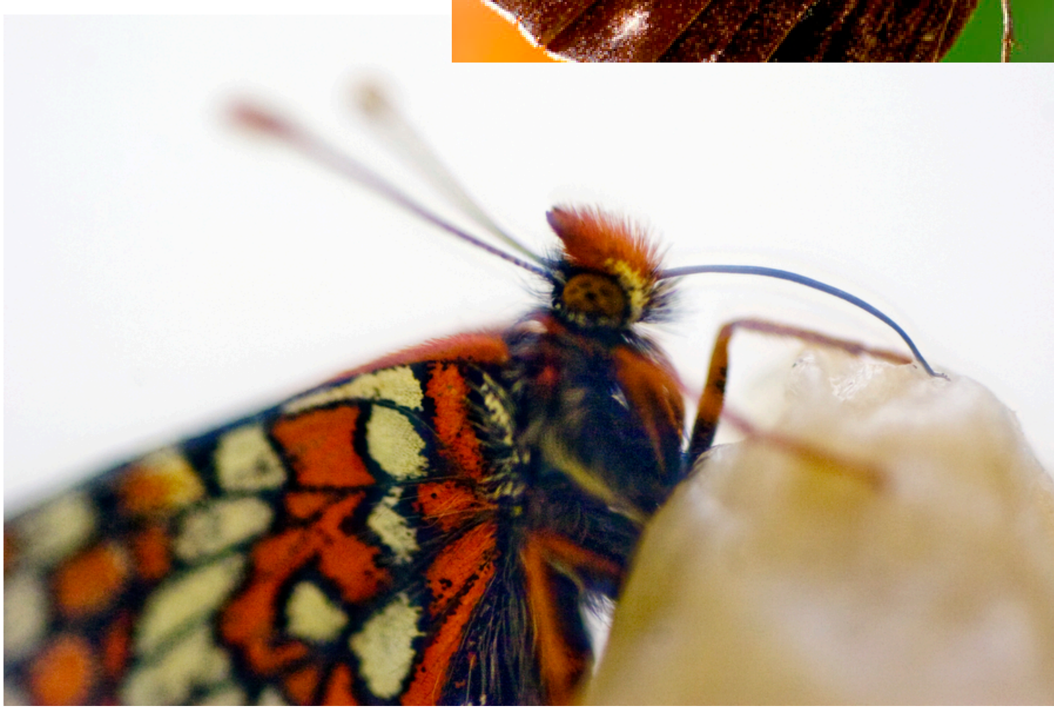
BABY SEEDS

How Pollination Works



A Butterfly's Proboscis





How Bees See Flowers

Silverweed

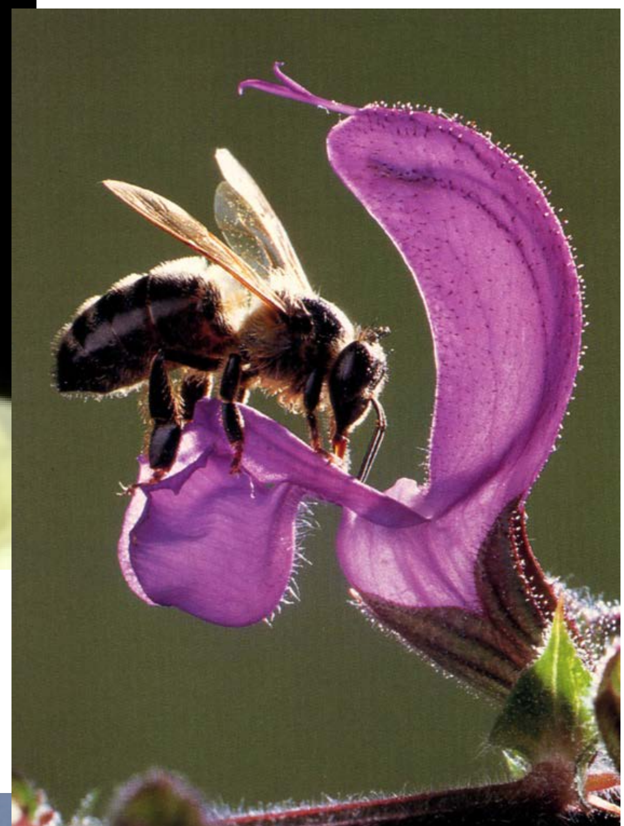
Primrose

Wood Anemone

Dandelion

Crocus

Pollinators

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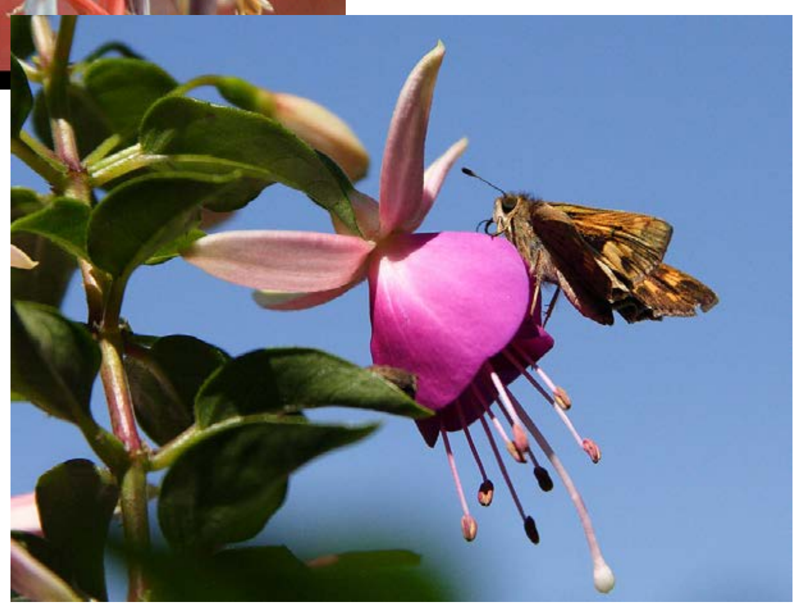


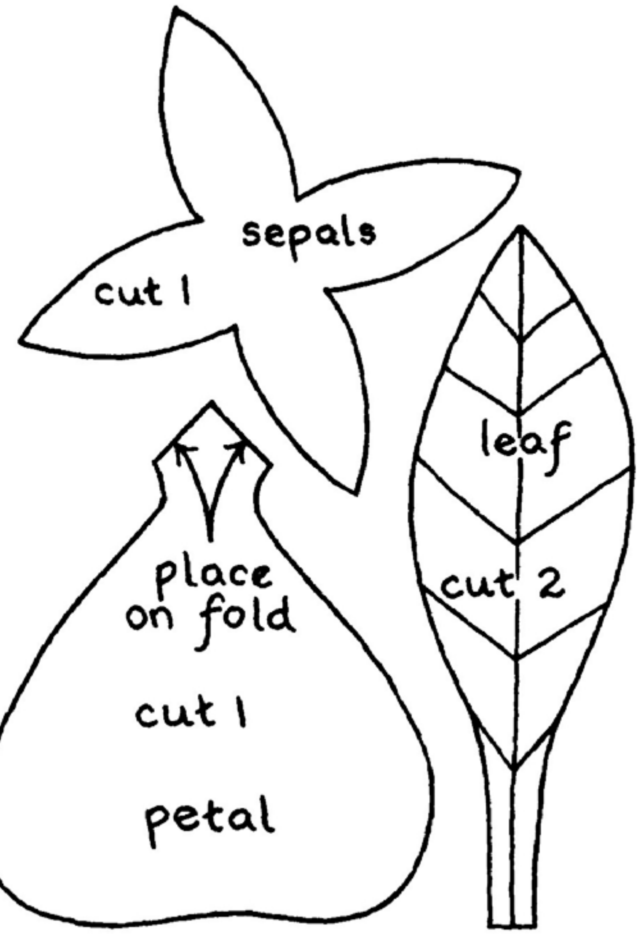
Bloomers

PROBLEM

What are the parts of a flower?

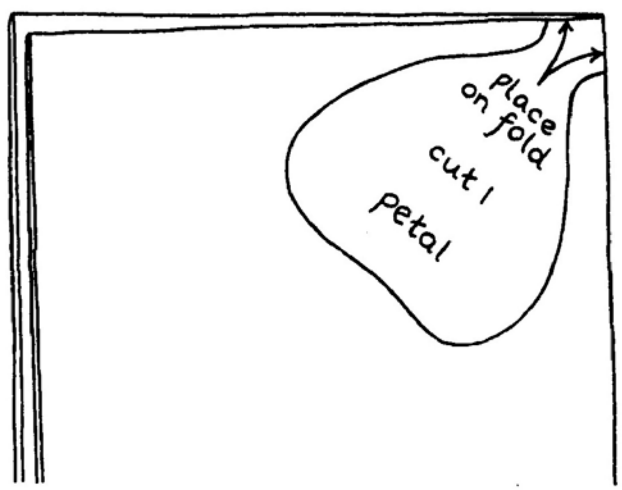
Materials

sheet of tracing paper
pencil
scissors
3 sheets of construction paper: 2 green, 1 red
walnut-size ball of modeling clay
flexible straw (use a green one if available)
transparent tape
one-hole paper punch
ruler
six 3-inch (7.5-cm) -long pipe cleaners: 1 green, 5 yellow
¼ teaspoon (1.25 l) fine-ground yellow cornmeal



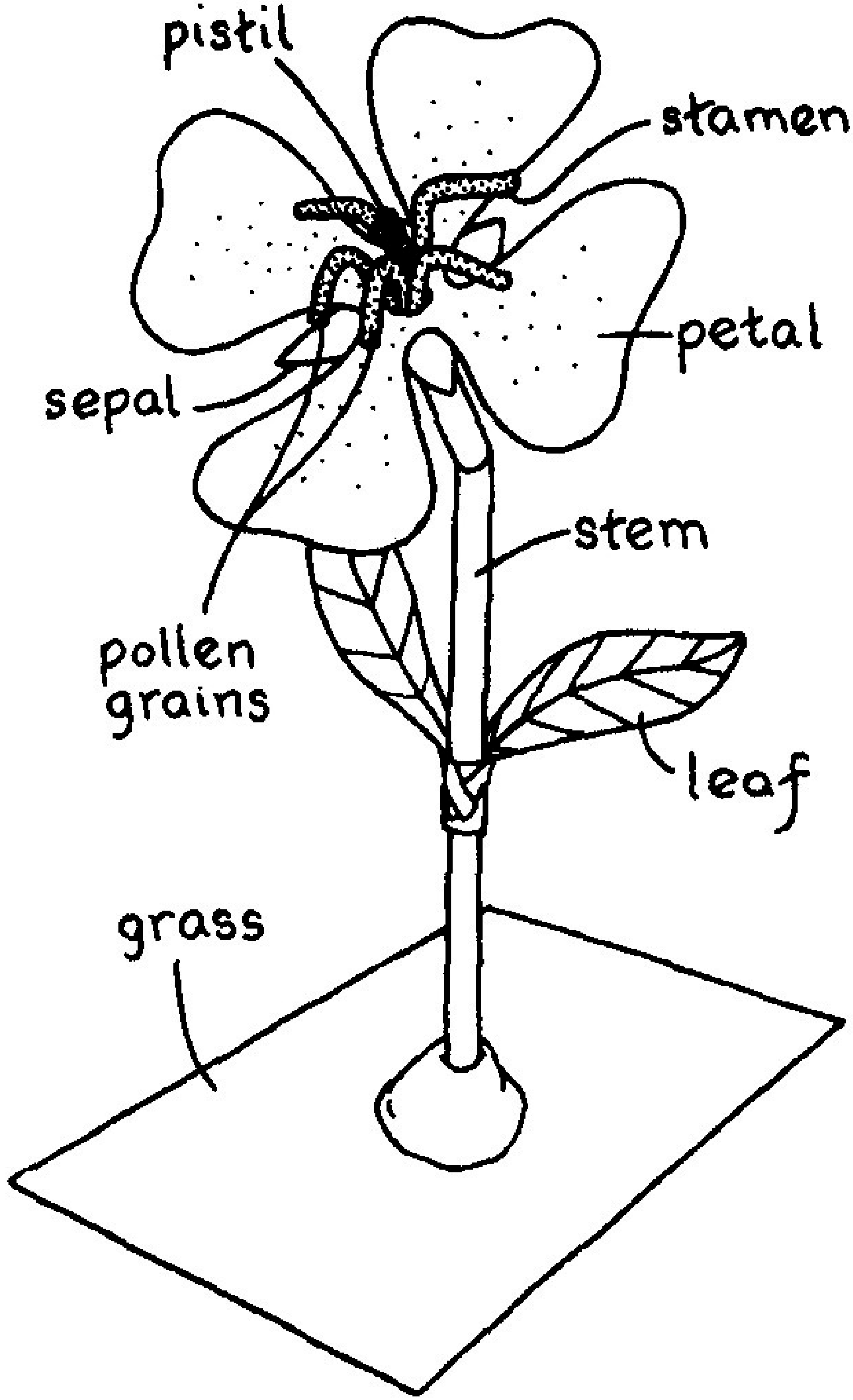
Procedure

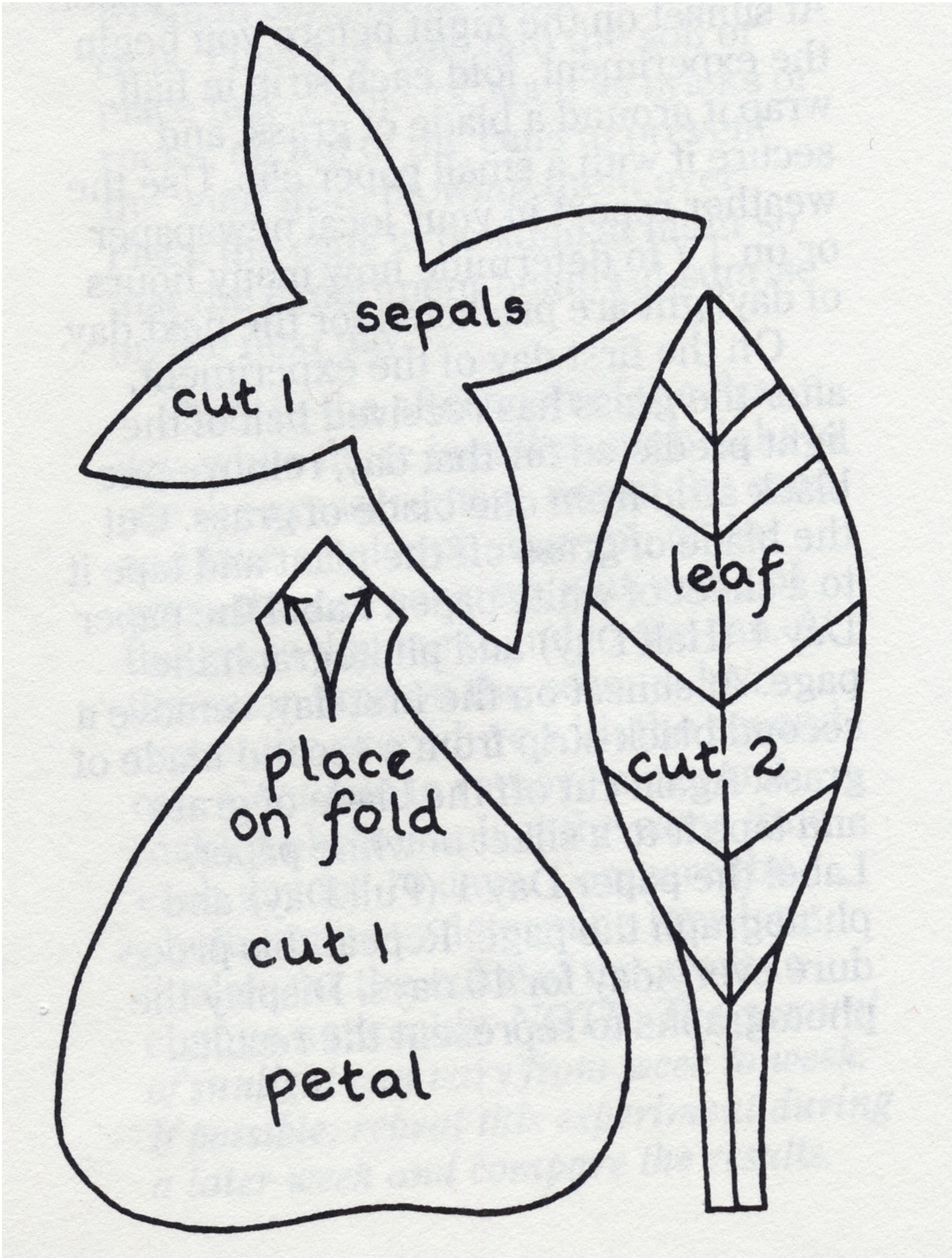
1. Lay the tracing paper over the patterns for the petal, sepals, and leaf. Trace and cut out the 3 patterns.
2. Use the leaf and sepals patterns to cut one sepal and two petals from one of the sheets of green construction paper.
3. Fold the red construction paper in half twice. Place the petal pattern on the folded paper as shown. Draw around the petal pattern, then cut along the lines you drew. Unfold the paper.



4. Place the second sheet of green paper on a table. Use the clay to stand the straw on the paper, flexible end up. Tape the leaves to the lower part of the straw.
5. Slightly bend about ½ inch (1.25 cm) of one end of the green pipe cleaner and insert the bent end in the end of the straw.
6. Make a hole in the center of the sepals and petals with the paper punch.
7. Insert the sepals over the green pipe cleaner through the hole in the sepals. Do the same for the petals.
8. Bend ½ inch (2.5 cm) of one end of a yellow pipe cleaner to a 90° angle. Insert the straight end of the yellow pipe cleaner through the holes in the petals and sepals and into the straw.
9. Repeat step 8 for each yellow pipe cleaner. Sprinkle the cornmeal over the bent ends of the yellow pipe cleaners.

   NOTE: Keep the flower model for the next experiment.


pistil
stamen
petal
sepal
stem
pollen grains
leaf
grass

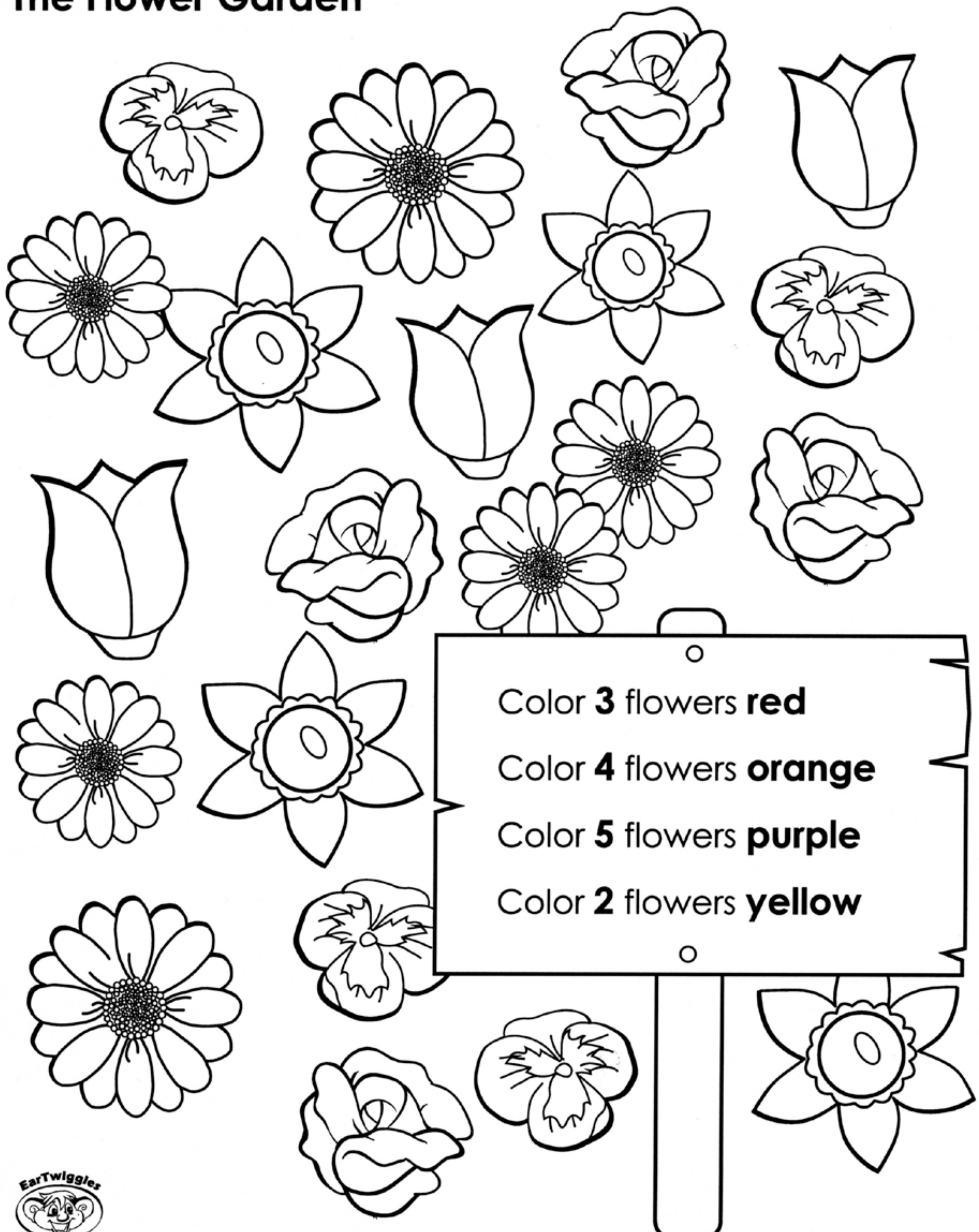

sepals
cut 1
leaf
cut 2
place
on fold
cut 1
petal

11. Flowers and Pollinators- K

Name_____________________Date______________

Draw your favorite pollinator and some flowers that your pollinator would like.

The Flower Garden



Dec.

12. Yummy!
Fruit

K

Objectives:
- Learn about the characteristics of fruits.
- Understand the jobs of fruits for plants
- Learn to distinguish a fruit from a vegetable
- Make predictions and conclusions

Materials

- 6-8 different fruits to pass around. Some suggestions are apples, grapes, tomatoes (firm), peppers, peanuts in the shell, green beans, squash, oranges, pears, peaches, peas in the pod, nuts in shells, and cucumbers. Don't use bananas, navel oranges, or other fruits that have had the seeds bred out.
- 2 each of yellow, green, and red apples.
- 1 paper plate for each student
- Extra information attached

Preparation

- Put the fruits to pass around in paper bags
- Have the fruits to cut and pass in the circle, a plate or cutting board and a knife ready for demonstration.
- Have the students wash their hands very well.
- Wash the apples

Procedure

<u>Observation:</u> *We will talk about another part of the plant today, but first we will pass around some bags with something inside. Feel what is inside without looking and try to guess what each thing is. Keep your idea in your head and don't tell anyone until we are finished so that everyone gets a chance to guess.*
- Pass around 6-8 paper bags each with a different fruit.
- After taking them out of the bags, cut them in half and pass around again. Remind the students to feel, smell, and look at each piece carefully.

<u>Question:</u> *What part of the plant are these objects? (Fruits) How are these items different? Describe some of the differences. Is there something that all of them have in common? (They contain seeds.)*
- The part of the plant that contains the seeds is the fruit.

- Vegetables are the part of the plant that we eat that does not contain seeds (lettuce, celery, carrots, potatoes, etc.)
- Cut up some vegetables such as carrots, celery, lettuce, or sweet potatoes and pass them around. Tell the students to look for seeds.
- These items contain no seeds, so they are vegetables.
- Hold up some fruits and then some vegetables and have the students tell you in which category they belong.
- Note to teacher: The word "fruit" is a botanical one. "Vegetable" is a culinary term. See the attached description of the Supreme Court case concerning tomatoes.

Question: Can you think of other fruits that you like to eat?
- Let the students give several answers.
- We eat many types of fruit and there are also many fruits that we do not eat. Remember, if it has a seed, it is a fruit.
- Show the attached pictures of fruits.

Question? Where do fruits come from?
- The fruit is formed from the place in the flowers where the baby seeds live.
- Review a picture of flower parts. Have the students point out the area with the baby seeds.
- The seeds and fruit grow after the flower is pollinated. Briefly review pollination.
- Show the flower to fruit diagram.
- Look at some of the variety of flowers changing into fruit with the flower to fruit pictures.

Question: Do you think that the fruit has a special job that it does for the plant?
- Fruits protect the seeds. Show with the cut up fruits how the seeds are protected inside.
- Fruits attract animals that eat them and then disperse them in their scat.
- Some plants, such as maple and burdock, have fruits that help seed dispersal by their shapes.
- Show the attached fruit pictures again and have the children figure out which ones animals might eat and disperse and which ones have a shape that helps seed dispersal (maple fruits flying, burdock fruits sticking to animals, and so on).

Question: Do you think that this apple contains some seeds? Who can predict how many will be inside? Do you think that these apples that are different colors will have the same number of seeds?
- Take several answers and write the numbers on the board.
- List predictions for each color of apple.

Have the students return to their tables. If they have not already, have them wash their hands.
- Cut each apple half across the middle and give one to each table. When cut this way, the ovules make a star shape.

- Have the students each count the number of seeds and then pass it to the next person to count.
- As a group they must report the number of seeds found in their apple.
- Write the numbers on the board next to the predictions.
- Look at the differences between the predictions and the results. Do all apples have the same number of seeds? How about the different colored apples?

Finish up by eating the apples!

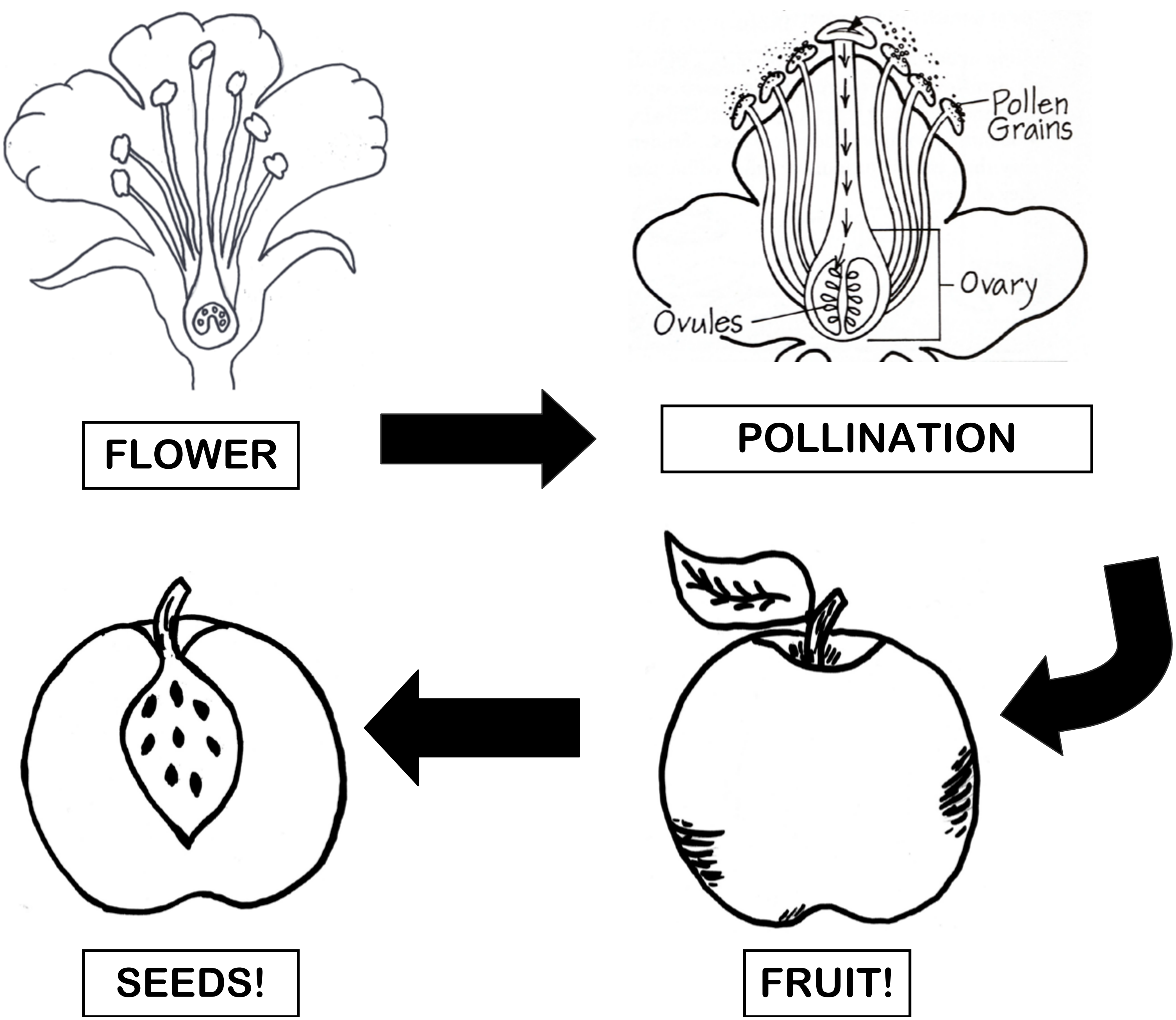
Let's Review

- Where can you find the seeds on a plant?
- How do you know if something that you are eating is a fruit or a vegetable?

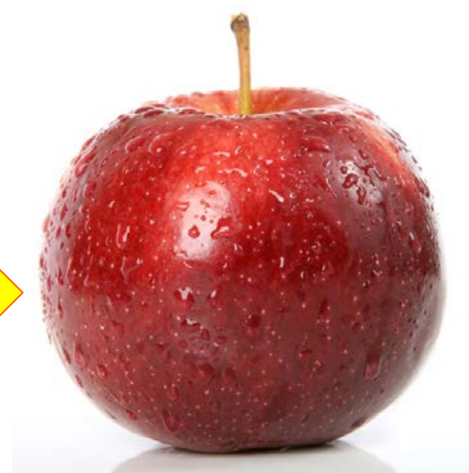
Keep Exploring

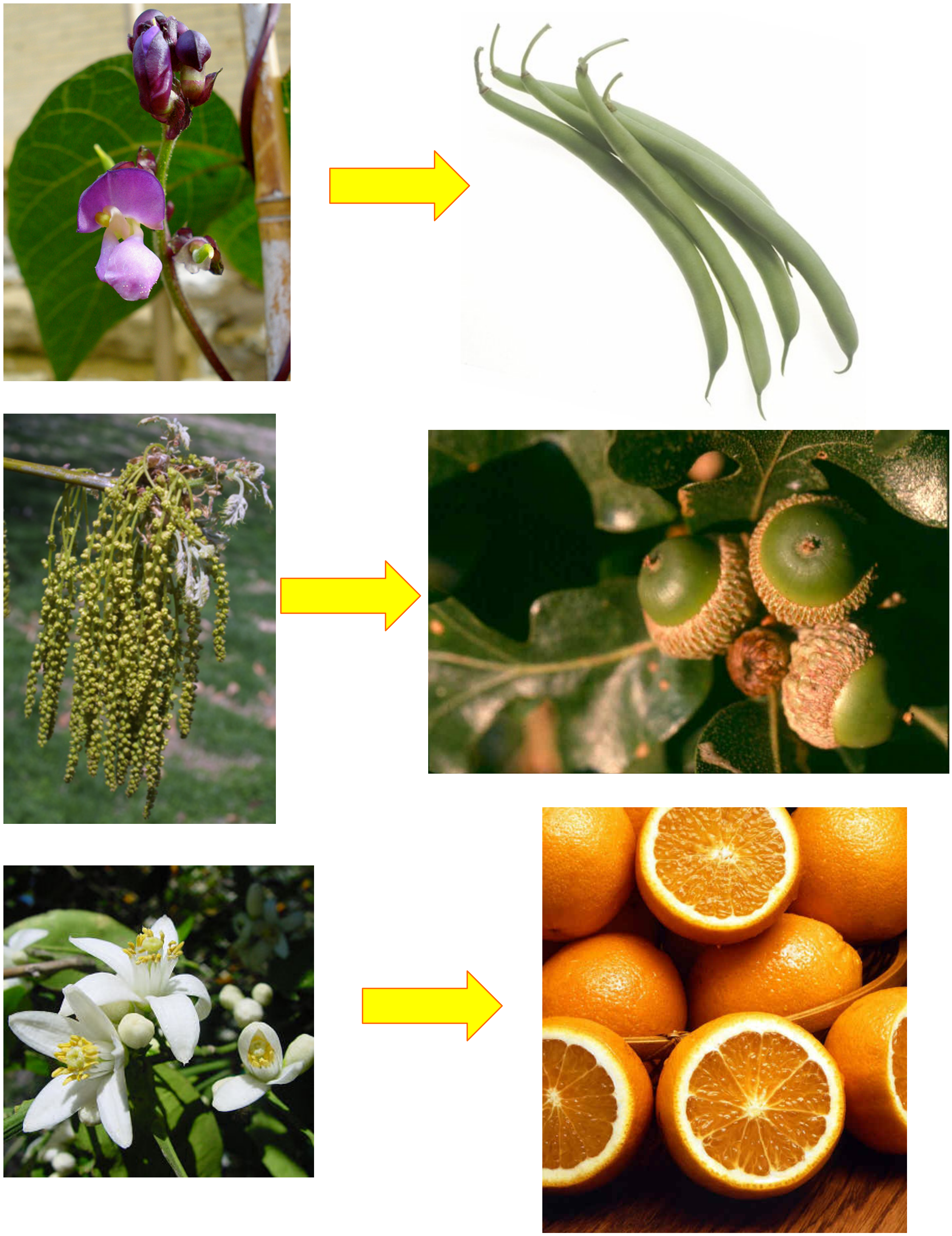
- Bring a variety of fruits for a class fruit salad. Remember to check out the seeds first!
- Read a book about apples or other fruit.
- Teacher's Note: bananas, seedless watermelons, navel oranges, and some other popular fruits have been bred to have very tiny, minimal, or no seeds. These plants are propagated vegetatively. You can usually see the vestiges of the original seeds.

Development of a plum fruit


Pollen Grains
Ovary
Ovules
FLOWER
POLLINATION
FRUIT!
SEEDS!

Flower To Fruit





If it has a seed, it is a fruit!

More Fruits!

More Fruits!

The Supreme Court v. The Tomato

Nix v. Hedden, 149 U.S. 304 (1893)[1], was a case in which the United States Supreme Court addressed whether a tomato was classified as a fruit or a vegetable under the Tariff Act of March 3, 1883, which required a tax to be paid on imported vegetables, but not fruit. The case was filed as an action by John Nix, John W. Nix, George W. Nix, and Frank W. Nix against Edward L. Hedden, Collector of the Port of New York, to recover back duties paid under protest. **Botanically a tomato is a fruit.** The court, however, unanimously ruled in favor of the defendant, that the Tariff Act used the ordinary meaning of the words "fruit" and "vegetable" – where a tomato is classified as a vegetable – not the technical botanical meaning.

Justice Horace Gray, writing the opinion for the Court, stated that: "The passages cited from the dictionaries define the word 'fruit' as the seed of plants, or that part of plants which contains the seed, and especially the juicy, pulpy products of certain plants, covering and containing the seed. These definitions have no tendency to show that tomatoes are 'fruit,' as distinguished from 'vegetables,' in common speech, or within the meaning of the tariff act." Justice Gray cited several different Supreme Court cases (*Brown v. Piper,* 91 U.S. 37, 42, and *Jones v. U.S.,* 137 U.S. 202, 216) and stated that when words have acquired any special meaning in trade or commerce the ordinary meaning must be used by the court. In this case dictionaries cannot be admitted as evidence, but only as aids to the memory and understanding of the court. Gray acknowledged that, botanically, tomatoes are classified as a "fruit of the vine", nevertheless they are seen as vegetables because they were usually eaten as a main course instead of being eaten as a dessert. In making his decision, Justice Gray mentioned another case where it had been claimed that beans were seeds — Justice Bradley, in *Robertson v. Salomon,* 130 U.S. 412, 414, similarly found that though a bean is botanically a seed, in common parlance a bean is seen as a vegetable. While on the subject, Gray clarified the status of the cucumber, squash, pea, and bean.

From Wikipedia

12. Yummy Fruit! - K

Name_____________________Date_______________

Draw 2 of your favorite fruits:

Draw the inside of one of the apples that you saw. Did it look like a star?

Jan.

13. Putting It All Together

Plant Part Review

K

Objectives:

- Review the names and functions of the parts of plants.
- Practice matching words to pictures

Materials

- Several plants pulled out of soil and cleaned off so that students can see all of the parts.
- 2-3 samples of each part of a plant (roots, stems, leaves, flowers, fruits, seeds)
- Cutouts of plant parts (template attached)
- Plant cycle cards (attached)
- Labels of plant parts (template attached)
- Labels of plant part jobs (template attached)
- Tape or magnets to put plant cut outs and labels on the board
- Paper plates and forks for each student.
- Salad made up of fruits and vegetables that represent each part of a plant. For example carrots=roots, lettuce or spinach=leaves, tomatoes or apples=fruit, broccoli or cauliflower=flowers, celery or broccoli stems=stems.
- Salad dressing
- 5 index cards labeled with plant parts

Preparation

- Gather materials
- Make salad
- Make cutouts and labels

Procedure

Have the students sit in a circle on the floor.

<u>Observation:</u> *Pass around the whole plants first asking the students to observe the plants carefully and to look for the plant parts. Then pass around the plant parts instructing the students to think of the plant part name quietly to themselves.*

<u>Question:</u> *Who can tell me the name of plant part? Have each student who answers correctly come up to the board and line up with you. Hand them the part of the plant that they named.*

Let's look at the parts of a plant on the board.

- Draw a line on the board that represents the soil line.
- Have each student that has a part of the plant model put that part on the board in the correct place. Start with the roots. They may need some prompting from you or the students. Have this group of students sit down.
- Bring out the plant part labels and put them on the board.
- Point to each label, have the class read it, and ask if someone can match the label to a part of the plant. Let that person come up and put the label next to a part of the plant. Ask the other students if they think that the label is correct. Move it if necessary with the help of the other students.

Question: Who remembers the jobs of all of these plant parts?

- Have the students name all of the jobs of plant parts.
- Read the plant part jobs on the labels and ask what part it is.
- The student who answers correctly can come and put the label next to the plant part.

Serve a salad that includes all of the plant parts. Have a display that includes an example of each item in the salad along with the labeled index cards. Before they see the display, hold up and example of each component of the salad and have at least one person from each table name the plant part. Now they can enjoy their plant part salad!

Let's Review

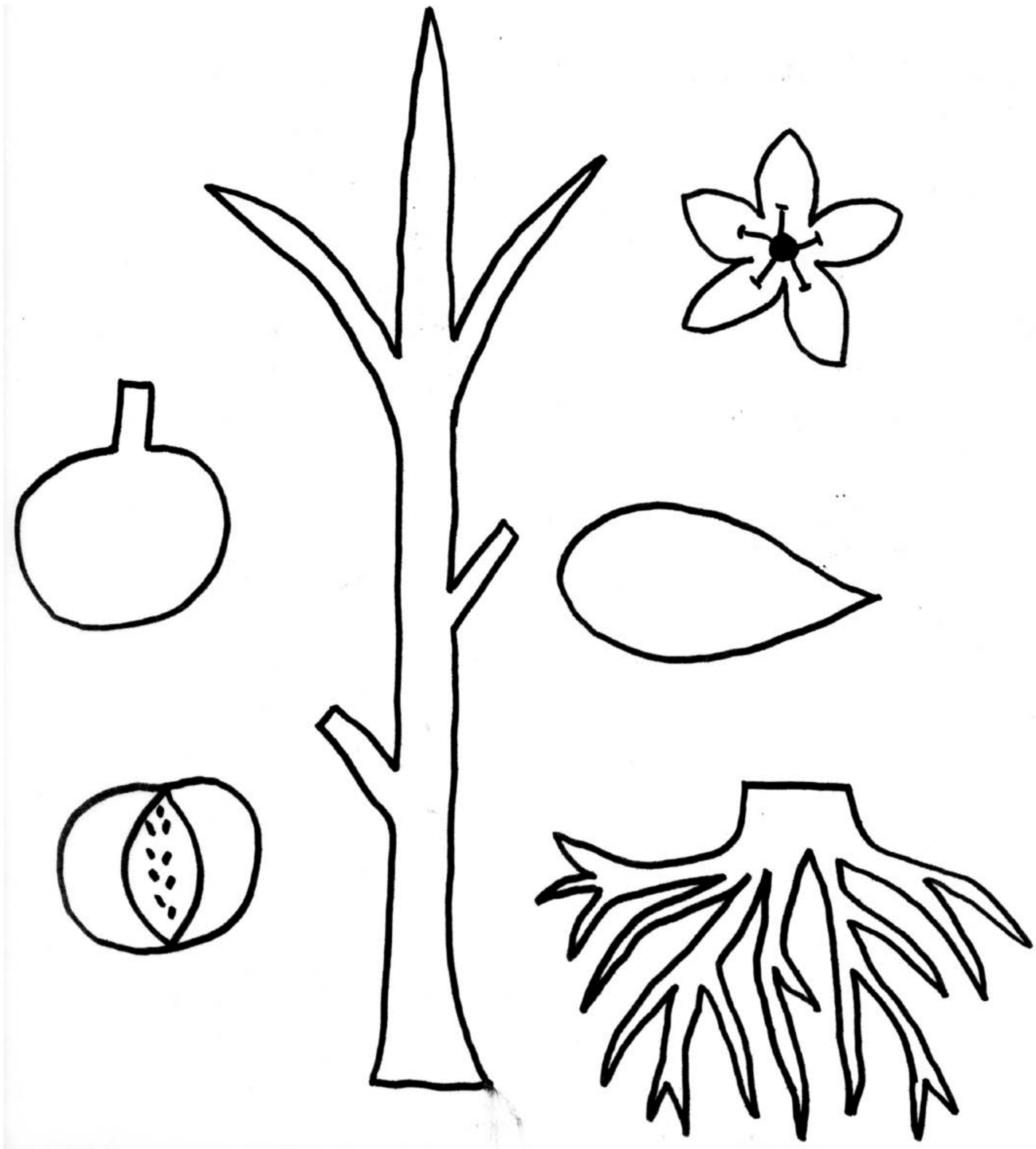
- What are the parts of a plant?
- What are the jobs of each part?

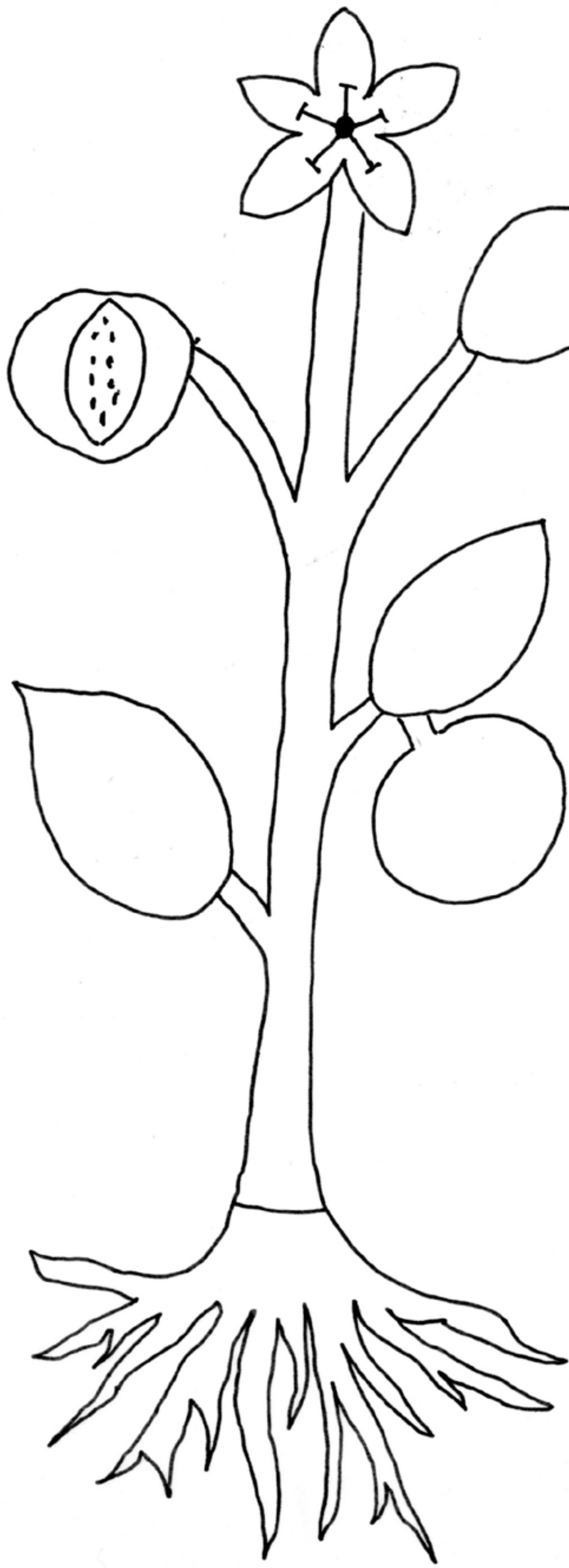
Keep Exploring

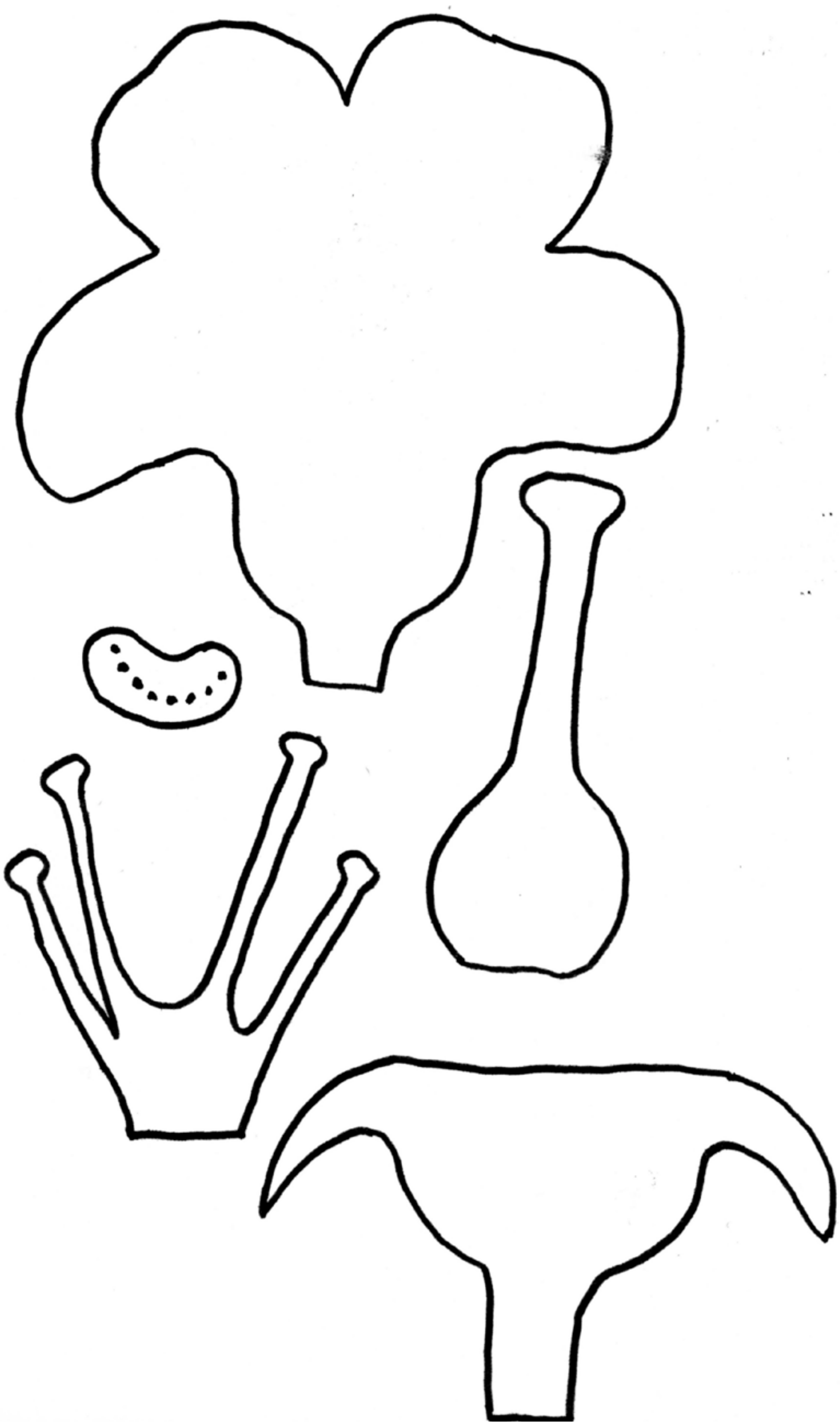
- Some book suggestions:
    - Tops and Bottoms by Janet Stevens
    - From Seed to Sunflower by Dr. Gerald Legg
    - One Bean by Anne Rockwell
    - From Seed to Plant by Gail Gibbons
- Take apart the plant model on the board and remove the plant part labels. Ask 6 questions about the 6 parts of the plant and give the parts to students with the correct answers. Have the students put the plant model back together. Some suggestions for questions:
    - What part of the plant is the food factory for the plant?
    - What part of the plant contains chlorophyll?
    - Bees and butterflies love what part of the plant?
    - Where does water start its' journey into the plant?
    - What part of the plant is usually underground?
    - What is one of your favorite roots (stems, flowers, etc.) to eat?
    - What would happen to the plant's leaves if the plant had no stems?

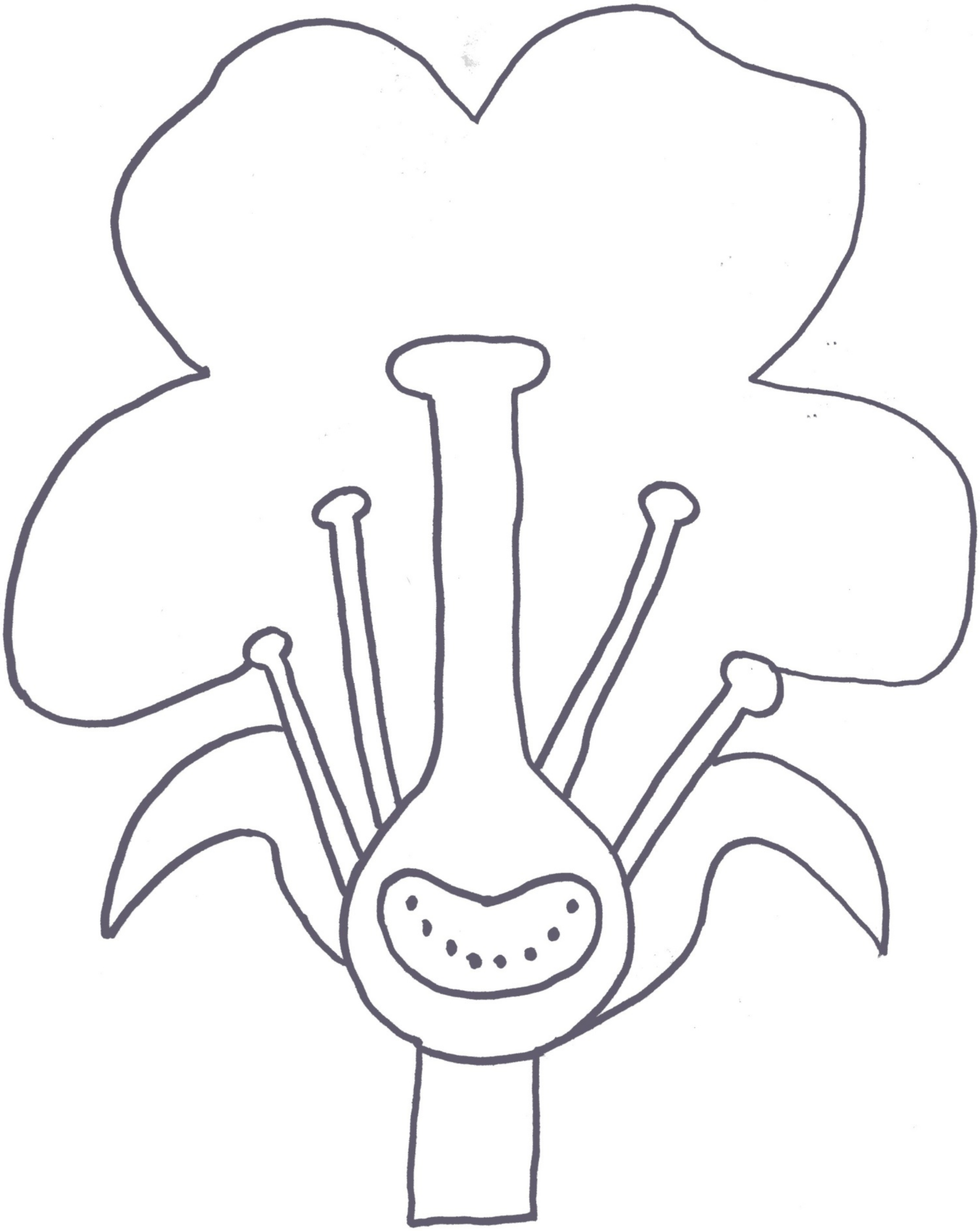
- Ask 6 more questions and have the students who answer come up and put the labels for the plant parts back in the correct places.
- Stop and look at plants wherever the class runs into them, inside or outdoors, and review the plant part names.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District









FRUIT

LEAF

STEM

ROOTS

SEEDS

FLOWER

Plant Food Factory

Holds the plant in place

Pulls up water and minerals from the soil

Attracts pollinators

Holds up the leaves and flowers

Where seeds grow

Pulls water and minerals up through the plant

Helps with seed dispersal

Protects the growing seeds

Contains chlorophyll

Contains the baby plant

Feeds and protects the baby plant or embryo

13. Plant Part Review- K

Name______________________Date______________

Draw a plant that has roots, stems, leaves, flowers, and fruits.
Draw seeds inside of the fruits.

Draw your favorite plant part:

Jan.

14. Let's Experiment!

K

Objectives:
- Practice the scientific method
- Learn about geotropism and phototropism in plants

Materials

- "Potato Box" (pattern attached)
  - Large shoe box or other box about 18'x10"x6"
  - Packing or duct tape
- Sprouted potato
- 6 quart size zip lock bags
- 6 paper towels
- Package of radish seeds

Preparation

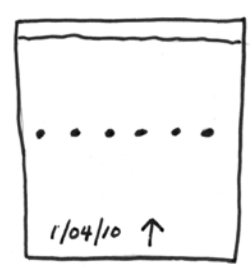
- Collect materials

Procedure

These are two experiments that could tell us some interesting properties of plants.

<u>Question:</u> In what direction do roots grow out of a seed? (Down) In what direction do stems grow out of a seed? (Up) Do you think that roots and stems always grow out of their seeds in the same direction? How do you think that we could figure this out?

Demonstrate the whole activity once. Pass out supplies and assist the students in each group make a bag.



- Fold a paper towel in fourths.
- Dampen the towel.
- Place the towel flat in the zip lock bag.
- Spread 6 radish seeds across the middle of the paper towel and close the top.
- Write the date and draw an arrow pointing up.
- Tape or pin the bag, with the arrow pointing up, in a light area of the room, but <u>not</u> in a sunny window.
- Explain that after the seeds sprout, they will turn the bag with the seeds around every few days when the root grows about another ¼ - ½ inch. The arrow is up one week and

down the next. *Note: The roots will not turn if they have become too long and the root hairs get attached to the paper towel.

- They should observe carefully the directions in which the roots and sprouts are growing. On the days that they are turned, check every few hours as the root tips begin to curve in just a few hours.
- They will also check periodically, without disturbing the seeds, that the paper towel is still moist.
- They will record their predictions and results in their journals.

Note: Plant Tropisms are plants' directional responses to environmental stimuli. Geotropism is a plant's response to the force of gravity. If they understand something about gravity, you could introduce this new word and the concept after they have gotten some results from the experiment. The roots will start growing down and the stems up. After turning the sprouts upside down the roots will slowly bend down again and the stems up.

Question: Does a plant need light in order to grow? (Yes) Will it grow towards light if it can? Let's find out.

- Show the potato maze pattern to the students.

Question: Do you think that we can find out the answer to our question with this experiment? Do you think that the potato will grow out of the top of the top of the box?

- Get out the maze supplies and make the box. Use students' help if possible.
- Pick out a sunny part of the room and place the box there.
- Open the box, put in the potato and close the box again.
- Stand the box on end so that the potato is on the bottom and the light is coming in the top.
- The students will keep track of the growth of the potato in their journals. They will open the box every few days to record their observations. Make sure to let them know not to move the potato.
- This experiment will take many weeks to finish.

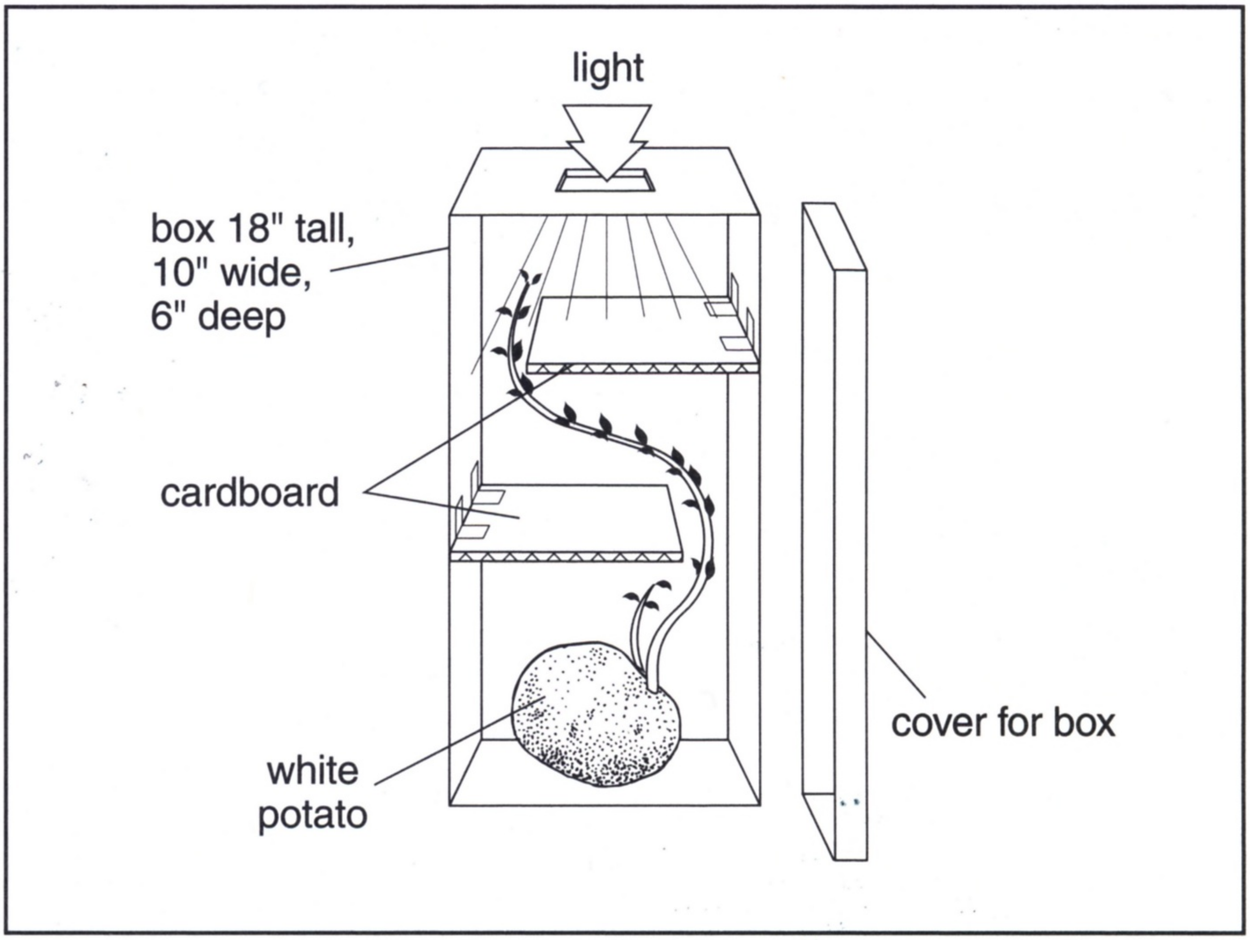
Note: Phototropism is the plant's directional growth and response to light. Usually plants move towards the light (positive phototropism). Again, you can introduce this concept after they have seen some results from the experiment.

Let's Review

- Why are we doing these experiments?
- How are we going to keep track of what happens?

Keep Exploring

- Try the seed experiment with different types of seeds and the light experiment with a vine-like potted plant such as a philodendron.



Will a plant follow a maze to seek light?

From: Science Fair Success by Phyllis J. Perry

14. Let's Experiment- K

Name_____________________Date______________

Draw your seed experiment:

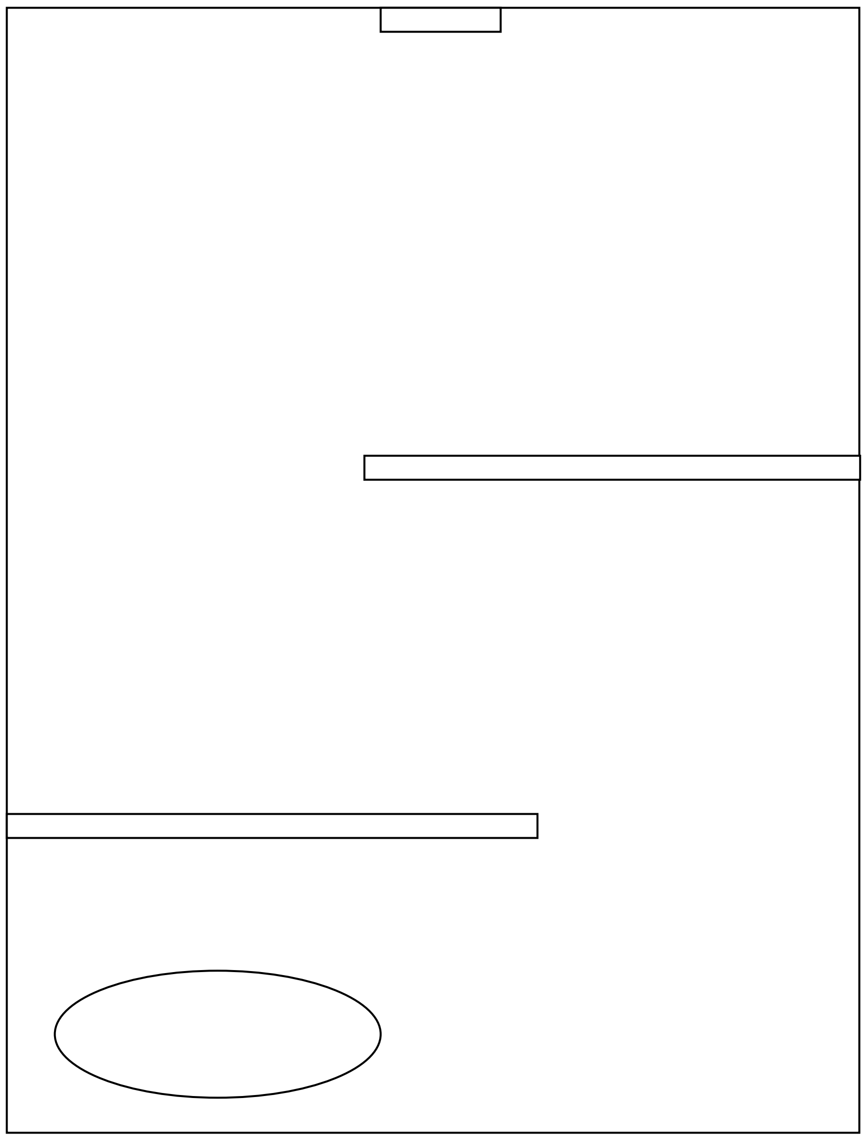
Guess what the seeds will look like in 4 days:

Draw what the seeds really looked like in 4 days:

Draw what the seeds really looked like in 4 days
after you turned the bag upside down:

Potato Experiment:

Light



This is your potato box. Draw how you predict that the potato will grow.

Jan.

15. Do We Really Need Plants?

K

Objectives:

- Learn about how animals and people utilize plants in daily life
- Learn how to plant lettuce seeds for the growing in the indoor light frame
- Practice listening to and following directions

**Note that the lettuce plants will be used in March's Lesson 3 on Transplanting*.

Materials

- Plant use cutouts (see attached)
- Plant cutout (see attached)
- Magnetic strips
- White board and markers
- Lettuce seeds
- Planting instruction cards (see attached)
- Six 6 packs for planting
- Tray (with no holes) to hold six packs
- Potting soil for the packs (moistened)
- About 75 lettuce seeds (miniature types such as Tom Thumb work well)
- 6 plant labels
- Black Sharpie
- Watering can or spray bottle
- Indoor growing area with lights
- Slow release organic fertilizer
- Directions for taking care of lettuce (see attached)
- Assortment of objects made from plants such as clothes, rubber bands, wooden spoon, paintbrush, pencil, book, toys, and other objects that seem unrelated

Preparation

- **Teacher's Note: This lesson could be divided into two sessions (uses of plants on one day and planting lettuce on another).*
- Prepare cutouts and attach to magnetic strip pieces
- Collect assortment of plant based objects
- Set up planting area
- Moisten soil

Procedure

Observation: *We are going to show you a number of objects. Look at them carefully and try to figure out how all of these things are connected. (They all have a plant component.)*

- All of these things are plants or are made from plants.

Question: *Do you think that you can get through one day without using any plants? Let's look at what you do during the day starting with waking up in the morning.*

- Use the board in front of the room.
- Put the plant cutout in the center of the board.
- Ask the students to begin with the start of their day (waking up) and let them contribute their days' actions. They may need some prompting for such things as taking medicine that is from a plant or using gasoline in the car. Following are some connection examples:
  - Sleeping: sheets⇒cotton⇒plant
  - Getting dressed: clothes⇒cotton⇒plant
  - Breakfast: food⇒plants
  - Sitting on a chair: wood⇒tree⇒plant
  - Taking a test: paper and pencil⇒wood⇒tree⇒plant
  - Playing a guitar: wood⇒tree⇒plant
  - Riding a bicycle: wheels⇒rubber⇒plant
  - Riding in a car⇒ gasoline: crude oil⇒remains of plants and animals
- Create the visual on the board based on a clock. The plant is in the middle and sleeping is on the bottom at 6:00 AM. Have the students go through their day, put the cutouts on the board and draw lines out to the cutouts as they are mentioned. Draw in a connection if there is not a cutout out for it. The final result should look like the spokes of a bicycle with the cutouts attached.

Question: *Did you know that there are so many uses for plants? Can you get through a single day without them?*

- Notice every time you connect with plants as you go through the rest of the day.
- Go over the plant uses again and put the examples in categories such as food, transportation, clothes, and things that you use at school.

A favorite way that we use plants is to eat them! Now you are going to plant some lettuce to grow in your classroom. Let's go over the planting steps.

- Choose the seeds.

Question: *Look at your seeds. Do you think that you should plant them as deep as one of your fingers can go into the soil, or with just a small amount of soil over the top? Why? (Just a small amount because the small seeds only have a small amount of food storage. The seedlings need to reach the surface to photosynthesize before the food storage runs out or the seedling will die.)*

- Make one label for each 6 pack with the name of the plant, the table number, and the date.
- Fill the 6 packs almost to the top.
- Gently smooth and flatten the soil.
- Pick up the tray about two inches off the ground and gently drop it to settle the soil. Add a little more soil if it seems too low.
- Add two seeds to each section of the 6 pack.

- Sift or sprinkle soil to cover the seeds (about 1/8 of an inch deep).
- Add a small sprinkle of fertilizer.
- Put a label in each tray.
- Water each tray gently.
- Place under the lights with the lights about 2 inches about the trays.
- After demonstrating the procedure, have the students at each table come up to the planting area. Give each student one of the jobs as they plant one of the six packs.
- Read a book about growing plants to the class while groups of children take turns planting lettuce.

Question: *Who can tell the class what three things these seeds need to sprout or germinate? (Water, warmth, air) Let's talk about other jobs that you need to do to take care of these plants.*

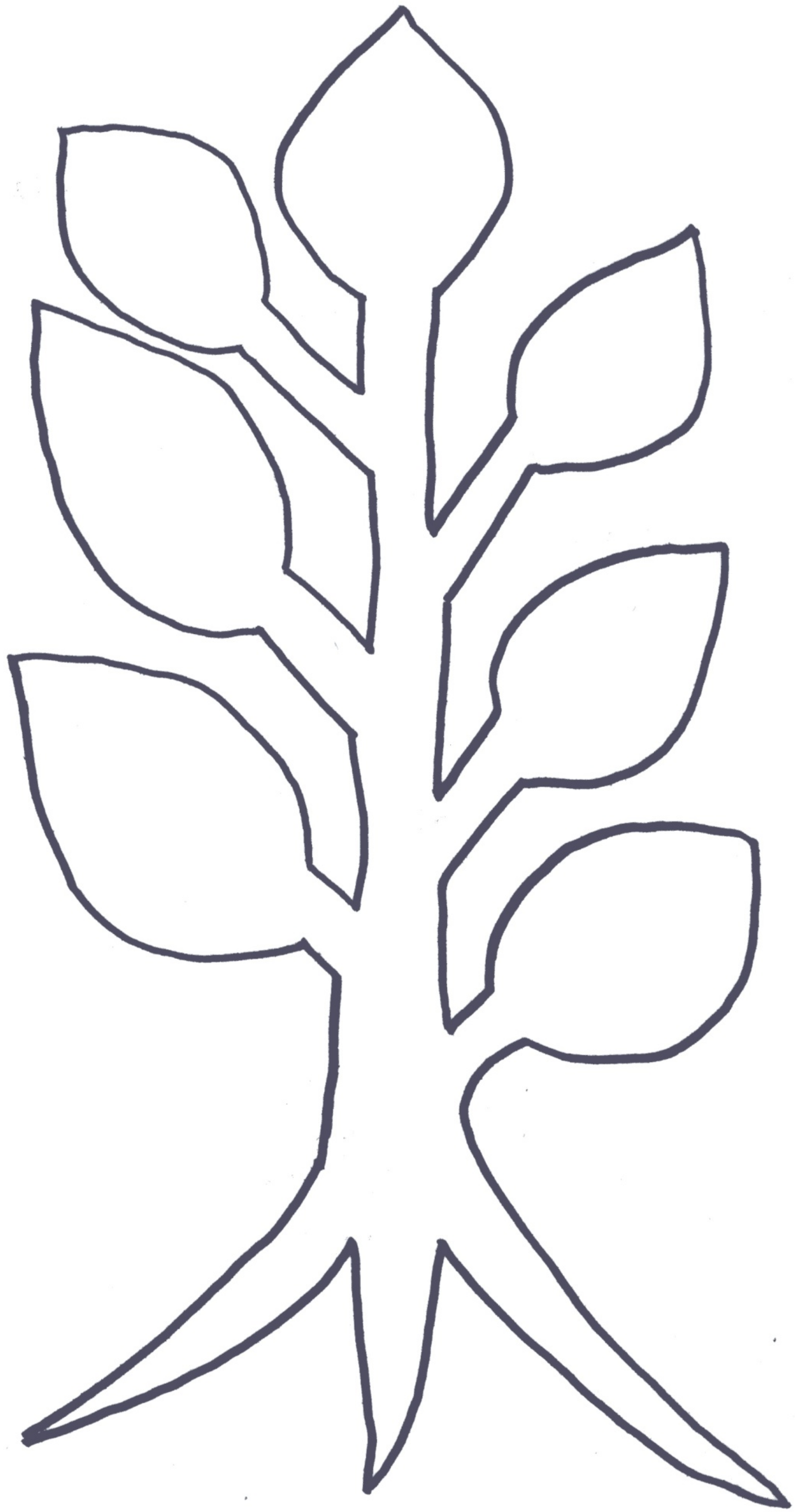
- Check the trays everyday.
- Keep the soil moist, but not soggy.
- Move the light up as needed to keep it about 2 inches above the plants.
- Thin out the plants in each cell to one when the plants are about 1 ½ inch tall. The best way is to cut off the extras at the soil line rather than pulling them out. This is a job for the teacher!

Let's Review

- Name some surprising ways that we use plants.
- Review the care of the lettuce plants.

Keep Exploring

- Look for more ways that people use plants.







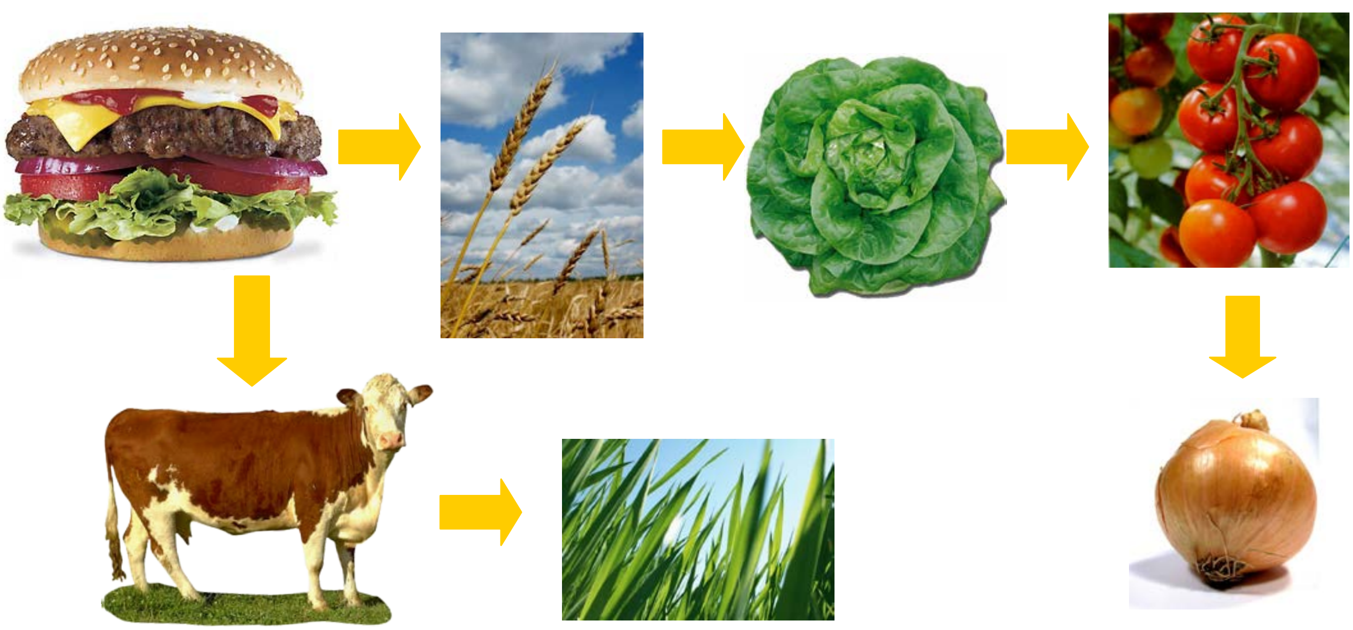




royalty free image - no exclusive rights available


Highland Sugarworks
Dark Amber
Pure New England Maple Syrup


yongzhao.en.alibaba.com

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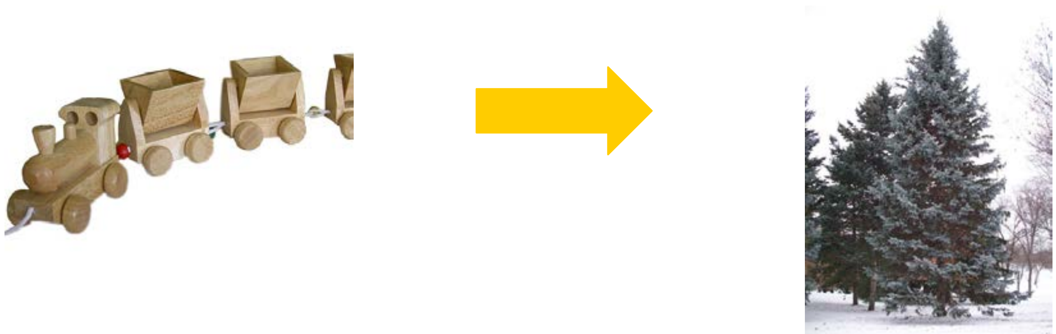

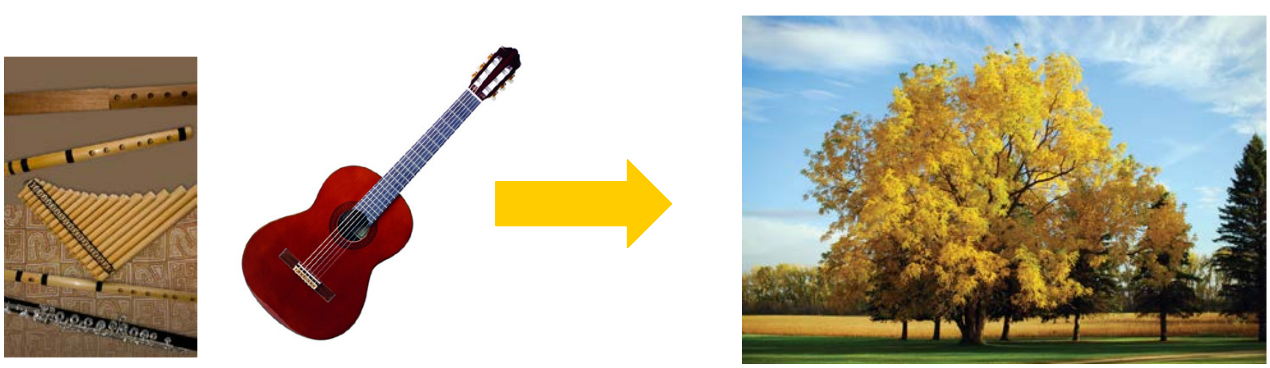

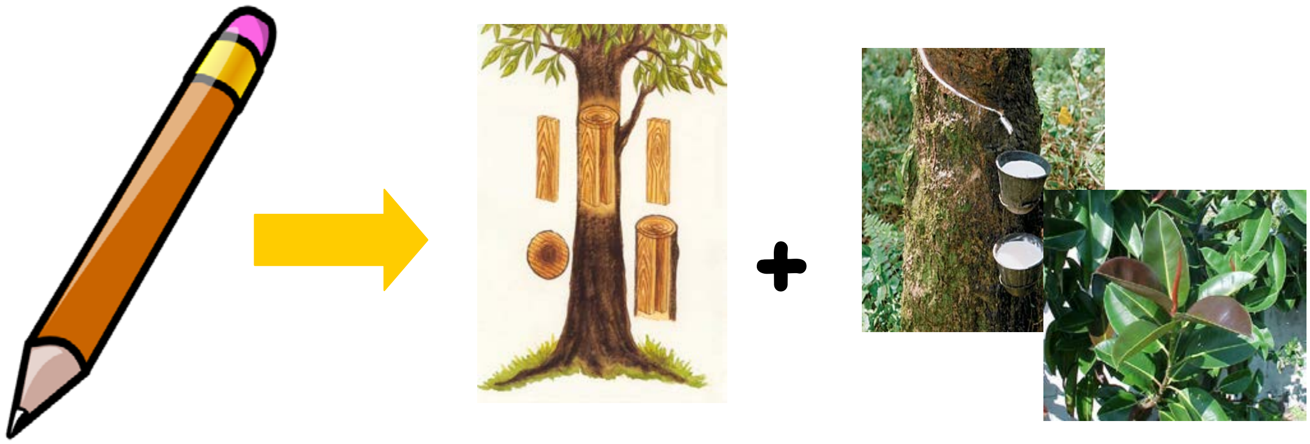


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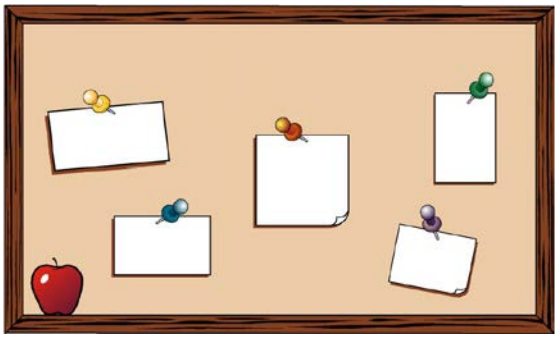


Chefwear


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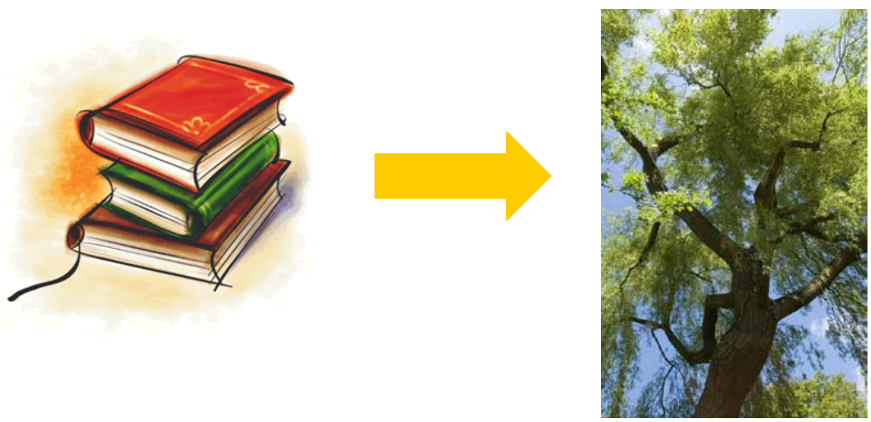



GAS

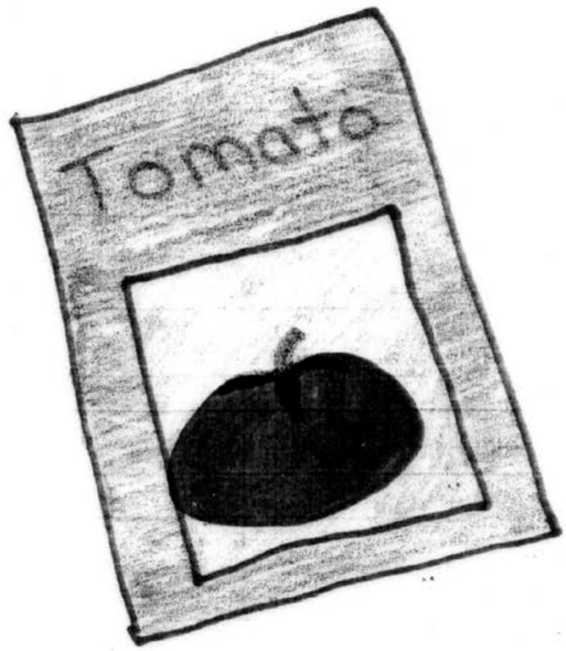

kamik
kamik


Whole Grain Guaranteed
Cheerios

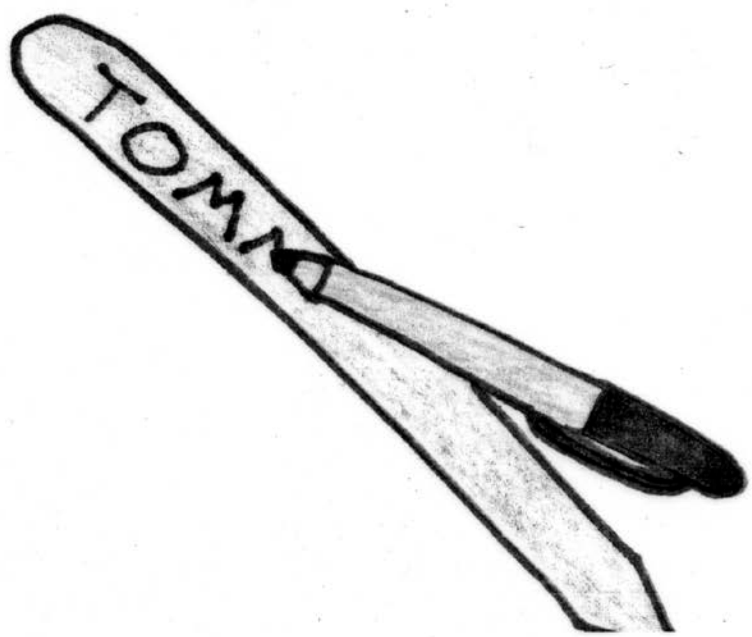

MILK


Toothpaste

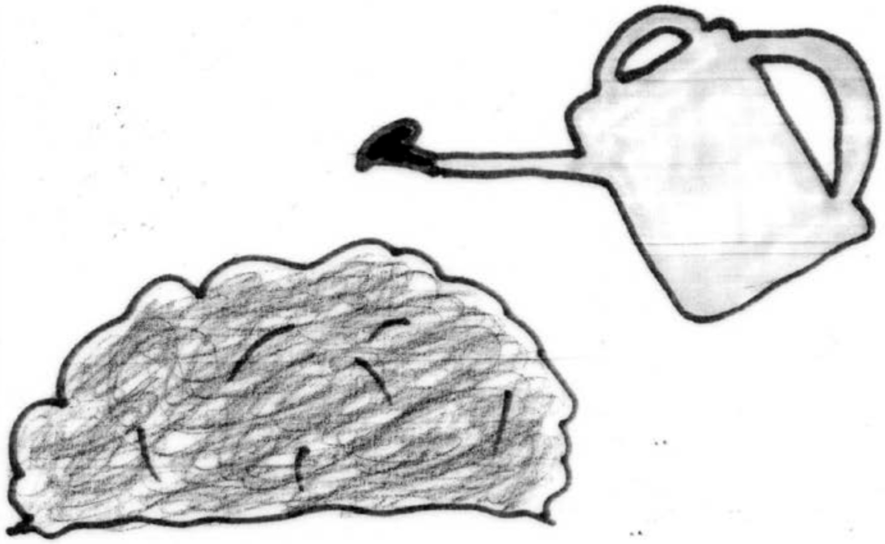
Choose seeds.



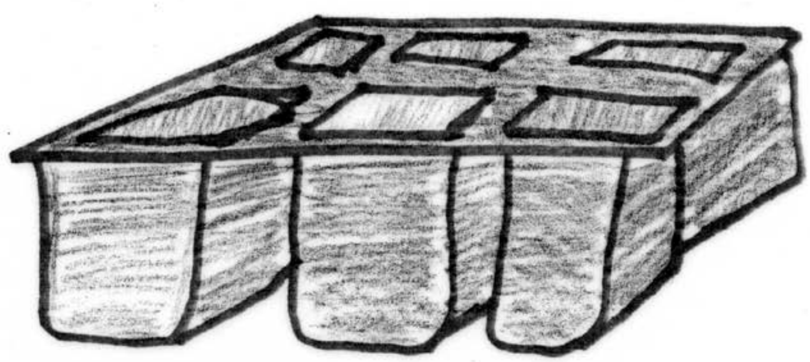
Make label.



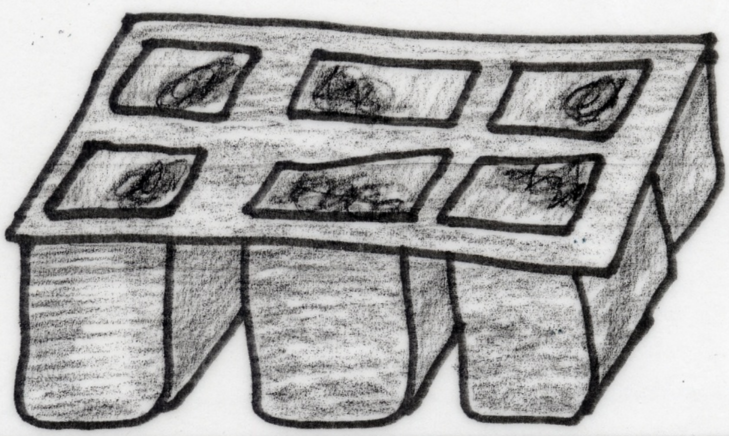
[redacted] Moisten soil.



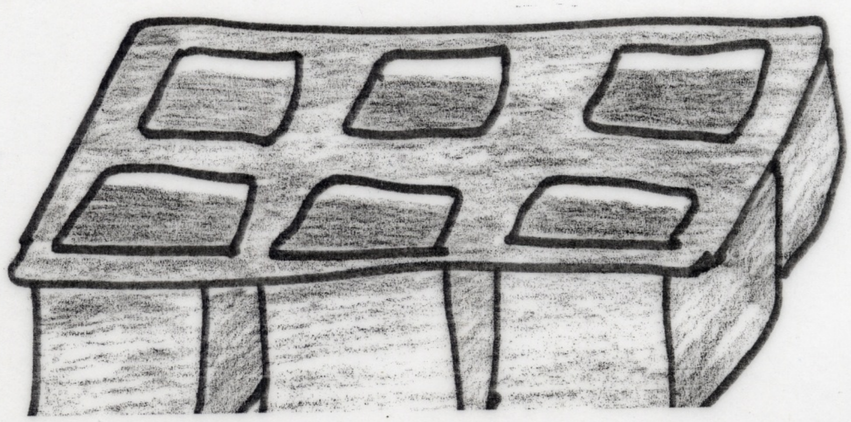
[redacted] Pick a pot.



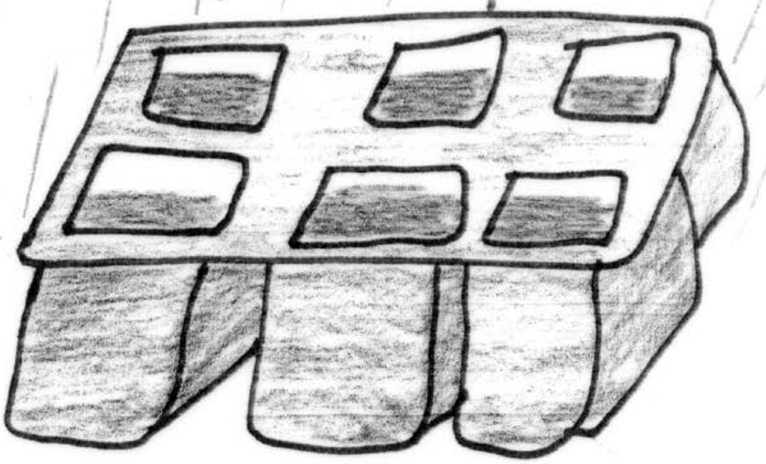
[redacted] Fill pots. (almost)



[redacted] Gently smooth and flatten soil.

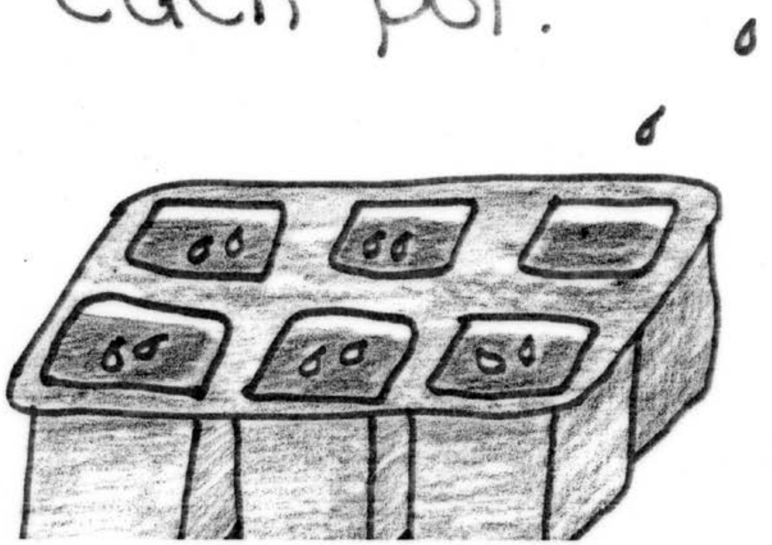


[redacted] Drop tray 2 inches.



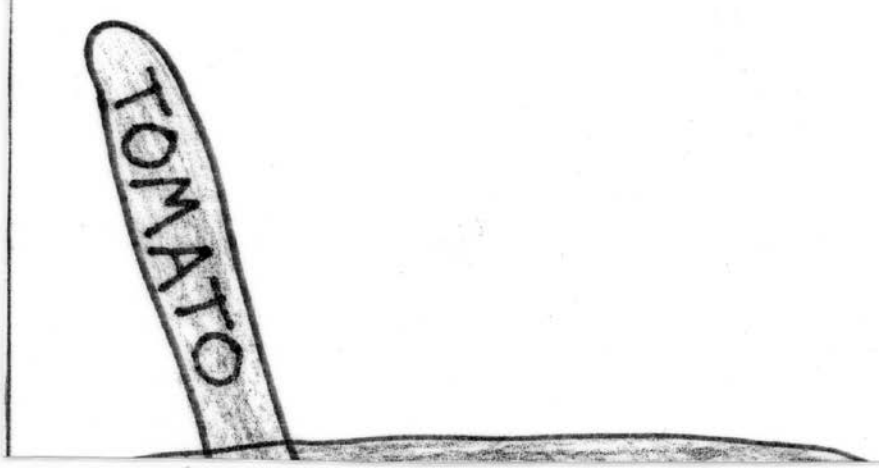
* If you need to, add more soil.

[redacted] Add 2 seeds in each pot.



[redacted] Sift soil to cover seeds.

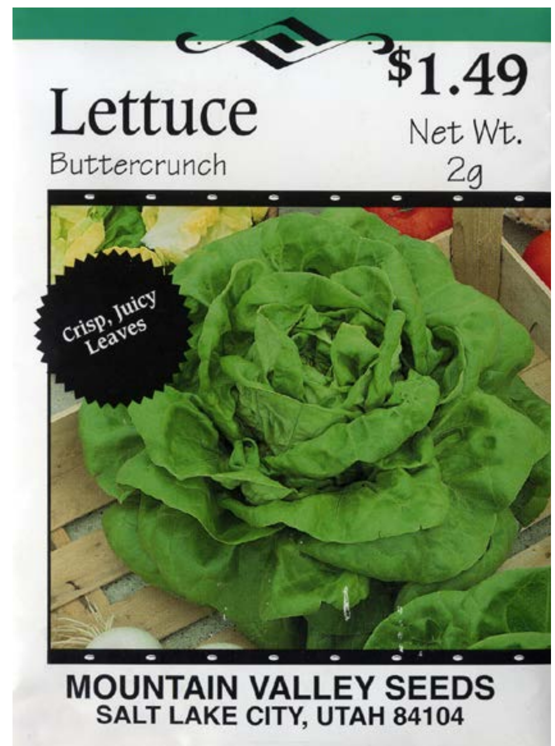
[redacted] Put label in pot.




[redacted]
Water with
confidence!

Growing Lettuce

- Check the trays everyday.
- Keep the soil moist, but not soggy.
- Move the light up as needed to keep it about 2 inches above the plants.
- Thin out the plants in each cell to one when the plants are about 1 ½ inch tall. The best way is to cut off the extras with scissors at the soil line, rather than pulling them out.



15. How Do We Use Plants?- K

Name_____________________Date______________

Draw two ways that you use plants:

Jan.

16. Animals, Insects, and Plants

K

Objectives:

- Learn about how animals and insects use plants
- Learn about connections and similarities between people, animals, and insects

Materials

- White board and markers
- Animal and insect labels (attached)
- 5 copies of the plant game pieces and cards (attached)
- 2 copies of the blank pieces
- Tape or magnets to attach labels to board

Preparation

- Print and cut out labels, blank pieces, game pieces and cards

Procedure

<u>Question:</u> *We talked last week about how we use plants in our everyday life. Who can tell us about some of the ways that you used plants this week?*

- Let the students give some examples.
- Review the general categories of human plant use such as food, shelter, transportation, medicine, and recreation.

<u>Question:</u> *Do you think that insects and other animals besides humans need plants to survive?*

- Have the students give some ideas.
- Set up and play the plant use game.
- While the students work on the game, draw a large, but simple generic plant on the board. (Yes you can!) Include a representation of all of the plant parts.

Plant use game:

- At their tables, give out the plant game pieces, the blank pieces, and cards (the labels are for the board).
- Have them spread out the cards for the 6 plant parts.
- Have them work together to figure out how each animal or insect on the game pieces uses plants. Give them a time limit of ten minutes or so.
- Put the game piece next to the plant part that is used. Let the students know that many animals and insects use more than one plant part. You can make this into a contest to see which table can come up with the most plant uses.

- As the students at each table finish, have them raise their hands.
- When all of the groups are done, have a student from each group report what they figured out.
- As the students report their results, put the larger, matching labels up on the board next to the appropriate plant part on the drawing. You can draw in extra pictures of insects and animals if you run out of labels or the students have thought of examples for which you do not have a label.
- Bring up some uses that the students may have missed such as monkeys swinging through trees (transportation), communication and medicinal uses (see attached articles).
- The students can alternatively use large pieces of paper on which to put the game pieces. They can work in pairs or small groups.

Question: *Wow! We know that we must have plants to survive, but what do you think now about insects and other animals?*

Let's Review

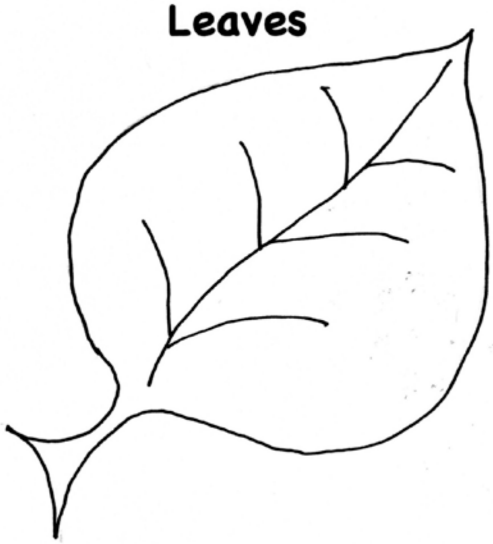
- Review the many ways that animals and insects use plants. Refer to the board.

Keep Exploring

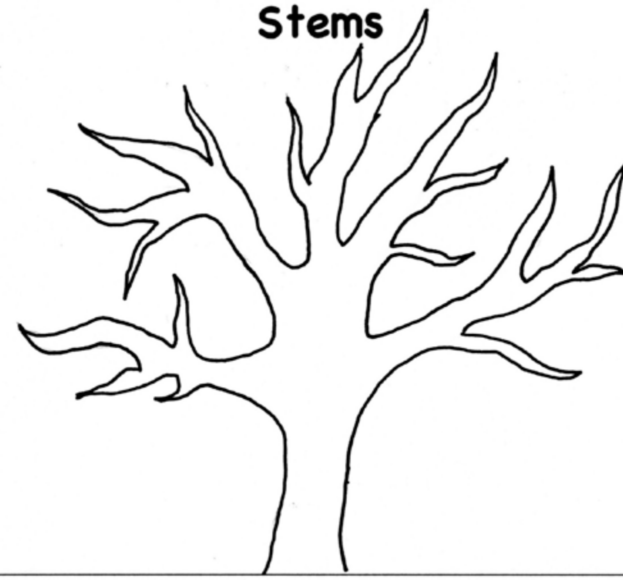
- Spend time outside looking for all of the ways that animals and insects use plants. Record what they find.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District

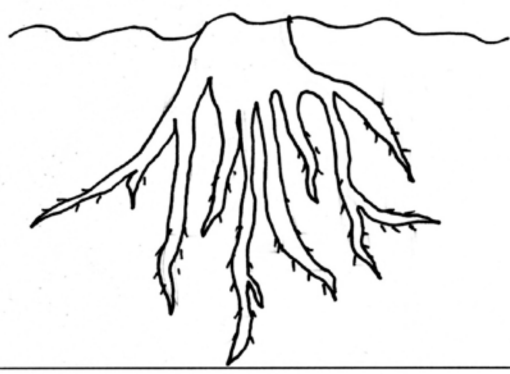
Leaves



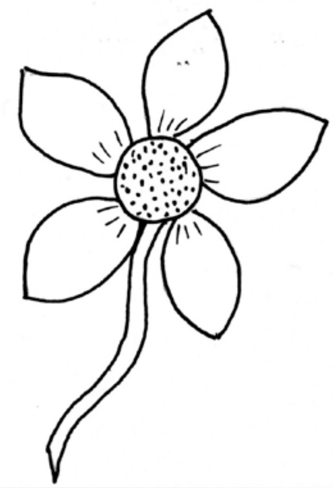
Stems



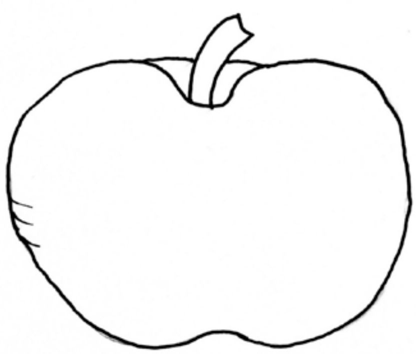
Roots



Flowers

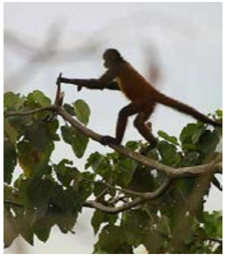


Fruit

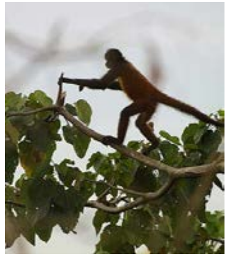


Seeds

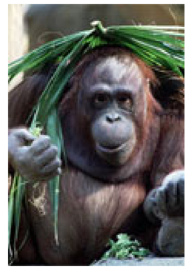
MONKEY



MONKEY



APE



SPIDER

TURTLE

TURTLE

CATERPILLAR

CATERPILLAR

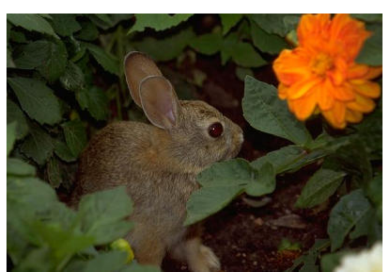
SPIDER

WORM

HORSE

BUFFALO

RABBIT

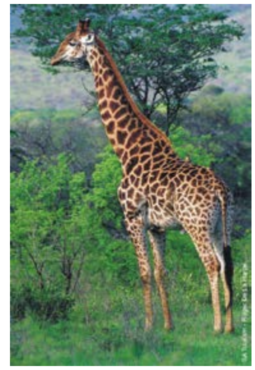


RABBIT

CHICKEN

GIRAFFE

GIRAFFE



BEE

BUTTERFLY

SQUIRREL

SQUIRREL

ANTS

ANTS

MOUSE

HUMMINGBIRD

GOPHER

BIRDS

BIRDS

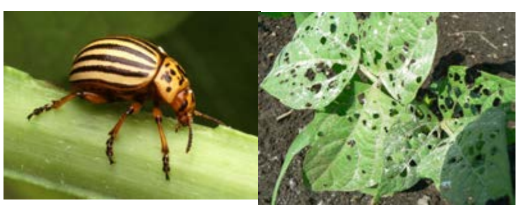
GORILLA

ELEPHANT

BEAVER

TINY WASP

INSECTS



CHIMPANZEE

DEER

MOUSE

Plant Game – Blank Pieces

WORM

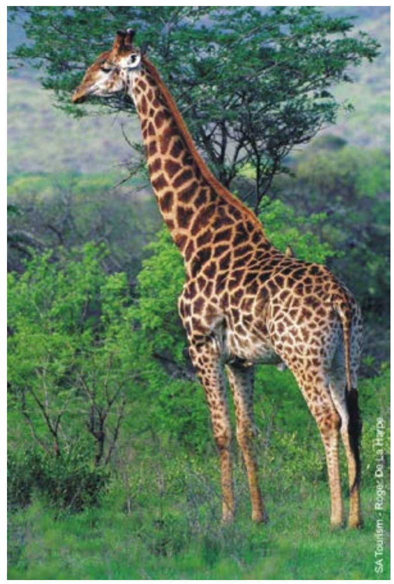
HORSE

BUFFALO

RABBIT

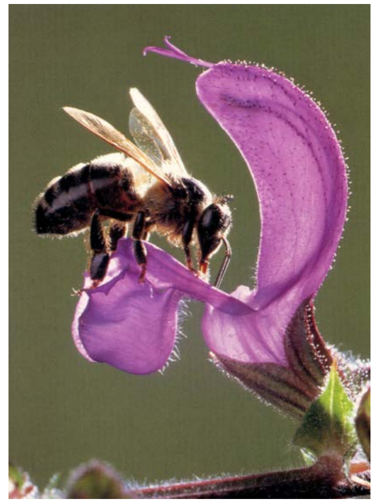
CHICKEN

GIRAFFE



DEER

BEE



BUTTERFLY

SQUIRREL

ANTS

HUMMINGBIRD

BIRDS

GORILLA

MOUSE

GOPHER

ELEPHANT

BEAVER

MONKEY

SPIDER

TURTLE

CATERPILLAR

TINY WASP

(GALL)

INSECTS

CHIMPANZEE

How plants and animals use plants

Monkeys and Apes
- Eat leaves, seeds, and fruits
- Use trees for shelter (Chimpanzees make new nests from sticks and leaves every night)
- Use trees for transportation off of the ground
- Eat some plants for medicine (see attached)
- Make tools from sticks

Cows, horses, buffalo
- Eat grass, corn, and grains

Deer
- Eat bark, leaves, fruit, nuts

Squirrels
- Eat nuts, berries
- Use trees for shelter

Rabbits, mice
- Eat leaves, berries
- Use plants for shelter and protection

Gophers
- Eat roots, grass, and seeds

Elephants
- Eat grass, twigs, leaves, roots, fruit

Beavers
- Use trees branches for shelter
- Eat the inner bark of trees, aquatic plants, leaves, and twigs

Birds
- Use trees and bushes for shelter
- Eat berries, seeds, new plant shoots

Hummingbirds
- Drink nectar
- Eat insects that are on plants

Squirrels
- Eat seeds, fruit, flower buds, bark
- Many species live in trees

Giraffes

- Eat leaves, twigs, fruit, flowers, seeds

Chickens

- Eat grains (seeds), fruit, vegetation (also insects and worms)

Rabbits

- Eat all plant parts
- Hide under plants for protection

Worms

- Eat decaying plant material

Insects

- Bees, flies, wasps, beetles, adult butterflies and others use pollen and nectar for food
- Many insects eat leaves by chewing or sucking (aphids, caterpillars of moths, butterflies, beetles, and more)
- Many insects use plants for shelter
    - Leaf curling caterpillars, tent caterpillars
    - Small wasps create galls (also a food source)
    - Leaf miners (larval form of some flies and wasps) live in and eat out the inside layers of leaves
    - Spiders create webs between-sometimes curling leaves
    - Hide under leaves, in bark, inside stems and roots
- Ants eat many parts of plants and sometimes make shelter with leaves
- Some use plants for communication (see attached-thanks Charlotte for the telephone info!)
- Some insects attach plant parts to their backs for shelter and protection

These are some suggestions. There are many more that your class can discover!

Animals Use Plants To Kill Parasites & Bacteria

Self-medication - animals know how to use Nature's pharmacy... can humans do it too? I am not saying that humans are intelligent enough to self-medicate, it is not something I would advise! It seems animals are intelligent enough to know which medicinal plants and herbs to eat so they stay healthy. Not only monkeys, but bears and insects consume plants, bark and herbs that have apparently little or no food value. Researchers have discovered that the medicine plants animals have been observed to eat, have been found to contain compounds that kill parasites and eliminate bacteria and fungus...

Chimps Eat Herbs To Cure Maleria

Researchers at Kibale National Park have discovered that chimps eat plants similar to the ones used by traditional healers to treat malaria and diarrhea.

"The chimps and human beings around Kibale use similar plants to overcome sickness," Sabrina Kreif, a researcher, said. She was speaking at Makerere University's Faculty of Science at a ceremony to launch a memorandum of cooperation between Uganda Wildlife Authority and French institutions.

In her five-year study at Kanyawara research station, located on the edge of Kibale, Krief found that chimps carefully select and consume plants like mululuza, which have little nutritive value.

These plants, however, have medical properties that help the chimps to overcome malaria and diarrhea, as well as to expel worms from their intestines, Krief said. Her research included collecting and analyzing chimp dung and urine.

"I had to examine the dung to find out the plants in their diet and then extract the active components," she said.

She also monitored the behavior of the chimps to find out if there was any improvement each time sick chimps ate the plants. She also found that traditional healers in the area use the same plants.

In some cases, the chimps ate the bark of certain trees, which helped them to overcome parasites that cause diarrhea. "It was stunning to see that the traditional healers use the same plants to treat the diseases," she said. "The studies on great apes, which are the closest relatives to humans, will help us to discover plants with medicinal properties." **Chimps Medicine Plants**

Healing Herbs: In Uganda, chimpanzees swallow leaves of Rubia cordifolia, a plant deemed so dandy for easing stomach ailments that local villagers cultivate it in home gardens. Ugandan chimps also carefully select and chew young leaves of a particular species of fig tree. Tests by phytochemist Rodriguez reveal that the fig leaves contain 5- methoxypsoralen, an antibiotic compound that kills nematodes, or wormlike parasites. **Read More...**

The term **Zoopharmacognosy** refers to the process by which animals self-medicate, by selecting and using plants, soils, and insects to treat and prevent disease. Coined by Dr. Eloy Rodriguez, a biochemist and professor at Cornell University, the word is derived from roots zoo ("animal"), pharma ("drug"), and gnosy ("knowing").

'-) Just break it up to understand it: **Zoo - pharma-cognosy**

Nature's Pharmacy Used by Animals - Self-medicating behavior is a topic of rapidly growing interest to behaviorists, parasitologists, ethnobotanists, chemical ecologists, conservationists, and physicians. Scientists from various disciplines are currently exploring the possibility that many species use plants, soils, insects, and fungi as 'medicines' in ways that guard against future illness...

POSTED BY AONACH DUBH AT 6:55 PM

LABELS: NATURE

Insects Use Plants Like A Telephone

Illustration of communication between subterranean and aboveground herbivorous insects. (Credit: Image courtesy of Netherlands Organization for Scientific Research)

ScienceDaily (Apr. 27, 2008) — Dutch ecologist Roxina Soler and her colleagues have discovered that subterranean and aboveground herbivorous insects can communicate with each other by using plants as telephones. Subterranean insects issue chemical warning signals via the leaves of the plant. This way, aboveground insects are alerted that the plant is already ‘occupied’.

Aboveground, leaf-eating insects prefer plants that have not yet been occupied by subterranean root-eating insects. Subterranean insects emit chemical signals via the leaves of the plant, which warn the aboveground insects about their presence. This messaging enables spatially-separated insects to avoid each other, so that they do not unintentionally compete for the same plant.

In recent years it has been discovered that different types of aboveground insects develop slowly if they feed on plants that also have subterranean residents and vice versa. It seems that a mechanism has developed via natural selection, which enables the subterranean and aboveground insects to detect each other. This avoids unnecessary competition.

Green telephone lines

Via the 'green telephone lines', subterranean insects can also communicate with a third party, namely the natural enemy of caterpillars. Parasitic wasps lay their eggs inside aboveground insects. The wasps also benefit from the volatile signals emitted by the leaves, as these reveal where they can find a good host for their eggs. The communication between subterranean and aboveground insects has only been studied in a few systems. It is still not clear how widespread this phenomenon is.

This research was carried out at the Netherlands Institute for Ecology (NIOO-KNAW) by Roxina Soler, Jeffrey Harvey, Martijn Bezemer, Wim van der Putten and Louise Vet. The PhD project, in which this study was carried out, was funded by the Free Competition of NWO Earth and Life Sciences.

Email or share this story:
| More

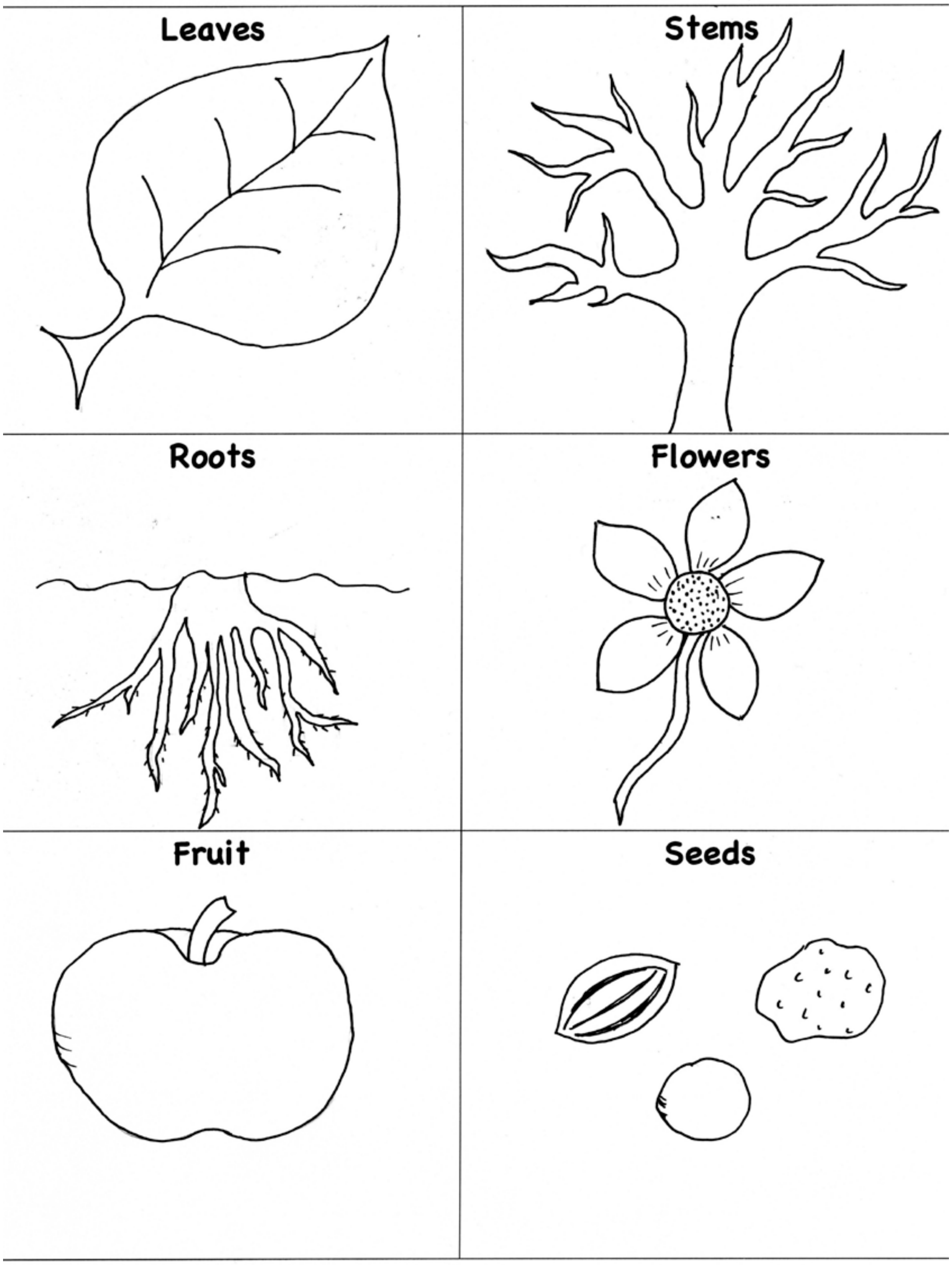
Story Source:

Adapted from materials provided by Netherlands Organization for Scientific Research.

16. Do Animals and Insects Need Plants?- K

Name______________________Date______________

Draw a worm by the roots, a butterfly on the flower, a caterpillar on the leaf, a mouse with the seeds, a monkey with the fruit, and a bird's nest on a stem.



Feb.

17. It's Crowded In Here!

K

Objectives:

- Learn about the effect of crowding on plant growth
- Practice using the steps of the Scientific Method

Teacher's note: The planted cups from this experiment will be used again in March's Lesson 3 on transplanting.

Materials

- Potting soil
- Six 4" plastic containers or large plastic cups with holes drilled in the bottom.
- Radish seeds
- Pea seeds
- Masking or other opaque tape
- Sharpie
- Measuring cup
- 2-4 potted plants with the roots washed off. Some need to be pot bound. Keep the pots with the plants.

Preparation

- Prepare planting area and supplies
- Moisten soil
- Copy growth charts and journal pages
- Prepare plants to pass around

Procedure

*Note: This is a fairly short lesson and can be combined with discussions about the other experiments that are running and with answering questions from the Question Book.

Observation: Have the students sit in a circle. Pass around the plants out of their pots so that everyone can see the root growth. Show the size of the pots next to the plants before passing.

- These are plants that have grown in different sized pots.
- Do you notice any differences in the size of the roots? Do they all look healthy?

Question: What is seed dispersal? Who remembers the reasons that seeds need to disperse?

- Have the students give answers.
- Remind them about the Mother Plant and her Baby Seeds that need to move away to find enough room to grow well.

Let's do an experiment to see what happens when seeds are crowded together.
Plant crowding experiment:

- Have the students help with the set up.
- Line up the six containers and fill each with the same amount of soil.
- Plant seeds about three times deeper than they are wide. Label the cups as they are planted:
    - Container 1: 1 radish seed
    - Container 2: 6 radish seeds
    - Container 3: 12 radish seeds
    - Container 4: 1 pea seed
    - Container 5: 6 pea seeds
    - Container 6: 12 pea seeds
- Use the measuring cup and water each cup with the same amount of water each time. Use the comparison to rain outside that falls on all plants in the same amount.
- Place the containers 2-3 inches under the grow lights.
- Check the soil moisture levels every day. Keep the soil damp, but not soggy.
- Always water with the same amount in each container.
    - Explain that the experiment is test crowding of seeds, not the effects of different amounts of water.
- Write the planting steps on the board (see attached) so that the students can copy the steps into their journals.

<u>*Question:*</u> *What do you think will happen? You will write this prediction in your journals and keeping track of what happens.*

- Take several answers.

Let's Review

- For what are we testing in this experiment?

Keep Exploring

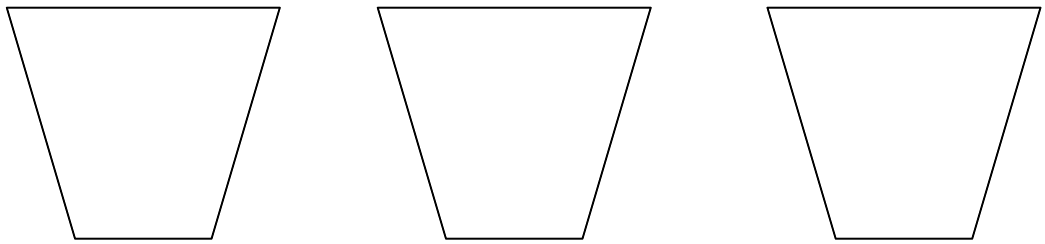
After 5-6 weeks, take the plants out of the soil gently to look at the roots. Have them record their observations in their journals.

17. It's Crowded In Here!- K

Name_____________________Date______________

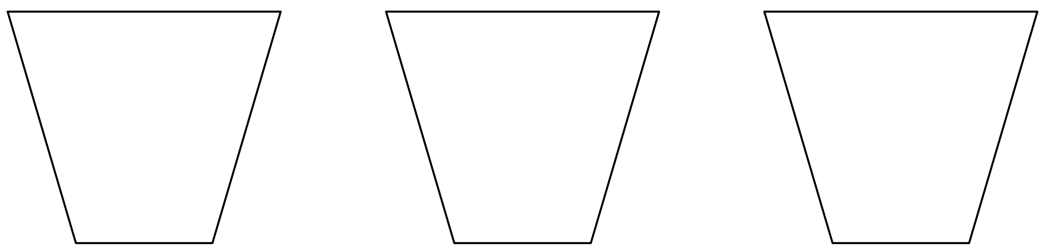
Draw in the picture how many seeds you planted in each cup:

Radishes:



#1 #2 #3

Peas:



#4 #5 #6

Which plants do you think will grow bigger, the ones with seeds that are crowded together, or the ones with only a few seeds?

____

*After 4 weeks what happened? On the back of your paper draw the plants that grew the biggest. Were they the most crowded or the ones that had more space?

____

Feb.

18. Eat a Rainbow!

Healthy Eating

K

Objectives:

- Learn about the major food groups
- Become aware of the food that they eat.
- Learn how food helps our bodies.

Materials

- Rainbow Food Team "players" (attached)
- Tape or magnets for white board

Preparation

- Print the pages on different colored papers (for example have all the fruits and veges on green paper and grains on yellow) and cut them out. Make multiple copies for bigger "teams".

Procedure

Question: What do plants need to survive?

- Have the students give answers.
- Narrow the needs to water, air, food (that they make themselves) and shelter

Question: What do we humans need to survive?

- The basic needs are the same as plants: water, air, food, and shelter
- Today we will talk about food that we eat.

Question: Why do we need to eat?

- Have a general discussion.
- The main reasons that we need food are for energy, growth, and maintaining health. You are growing fast, you need energy to learn and play, and you want to feel good because you are healthy.
- Write the categories on the board: Energy, Growth, and Health

Question: What are some of your favorite foods to eat?

- Take several answers and write them on the board.

Question: Are all of these foods alike?

- Food comes in all shapes and sizes. There are many different types of food that we can put into groups.

- These are the groups: **Grains** (they may need an explanation of what these are), **Meat & Beans**, **Milk** (and things made from milk), **Fruits** and **Vegetables.** You also need some oils in small amounts that you can get from different foods.
- Write the names of the food groups in a horizontal line on the board.

Question: Do you eat only one type of food or many kinds?

- Some types of food give us energy, some help us to grow, and some keep us healthy and feeling good. We need all kinds of food every day.
- Let's build a Food Team. We'll need all kinds of food and many different colors of fruits and vegetables. It will be our Rainbow Food Team!
- Emphasize that all teams need many different types of players to catch, throw, hit, kick, and more.
- Build the team on the board by placing the food cutouts on the board under the food group names. The number of cutouts shows the proportions of foods for healthy eating.
- This is a team that will make you strong and healthy.
- Talk about the "extras" like fats and sugars that they can eat in very small portions, but are not part of the healthy Rainbow Food Team.
- Now look at your favorite foods listed on the board. What food groups are they in? Many foods are made up of several groups.

Let's Review

- What players do you want on your Rainbow Food Team? Why?
- What did you eat for breakfast today? What food groups did you eat?
- What food groups will you (or did you) eat for lunch?

Keep Exploring

- Have students draw food pictures and match them to the food groups.

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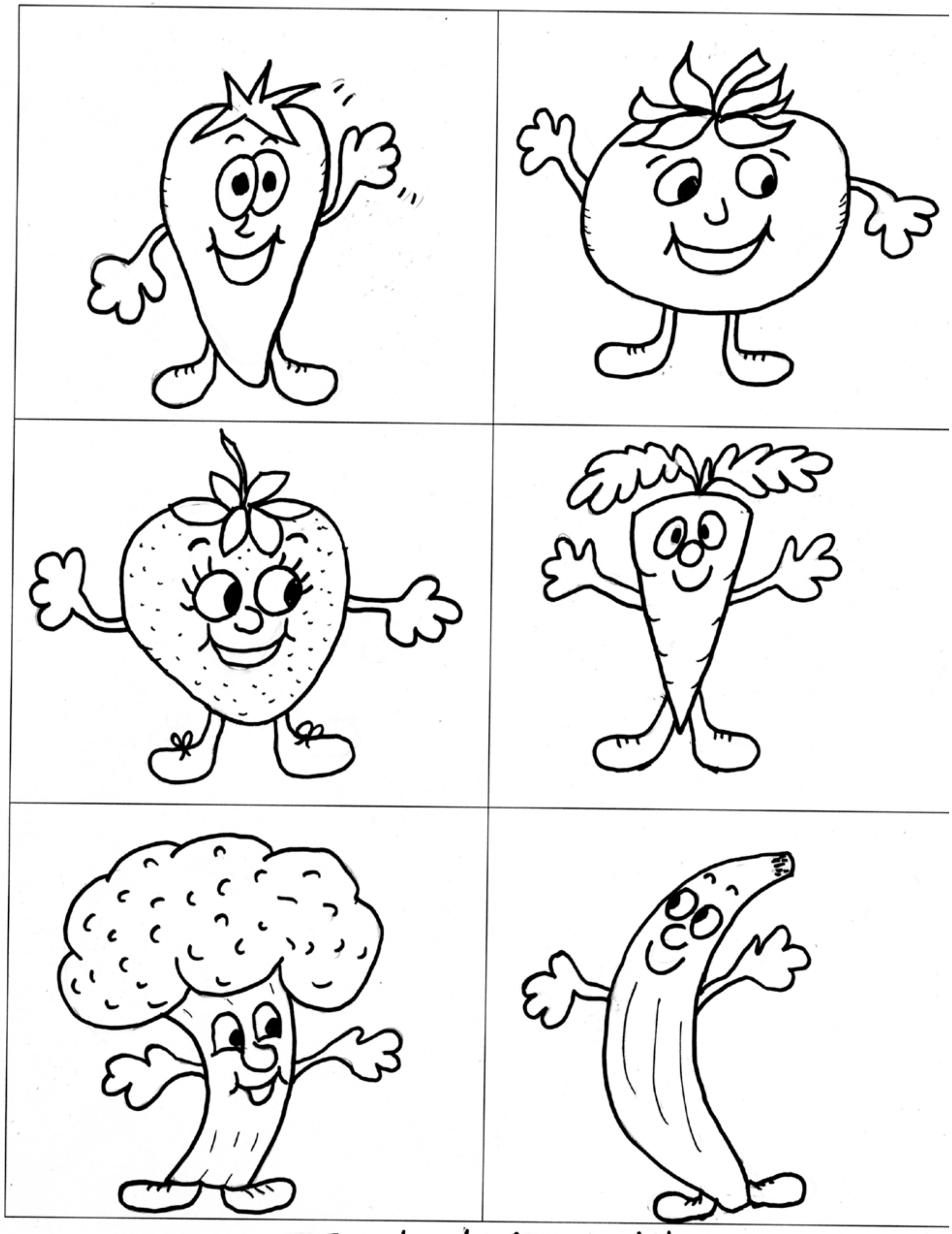
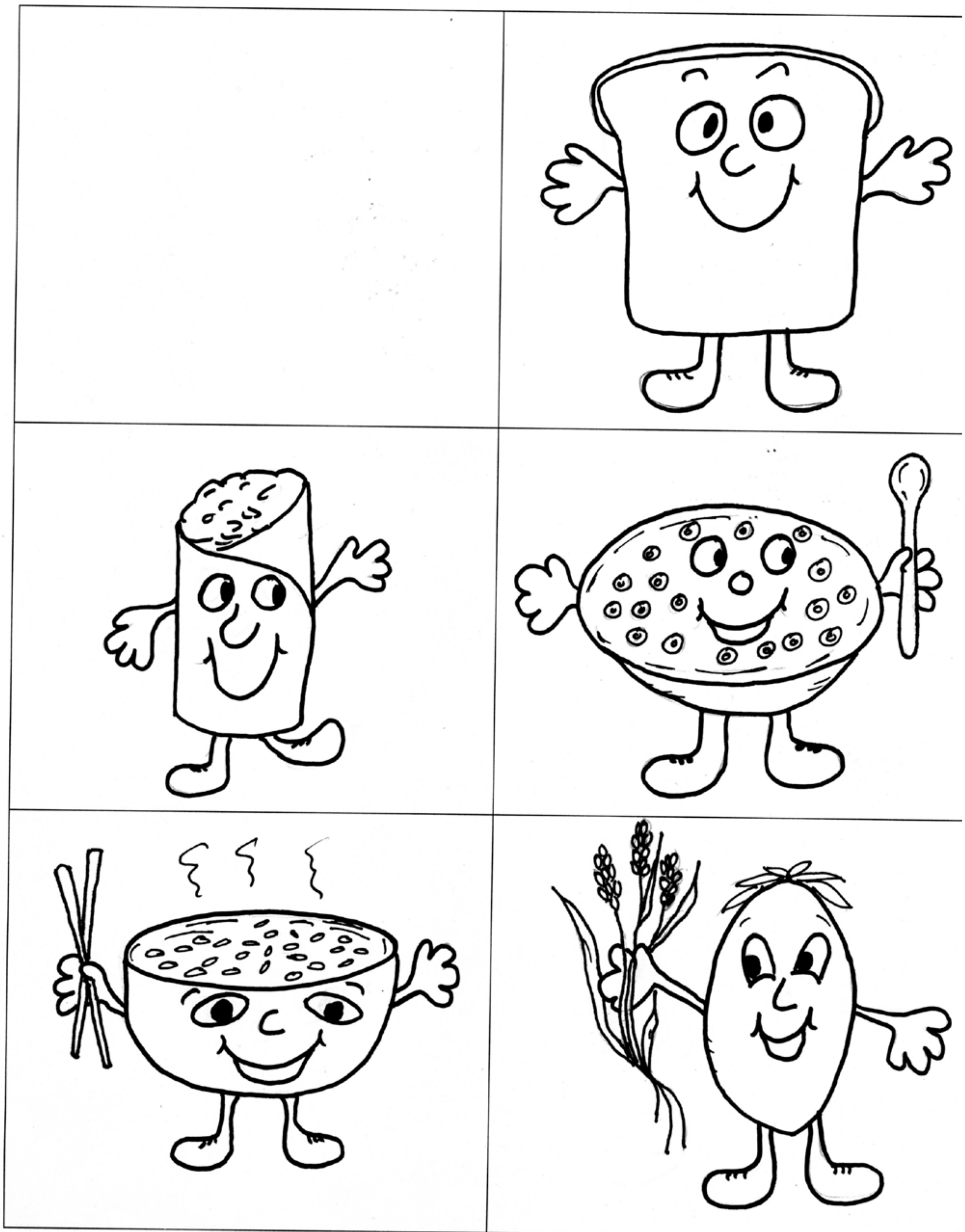
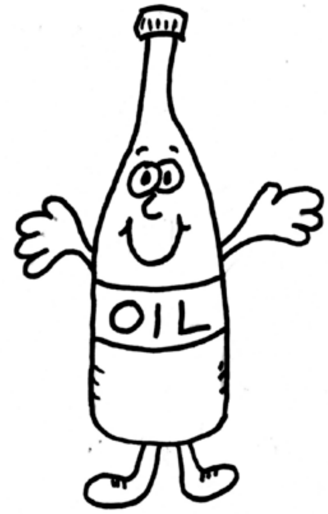
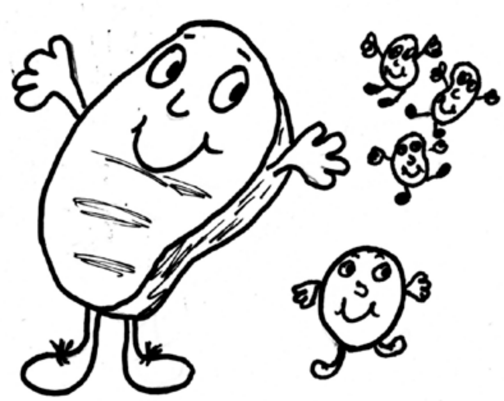


Fruits & Vegetables

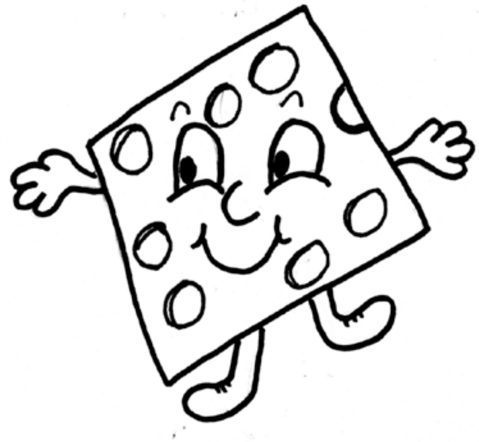


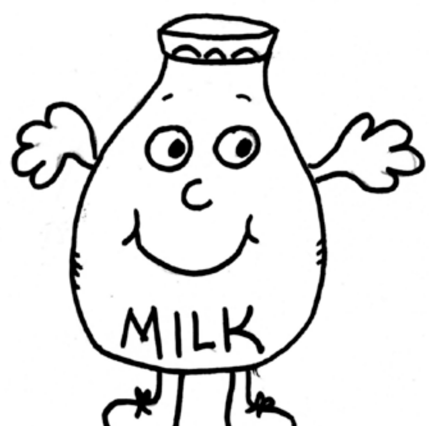
Grains





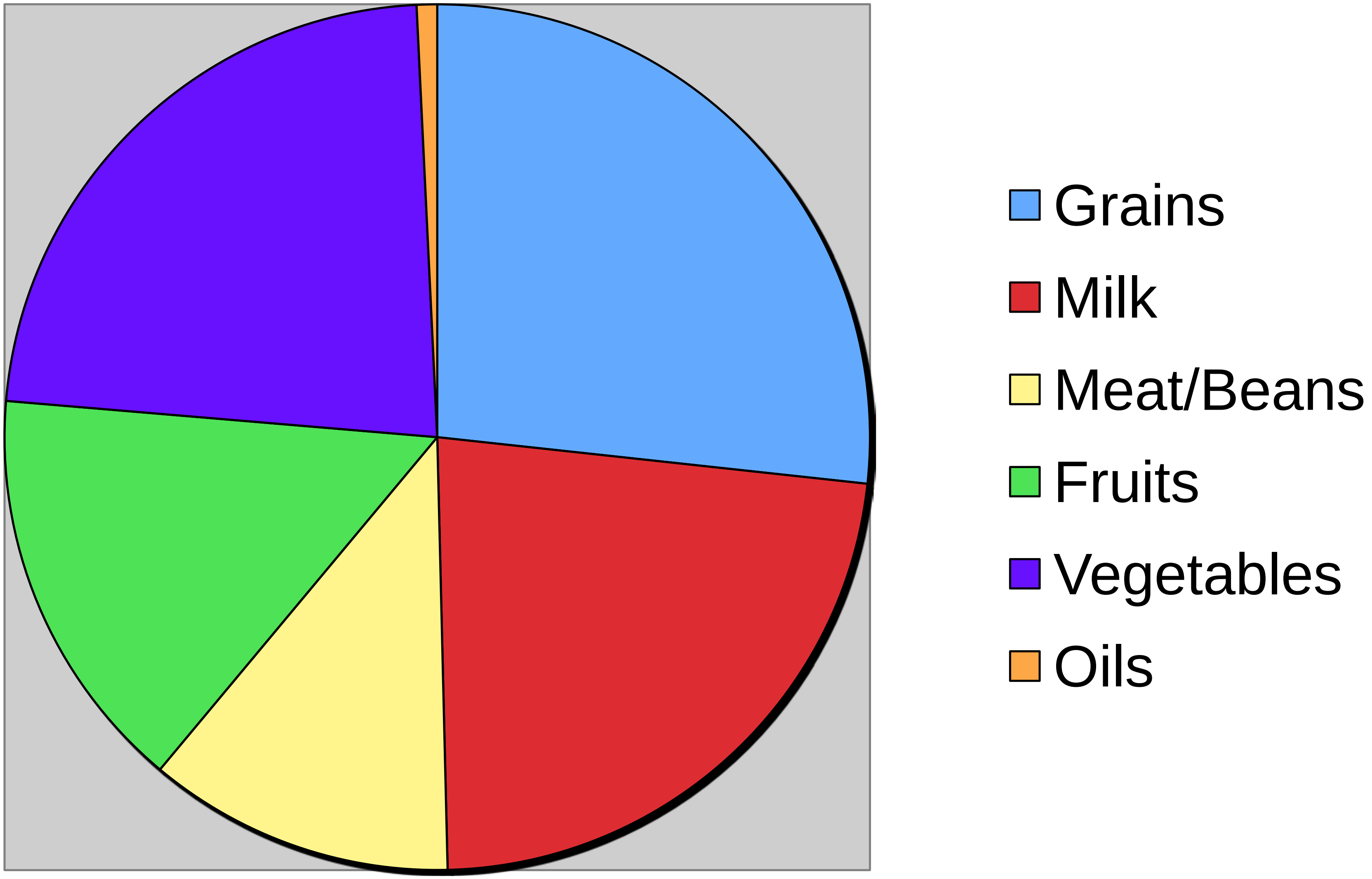
meat/Beans + Oil





Milk Products

Food Group Cards


Grains
Milk
Meat/Beans
Fruits
Vegetables
Oils

18. What Do You Eat? Food Groups-K

Name_____________________Date______________

Draw what you ate for lunch today? How many food groups did you eat?

Draw and color your favorite members of the Rainbow Food Team.

Feb.

19. Scientists Are Observers!

K

Objectives:
- Practice observation skills
- Use descriptive words to report on their observations
- Practice these putting descriptive words together to create a poem or short story

Materials
- 1-3 index cards for each student
- 7-8 magnetic strips-cut each strip into 12 pieces
- Marker for each group leader
- Clipboard for each group leader
- 6-10 feet of brightly colored rope or heavy string
- Bandana or other small cloth
- Outdoor Rules Poster
- 7-8 stones, cones, sticks, leaves, and other articles for the observation exercise
- Portable white board and markers

Preparation
- Go to an outside area and choose several interesting areas approximately 6-8 feet across and place string around it. You will divide your class into groups (one for each adult leader) for the outdoor observation exercise. Make that many group areas.
- Collect observation game objects
- Attach pieces of magnetic strip to index cards
- Gather other materials

Procedure
Question: What is observation?
- Take several answers.
- Demonstrate by showing two ways to look at the classroom. Go outside of the room and come in, just glance around and leave.
    - Put your head in the door and ask if they think that you saw very much.
    - Then come in again and spend a few minutes really looking, feeling, smelling, and listening.
    - Ask them if they think that you learned more about their class the first or second time.
    - Talk about using all of their senses for observation.

Scientists must first be great observers. You can become a better scientist when you really know how to see. After you learn to really observe, you must be able to explain what it is that you have observed with descriptive words. We'll go outside today and practice observing and reporting!

- Go outside bringing the white board, rules poster, markers, clipboards, bandana, objects for observation game, and index cards.
- Have the students sit on the benches.
- Go over the Outdoor Rules
- Play an observation game to warm up:
    - Place the collected items on the ground in a group that the students can all see.
    - Tell them to look at and try to remember the items.
    - After several minutes, put a piece of cloth such as a bandana over the group.
    - Put a hand under the cloth, pick up an item, and keep it covered as you bring it out.
    - Ask the students what is now missing from the group.
    - Repeat again after they have figured out what you took out.
- Divide the class into groups to go with each adult.
    - Explain that each group will go to a designated area.
    - There they will spend some time observing what is in the area.
    - Instruct them to use all of their senses (except taste).
    - Have them look for the variety of plants, shapes, colors, fragrances, and textures. Have them look without talking for this first part. Direct their attention to some items so that they really start looking and seeing.
    - After 5 minutes or so, have them point out some of the things that they have noticed and use words to describe what they see.
    - Have each student choose 1-2 words (1 per card) to describe something that they see, smell, feel, or hear.
    - The group leaders write down the words and give them to the students to hold onto for the next part of the lesson.
- Have the students return to the benches with the students from each group sitting next to one another.
    - Each group comes up to the board. They point out the area that they were observing, read their descriptive words, and place them on the board.
    - Have the students practice reading the words on the board aloud.
    - When all of the words are on the board, the words can be used to create short descriptive phrases, a story, or even some poems. Add in articles, verbs, etc. when needed. You and the students can also come up with other garden and plant related words to add into the mix.
    - Have students come up to the board to move the words around as other students offer suggestions.
    - You can also put together a line of words to start them off.

Let's Review

- What is observation?
- What senses do you use when you are observant?

Keep Exploring

- Spend more time outside exploring with all of the senses (except taste unless you know that something is safe). Have the students write down their observations with more descriptive words.
- Spend time outside drawing something in the area that catches their attention.

***Note:** **This class can also be done inside.**

- Use fruits and vegetables or other plant material.
- Use some of these materials and others for the observation game.
- Divide the class into groups giving each group a bag with a piece of plant material for each student to observe using all of their senses except for taste.
- Each group has an adult group leader as above.
- The remainder of the lesson is the same as the one described above.

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19. Scientists Are Observers!- K

Name______________________Date______________

Observe a plant in your room and write 3 words to describe it.

____

____

____

Draw a picture of your plant:

March

20. Is It Just Dirt?

K

Objectives:

- Practice observation
- Learn about soil components
- Review plant needs

Note to teachers: The jars of soil created in this experiment will be used again for the March Lesson 4 on testing soils.

Materials

- 4 trowels
- 4-6 samples of different types of soil (about ¼ cup each)
- 1 ½-2 cups of soil for demonstration
- Clear plastic cups for soil samples
- Samples of items that can turn into soil such as rocks, roots, sticks, bones, live plants, shells, and food items such as vegetables and fruits
- 4 small plastic buckets
- 5 quart mason jars
- 4 pieces of paper (about 4x5) on which you write #'s 1-4
- Tape and 4 sticks
- Carrier (bag or box) in which to carry outside supplies (trowels and buckets)

Preparation

- Collect 1-1 ½ cups of demonstration soil. Save about ¼ cup in a small container. Put the other ¾ -1¼ in a mason jar. Add water until the jar is about ¾ full. Shake well and let it settle for a day out of sight of the students.
- Write number signs and tape them to sticks
- Choose areas, before the lesson, where the students can safely dig for soil samples. Each group will need an adult leader, so the number of available adults equals the number of possible groups and digging areas. Put the numbered papers in each area.
- Collect other materials

Procedure

Today we are going to talk about something that is very important for plants.
Question: *What are some of the things that plants outside need to survive?*

- Take students' answers.
- Bring up "soil", if it is not mentioned, by asking where roots grow.
- If the students do mention soil, ask them what part of the plant lives in the soil.

Question: *What do you think is in soil?*

- Take answers and write them on the board.
- Put the samples of what is in soil into a cup as they mention them. Talk about and add the ones that they may not have thought of.
- Hold up the cup of "ingredients" next to a cup of "completed" soil for comparison.
- Pass around the soil samples to demonstrate the wide variety of soils. Tell them to feel, smell, and look carefully at the soils.
- Ask them to briefly describe some of the different soils.
- Show them the demonstration jar that has settled, being careful not to shake it up. Explain that this soil has been in water for a few days and that different parts of the soil have separated out of the mix. Show them the sample of the soil that went into the jar.

Let's go outside to check out the soil there.

- Take the trowels and small buckets
- Divide the class into groups to go with each group leader.
- Each group goes to one of the numbered areas with one of the trowels and a bucket.
- The students will take turns digging up three small scoops of soil and putting it in the bucket. You could start the hole so that it is 4-6 inches deep.
- Collect 2-3 cups of soil in each bucket.
- Put soil samples on the paper plates or aluminum trays. Have the students spend some time looking through the soil to see what they can discover.
- Bring the buckets of soil back to the classroom.

Let's see if the soil that we found outside is all the same and if it will change, as did the soil in this jar. (Show the pre-prepared demonstration jar again).

- Add about a cup of the collected samples to four different jars, fill in water about ¾ of the way up and shake well.
- Watch the result as the sand particles settle out immediately.
- Draw a line on the jar where the sand has settled.
- Observe the jar during the day.
- The next day, draw lines where the silt and clay have settled. Note that the water still contains particles that are suspended.
- Organic material will be floating on the top.
- Note the differences in the layers.

Let's Review

- Is soil just made out of one thing?
- What are some of the objects that you found in your soil from outside?

Keep Exploring

- Read Diary of a Worm by Doreen Cronin
- Explore other areas outside for different soils.

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20. Is It Just Dirt?- K

Name_____________________Date_______________

Draw some of the things that you found in the soil outside:

March

21. What Should We Plant?

K

Objectives:

- To become aware that many of the foods we eat can be grown in a garden.
- To recognize that some crops grow in warm weather and others in cool.
- To design a garden plan.

Materials

- List of warm weather crops
- List of cool weather crops
- White board

Preparation

- Print the lists of warm and cool weather crops.

Procedure

Question: What are some of your favorite things to cook/eat?

- Have the students give answers.
- List the answers on the board.
- Today we are going to look at the ingredients of some of our favorite meals to help us decide what to plant in our garden.

Question: Which meal(s) should we focus on today? What should we plant in our garden?

- Take class vote on the most popular choice(s).

Question: How do you make ____________? What are the ingredients?

- Have students list all the ingredients they know.
- Help add remaining ingredients if necessary.

Question: Can we grow each of these items in our garden?

- Have students go through ingredients one by one, to determine if they are found in a garden. (ex. tomato, yes. cheese, no)
- Students should cross out any non-garden ingredients.

Question: Can we plant all of our ingredients in the garden now?

- Display the warm weather/cool crop lists so that all can see it.
- Go through and circle the items on the lists that are ingredients for the group meal.

- From those lists, students will create a garden plan in their journals to be shared with the class.

<u>Question:</u> *What should we plant on our class garden?*

- Have students present their garden plans.
- Once a student has shared his/her ideas, the plan should be left on display.
- Create a class garden plan using the "favorite" ideas from the individual plans.

Let's Review

- Why are gardens important? (so we can eat!)
- Why is planning for a garden important? (plants have different needs)
- What was the best and/or most challenging part of designing your own garden?

Keep Exploring

- Cook the meal together as a class.

Cool-weather crops:

(to be planted outside in March)

arugula 	**beets** 	**broccoli** 
Brussels sprouts 	**cabbage** 	**carrots** 
cauliflower 	**celery** 	**kale** 
kohlrabi 	**leeks** 	**lettuce** 

onions (scallions) 	**parsley** 	**parsnip** 
peas 	**radishes** 	**spinach** 
sorrel 	**Swiss chard** 	**turnips** 
winter squash 		

Warm-weather crops:

(to be planted outside in May/June)

beans 	**berries** 	**collards** 
corn 	**cucumbers** 	**eggplant** 
garlic 	**melons** 	**okra** 
onions 	**peppers** 	**potato** 

pumpkin 	**summer squash** 	**sweet potato** 
tomato 		

21. My Garden Plan – K

Name_____________________Date______________

What are three things you would like to eat from your garden?

1. ____________________________________

2. ____________________________________

3. ____________________________________

Draw a picture of your garden plan.

March

22. Give Me Some Room!

Transplanting

K

Objectives:

- Learn how to transplant
- Follow multi-step directions
- Review the effects of crowding on plant growth

Materials

- Planted cups from the February lesson #1 on plant crowding
- Lettuce 4 packs from January Lesson #3 on plant uses
- Twelve 4 inch plastic pots
- Potting soil for each pot
- 5 spoons or forks
- Water container
- Sharpie
- Pot bound plant (one that is too crowded in its pot)
- Transplanting directions (attached)
- A plant related book such as <u>The Carrot Seed</u> by Ruth Krauss, <u>Fran's Flower</u> by Lisa Bruce or <u>Tops and Bottoms</u> by Janet Stevens

Preparation

- Collect materials
- Set up a space for transplanting with the soil, pots, several four packs of lettuce, water container, and utensils.

Procedure

Have the students in a circle. Show them the pot bound plant in its pot and then pull it gently out of the pot so that they can see the roots.

<u>Observation and Question:</u> Take a close look at this plant and its roots. Do you notice something about the way that it is growing that could harm the plant? (Lack of space, crowded roots)

Let's look at our experiment in which we put a different number of seeds in each pot.

- Look at the cups and consider the results.
  - The plants that are crowded should be showing signs of stress (smaller or thinner and lanky, paler, smaller and more crowded roots, etc.)

    - If the plants did not grow as expected, try to figure out the reason. For instance, the soil could have been watered irregularly.
- Pull up some of the plants to look at the roots.

<u>Question:</u> You planted lettuce in containers of a certain size. What do you think that you could do to help the lettuce to grow larger?

- Think about your crowding experiment.
- Now everyone stand up and slowly walk together into a tight group around me.
- Without moving your feet (these are your roots), slowly lift your arms to the side and up as if you were growing.
- Can you grow very much? What is the problem? (Crowding)
- Now spread out and try to "grow". Does that work better?
- Return to the circle

<u>Question:</u> How can you help your lettuce plants to grow larger?

- Look at the lettuce 4 packs and carefully remove 1-2 plants to look at the condition of the roots.
- Let's give your plants some more room and transplant them into larger pots.
- Demonstrate the difference in sizes between the openings of the four packs and the larger pots.

Each group transplants some lettuce. One teacher will assist the students and another adult will read a story to the students who are not planting.

- Write the planting steps, with diagrams, on the board.
- Each table will come to the planting table one at a time.
- Each student at the table will do one of the steps when transplanting.
- Put the transplanted lettuce back under the grow lights and water.

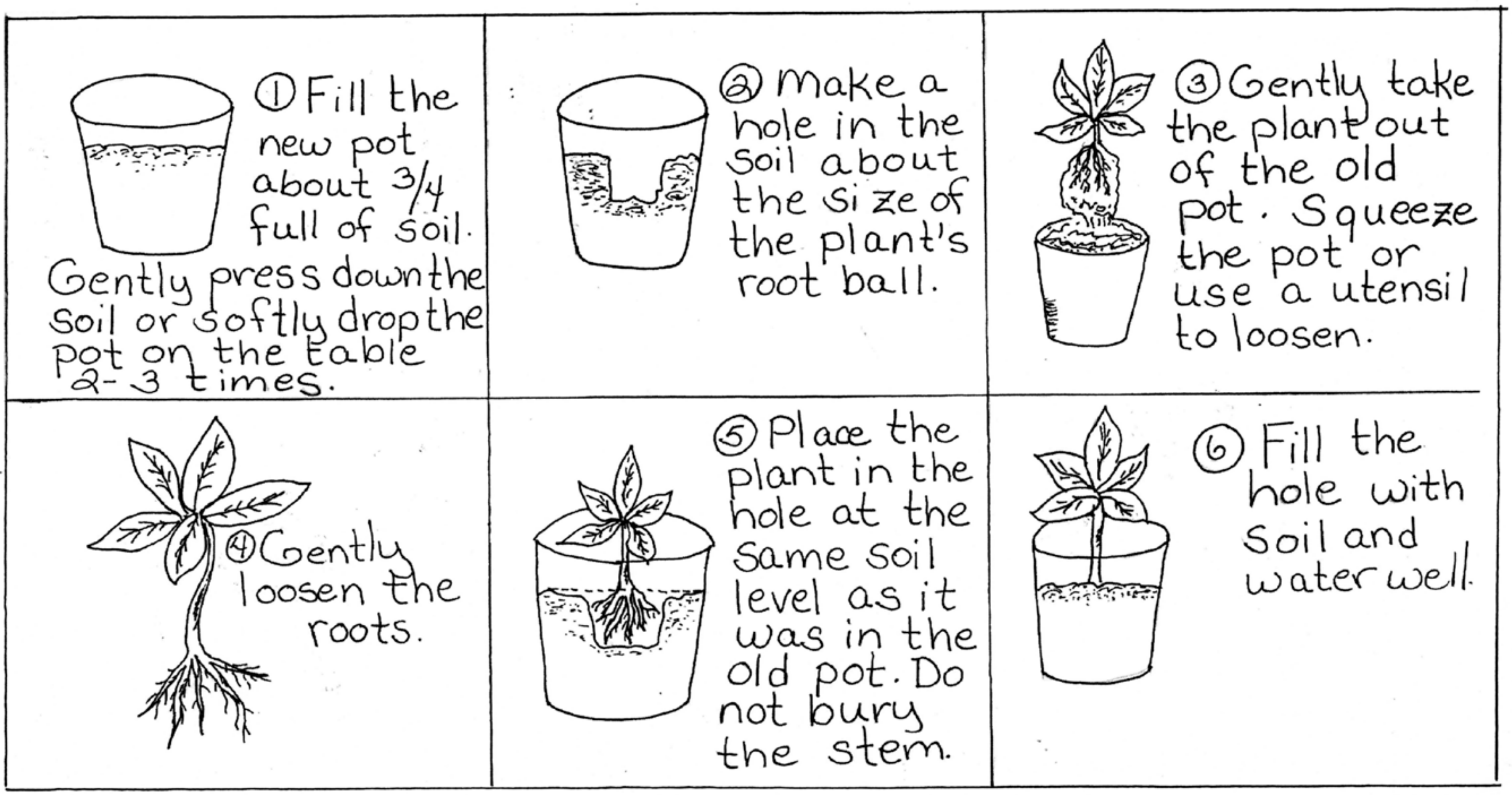
Let's Review

- How did we help our lettuce so that it can grow larger?

Keep Exploring

- Try starting some seeds (such as lettuce and spinach) indoors to transplant outside when the weather is warmer and the plants are about 4 inches tall.

Transplanting



22.Transplanting- K

Name_____________________Date______________

Why did we transplant our lettuce?

____

____

Draw your lettuce in its new pot:

March

K

23. Do You Think ThisWill Work?

Testing "Soils"

Objectives:

- Practice using the scientific method
- Practice recording data
- Learn more about seed germination requirements
- Make discoveries about "outdoor" soil and other planting materials

Materials

- Nine 3" plastic containers or 12 oz. plastic cups with holes drilled in the bottom
- Measuring cup or container for water with markings for 1/8 , ¼, and ½ cup
- Materials for each cup:
  - Large gravel or marbles
  - Sand
  - Potting soil
  - Clay or Play Dough
  - Sponge to fit the top of a container
- Aluminum tray to fit under the containers
- Jars with outside soil and water from soil experiment (March #1)
- Strainer (one that you don't mind getting dirty!)
- Large spoon
- 30 radish seeds
- Masking tape
- Sharpie

Preparation

- Collect soil jars from March/Lesson 1: "Is It Just Dirt?"
- Gather other materials
- Fill each of four cups ½ - ¾ full of one each of the cup materials.
- Cut a sponge to fit on top of a cup.
- Put a piece of tape on each cup to use as a label.

Procedure

Have the students sit in a circle on the floor. Bring out several of the plants growing in your classroom and put them in the middle of the circle.

<u>Question:</u> In what are these plants growing? (Soil) Is it the same in each container? (Yes)

- Now put the five cups with the different materials in the middle of the circle.
- Have the students help to identify what is in each cup. Pass each cup around.
- Write the contents of each cup on the label.

Question: *What do you think will happen if we plant some seeds in the different materials in these cups? Will they germinate (review the definition of germination) and grow well? Will they not germinate or die before getting large?*

- When the cups have been inspected, write at the top of the board the phrase "What will happen if I plant seeds in _____?" Underneath list the materials in the cups, leaving room for answers.
- Have the students predict what will happen and write down the answers beside each material.
- Repeat the questions with the soil from experiment jars #1-4.
- Strain the water out of each jar, mix up the soil and put each jar's soil in new containers as you did the other materials.
- Write a label for each jar's contents with the number and a brief description of the soil in each (for example: mostly sand, very dark, light colored, etc.)
- Have 9 students come up to help plant 3 radish seeds in each of the nine cups.
- Place the cups on the aluminum tray and place in the window or another bright area of the classroom. They do not have to go underneath the grow lights.

Let's Review

- *For what are we testing in this experiment?*
- *Do you think we need to water the seeds?*
- *Should we give the same or different amount of water to each one? (Same-use a measuring cup).*

Keep Exploring

- Try planting seeds in other materials.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District

23. Soil Testing- K

Name_____________________Date______________

Draw what your seeds in each cup looked like after 1 week.
Did the seeds grow in each one?

Draw what your seeds in each cup looked like after 2 weeks.
Did the seeds grow in each one?

Which seeds did the best after 3 weeks?

Cup # ______

March

24. Worms Eat Our Garbage!

K

Objectives:

- To understand the benefits of vermicompost (composting with worms)
- To know the components of the vermicompost cycle.
- To identify how worms use their senses to survive.

Materials

- An established worm bin.
- 15 plates
- Long rope (75 – 100 ft)
- Bandanas (1 for each student)
- 12 apples (6 for the game, 6 pre-washed to eat)
- Apple slicer/knife
- Vermicompost cycle poster
- Worm anatomy poster
- Popsicle sticks (1 for each student)
- 10 cups
- 1 bucket/bag

Preparation

- Gather materials.
- Set out rope for game boundary.
- Make posters.

Procedure

Have students sit in a circle. Pass around a worms for the children to look at.

Question: Do worms have eyes? (no) Ears? (no) Nose? (no) Mouth? (yes) Hands or feet? (no) If you cut a worm in half, will you then have two worms? (NO!)

- Hold up the worm anatomy poster.
- Have students point to the different parts on their own bodies that worms also have.
- If you cut one of us in half would you then have two people? No! Same with the worms. All of their important organs are on one half of their body. If you take that away, the worm cannot live.
- When you first cut the worm it may APPEAR to be two live worms because the blood is still running through its muscles. If you watch it long enough, you will see that it does not survive.

<u>Question:</u> If worms don't have eyes, ears, a nose, or hands and feet, how do they survive, move, and eat? (They have to feel where to go and eat)

- Let's pretend to be worms in search of food.
- Show children the playing space and boundary within the rope on the ground.
- Have students close their eyes (or use bandanas to blind fold). Let them each feel an apple to know what food they as worms will be looking for.
- Once they have all felt it, scatter the apples in the playing space
- Have all the students crawl around the playing space in search of an apple. (Be sure to go over the safety rules of going slowly and carefully so as not to crash into others.)
- Once a student has found an apple, he or she should take off the blindfold, stand up, and stay to the side so others can continue looking safely.

<u>Question:</u> How did you feel as a worm? (One answer could be that they work hard for food.)

- Let's be people again and wash our hands.
- While children are washing their hands, slice the pre-washed apples leaving the cores on the plate that is passed around.
- Pass around the slices to eat.

<u>Question:</u> Why are vermicompost worms important? (They eat our garbage which helps reduce unnecessary waste in landfills, their castings fertilize the soil, and worms live in smaller spaces than those taken up by compost piles and outdoor bins)

- Show vermicompost cycle poster.
- People eat food but have food scraps/garbage left over.
- What did we eat today? (apples)
- What did we have left over? (apple cores)
- Worms help eat our garbage! They will eat our apple cores for us and then give us worm castings.
- Worm castings get put back in the garden to help make more food for us.

<u>Question:</u> How can you help complete the vermicompost cycle?

- Today we are going to "harvest" the worm bin.
- We will take the castings out to put in the garden and then put the worms back in the bin to eat more of our garbage. We can feed them today's apple cores.
- Each group will get a plate with castings and worms.
- Put the worms and eggs in the plastic cup and keep the castings on the plate until you are sure ALL the worms are out (otherwise they will die).
    - * You can use popsicle sticks if you don't want to touch them. If you do want to hold the worms, be sure to watch for the stress signal (looks like the worm is peeing on you).
- If you are ready, trade plates with another group to double check each other's work.
- If all the worms are out, put the castings in the bucket so that we can take them out to the garden or put them on our plants in our room.

Let's Review

- <u>*Question:*</u> *Why do we keep worms? How can they help our plants?*

Keep Exploring

- Read <u>Diary of a Worm</u> by Doreen Cronin
- Start a class worm bin
- Calculate how much food the class throws away during lunch. How much of that could have been fed to the worms?

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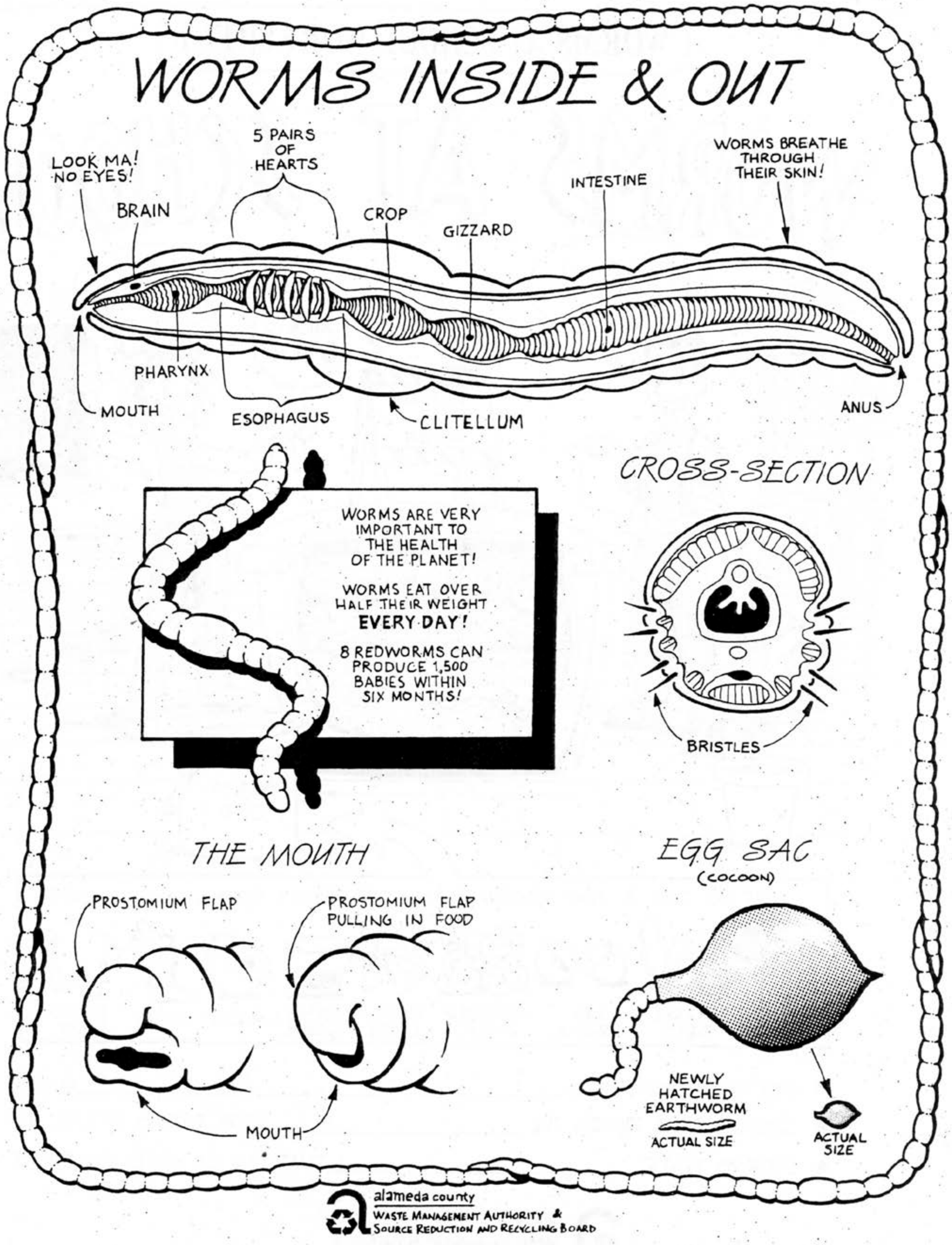
WORMS INSIDE & OUT
LOOK MA! NO EYES!
5 PAIRS OF HEARTS
BRAIN
CROP
GIZZARD
INTESTINE
WORMS BREATHE THROUGH THEIR SKIN!
PHARYNX
MOUTH
ESOPHAGUS
CLITELLUM
ANUS
CROSS-SECTION
WORMS ARE VERY IMPORTANT TO THE HEALTH OF THE PLANET!
WORMS EAT OVER HALF THEIR WEIGHT EVERY DAY!
8 REDWORMS CAN PRODUCE 1,500 BABIES WITHIN SIX MONTHS!
BRISTLES
THE MOUTH
PROSTOMIUM FLAP
PROSTOMIUM FLAP PULLING IN FOOD
MOUTH
EGG SAC (COCOON)
NEWLY HATCHED EARTHWORM
ACTUAL SIZE
ACTUAL SIZE
alameda county
WASTE MANAGEMENT AUTHORITY & SOURCE REDUCTION AND RECYCLING BOARD


WORMS EAT OUR GARBAGE!
Worm Castings = The world's best fertilizer!

24.Worms!- K

Name_____________________**Date**______________

One of the worms looks like this:

How does the worm's skin feel?

____

____

____

What do the worms like to eat?

____

____

____

April

25. Break It Down!

Compost

K

Objectives:

- Learn about the decomposition process and compost
- Make predictions and record outcomes
- Follow multi-stepped directions

Materials

- 3 clear two liter soda bottles
- Clear packing tape
- Utility knife
- Scissors
- Push pin
- Organic materials such as food scraps, leaves, grass clippings, newspaper, etc. Do not use any meat or products with oils or fats.
- Container with finished composed
- Empty bucket or bowl
- Pictures of "compost creatures" (attached)
- Water

Preparation

- Collect materials
- Cut out column pieces from bottles (directions attached)
- Print out compost creature pictures
- Have the compost example, dry materials, empty bucket, and water ready

Procedure

Question: *Let's think again about what we learned about soil. Is soil made out of just one thing? Is it made very quickly, or does it take a long time to form?*

There is something that we like to make and add to our soil to help make it very healthy for our plants.

- Pass around the samples of finished compost.

Question: *What does this look like?*

- Take some answers until someone says "soil".
- It does look like soil, but it is something that we can make more quickly.

Question: Does anyone know what this is? If the students cannot guess, ask if anyone has heard of compost.

- This is compost and we make it out of these kinds of ingredients.
- Write the word compost on the board.
- Pass around the dried and fresh plant materials.
- Demonstrate putting the materials in a bucket, adding water, and stirring in air.
- In the compost pile are a lot of creatures that help to break down the pieces of the plants into smaller and smaller pieces until we get compost. It is like the worms in the worm bin that ate the food and newspaper and left castings behind.
- Show pictures of some of the compost creatures.
- This process of the plant materials breaking down is called decomposition.

Today we will make a "Compost Column" where you can watch some of these ingredients as they break down.

- See attached directions and let the students help to put the column together and fill it with plant ingredients.
- If you do this activity outside, have each student go around the area and pick 5 pieces of green or brown plant material to put in the column.
- Add the water and put it in a warm spot.
- Check the progress of the ingredients at least once a week. Note color changes, odor, creatures that may show up, height of the ingredients, and any other variations that the students observe.

Question: What do you predict will happen to the ingredients in your column? When do you think you will see some changes if they happen?

Let's go out to the garden and look for an area where plant materials have been breaking down. Let's look for compost creatures!

Let's Review

- What did we put in our compost? What will happen to it?

Keep Exploring

- Start a composting area outside.
- Spend some more time searching for compost creatures. Draw pictures of ones that you find.

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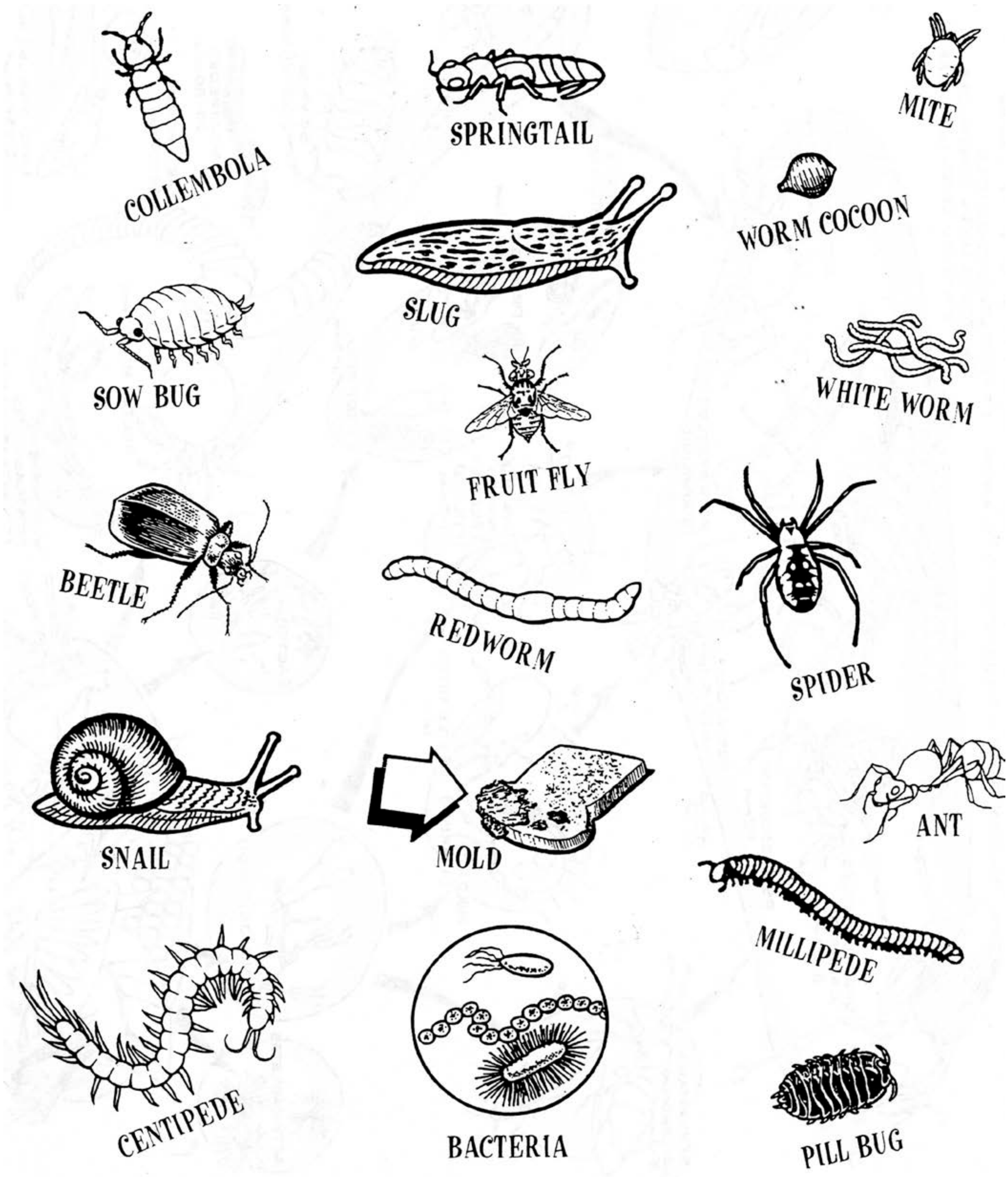
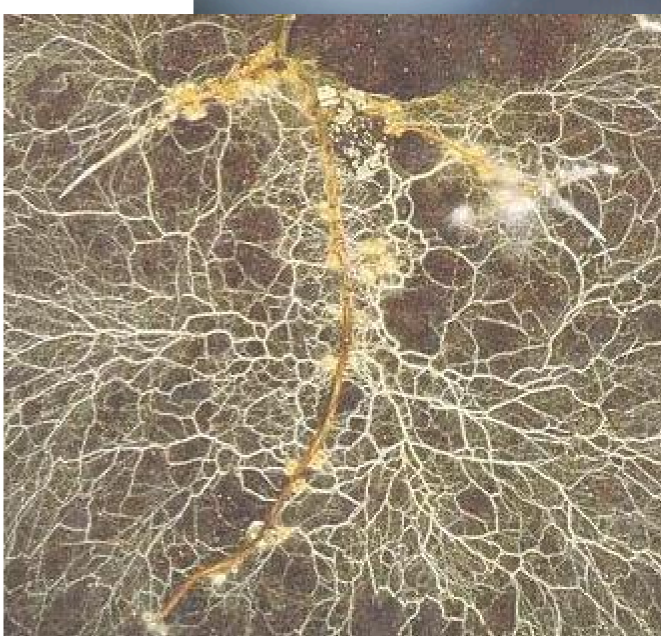
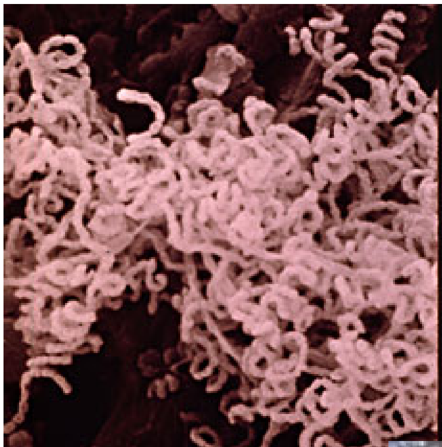
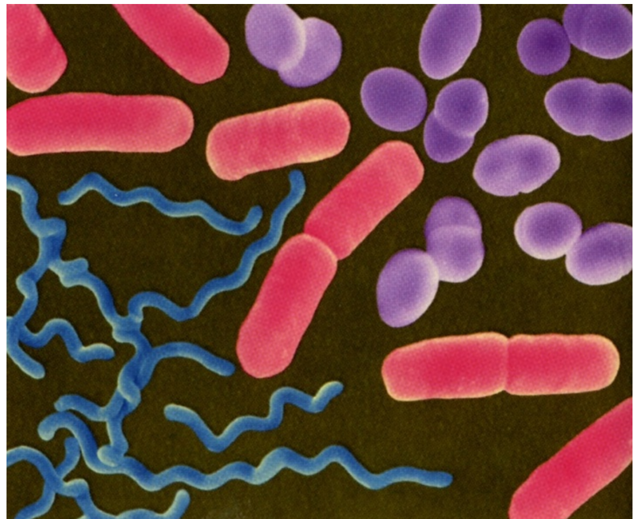

COLLEMBOLA
SPRINGTAIL
MITE
WORM COCOON
SLUG
SOW BUG
WHITE WORM
FRUIT FLY
BEETLE
REDWORM
SPIDER
SNAIL
MOLD
ANT
MILLIPEDE
CENTIPEDE
BACTERIA
PILL BUG

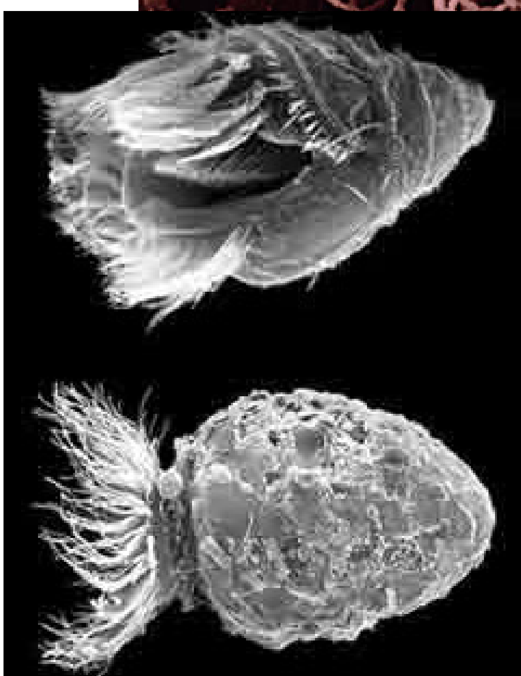

James L. Castner, U. Fla. Ent. Dept




http://www.californiabiota.com/cabiota/





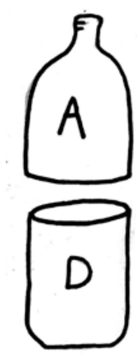


Making a Decomposition Column

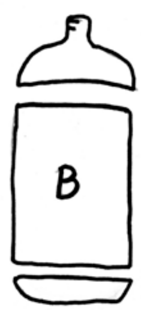
1. Supplies:
    - 3 clear two liter soda bottles
    - Clear packing tape
    - Utility knife
    - Scissors
    - Push pin
    - Organic materials such as food scraps, leaves, grass clippings, newspaper, etc. Do not use any meat or products with oils or fats.

2. Preparing the bottles:
    - Rinse out the bottles and remove the labels. You can use a hairdryer to heat the label glue (keep the heat low so that the bottles don't warp) or soak in hot water for easier removal.
    - Draw the cutting lines first with a marker or wax pencil (See the measurements below).
    - Cut with a sharp utility knife.
    - Make the air holes (see below) with a very sharp pushpin.

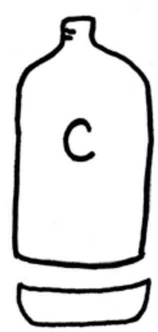
3. Making the columns:
    - Cut the top off of bottle #1 about 2-3 cm. below the shoulder so that the cylinder has straight sides.



    - Cut the top off of bottle #2 2-3 cm. above the shoulder. Cut the bottom off 2-3 cm. below the hip. The cut cylinder will have two tapered ends.

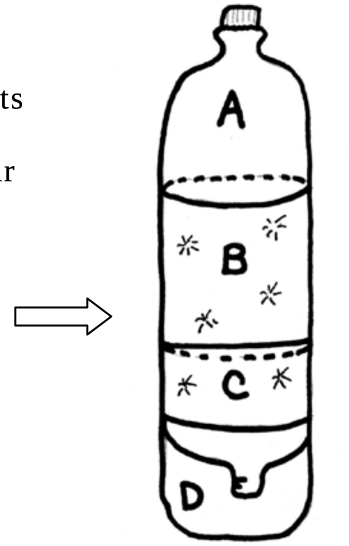


    - Cut the bottom of bottle #3 2-3 cm. Above the hip so that the cylinder has a straight end.



- Invert “C” and stack into base “D”. Stack in “B” and tape the middle seam securely. You can add some ½ inch cuts to the bottom of “B” if it is difficult to place it into the column. Poke 10-20 air holes. Top “A” will be the lid.

Tape here



- Add the organic materials (loosely packed), filling the column. Add water from the top until about ½ cup flows into the bottom. Keep the materials moist, but not soggy, by adding this water back into the top of the column every few days. If the materials seem dry, add another small amount of water.
- Put top “A” on top and keep the column in a warm place.

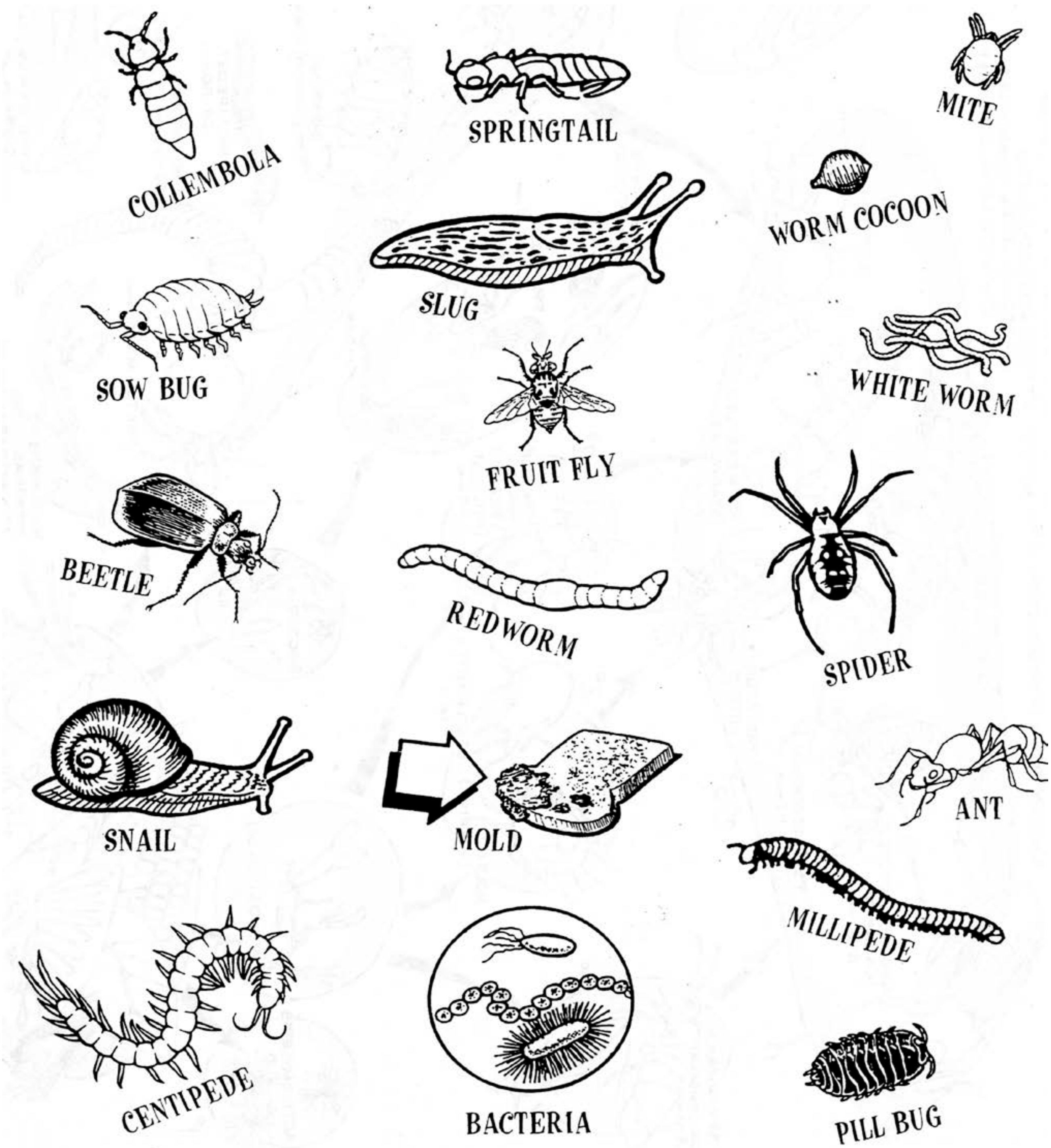
25. Compost Column- K

Name___________________ Date_____________

Draw a picture of your compost column:

Draw a picture of your compost column in 4 weeks. Does it look different?

Color in these compost critters:



April

26. I Eat Dirt!

K

Objectives:

- To understand all food has a connection to soil.
- To explain how each ingredient in a school lunch can be traced back to soil.
- To describe the importance of healthy soil.

Materials

- Student lunches (optional)
- "I eat dirt. Ask me how!" sign (attached)
- Whiteboard/markers
- Journal page
- Mailing labels printed with, "I eat dirt. Ask me how!" (1 for each student)

Preparation

- Copy journal page.
- Read background information:
  - Many children do not understand that all of our food originates from the earth's soil. Soil is made up of 7 components: sand, silt, clay, organic material, soil organisms, air, and water. Different soil types have different proportions of these components. In general, soils high in organic material house large numbers of soil organisms and are very fertile. Soil organisms are classified as decomposers since they eat dead organic material. Organic material is anything composed of or derived from living organisms. There are many decomposers. Some we can see like worms, sow bugs, and beetles, but most, like bacteria and fungi, are too small for our eyes. A tablespoon of healthy soil can contain many billions of bacteria and fungi.

Procedure

You can either eat lunch with the students to begin this activity (which will really engage them in their lunches!), or simply tell them to try to remember everything they have for lunch that day.

Question: *What did you have for lunch today?*

- Make a list on the whiteboard of the different items students ate (ex. peanut butter and jelly sandwich, carrots, chips, and chocolate chip cookie.)

Question: *What are the ingredients used to make each of these items?*

- Go back through the list and brainstorm the ingredients for each item (ex. peanut butter and jelly sandwich = bread + peanut butter + raspberry jelly)
- Make a vertical list with all of the ingredients.

Put on your "I eat dirt. Ask me how!" sign.

Question: *What does my sign say? Do you believe that no matter what ate for lunch, you really ate dirt?*

- Let's look at the list of ingredients to see if they all came from dirt:
    - Bread came from wheat grown in the dirt.
      bread ⇨ *wheat* ⇨ ***dirt***
    - Peanut butter came from peanuts grown in the dirt.
      peanut butter ⇨ *peanuts* ⇨ ***dirt***
    - Raspberry jelly came from raspberries grown in the dirt.
      raspberry jelly ⇨ *raspberries* ⇨ ***dirt***
- Continue with as many ingredients as the students need to see the connection from soil to food and/or have interest for seeing how their lunch is dirt.

Question: *What does it really mean that we all eat dirt?*

- Dirt/soil is REALLY important!
- In order to have healthy foods, we need healthy soil!

Let's Review

- Think back to what you ate for breakfast this morning, dinner last night, or yesterday's lunch.
- Each student is going to name ONE food/ingredient he/she ate and how it is connected to dirt.
- Each time a student makes the connection back to dirt, that student earns an "I eat dirt. Ask me how!" sticker.
- Listen to your friends because there cannot be any repeats!

Keep Exploring

- Challenge students to wear their stickers and talk to **1** person to explain the connection between food and dirt.

***This lesson has been adapted from "Dirt for Lunch" by the Marin County Office of Waste Management.

I eat **dirt**.

Ask me how!

I eat dirt.

Ask me how!

I eat dirt

Ask me how!

I eat dirt.

Ask me how!

I eat dirt.

Ask me how!

I eat dirt.

Ask me how!

I eat dirt

Ask me how!

I eat dirt.

Ask me how!

I eat dirt.

Ask me how!

I eat dirt.

Ask me how!

I eat dirt.

Ask me how!

26. I Eat Dirt!- K

Name ______________________ Date_______________

Draw a picture of a meal that you ate today.

Name what you ate:

____

____

____

Draw a picture of what your food looks like when it is growing in the ground.

I could also say that I ate **dirt** because:

____

____

____

April

27. It's All Connected!

Web of Life

K

Objectives:

- Understand connections in the Web of Life
- Practice logical thinking
- Each grade level can make the connections more intricate.

Materials

- Rope, yarn or thick cord (at least 125-150 feet)
- 25-30 large index cards (1 for each student) with a word for one component of a web of life component. Make sure that you have one for sun, water, air, soil, plant, leaf, root, flower, fruit, seed, rock, then add animals (human, bear, rabbit, mouse, wolf, fox, skunk, deer, bat), birds (hawk, woodpecker, quail, etc), reptiles and amphibians (snakes, lizard, frog, toad), insects and spiders (ladybug, spider, bee, butterfly, aphid, grasshopper) and other related things such as trees, grass, and earthworms.
- Clothespins to attach cards
- Web of life sign (attached)

Preparation

- Gather materials
- Prepare index cards

Procedure

Question: *Last week you learned how you eat dirt. Did anyone eat dirt during the week? You learned how your food is connected to the soil. Did you know that all living things are connected to each other? Let's figure this out!*

- Go through several of the "I Eat Dirt" examples such as bread ➔ flour ➔ wheat ➔ soil

Question: *Let's think of some other connections. Do plants need sun to live? (Yes) Do cows need the sun? (Yes: cows eat grass➔grass is a plant➔a plant needs the sun➔Therefore, cows need the sun.)*

Let's play a game that will show us many of the connections in nature. We'll call this a "Web of Life" game. (Note: This game is best played outside).

- Have the students stand in a circle.
- Clip a card on each student.

- Explain that everyone represents something that is connected to everyone else. Either they need something or that something needs them to survive.
- Start with the sun, as it is the source of all energy, and have that person hold onto the cord (the teacher holds onto the ball of cord, rope, or yarn). Have everyone who thinks that what is on their card is connected to the sun raise his or her hand. Pick one person (for instance the Plant person), roll the ball of rope over to them to hold, make a connection between them and another person who uses a plant or that a plant needs to survive, and so on.
- Keep making connections and creating the "web" until everyone is holding the rope.
- Have different people one at a time pull their part of the rope to see how others can feel the tug and feel the connections.

Question: *Wow! All of you are connected. What will happen to everything if some of you drop your connections?*

- Pick one student at a time to drop their hold on the rope and sit down where they are standing. Have everyone who thinks that they are connected to the first person raise their hands, and then have them drop the rope and sit down. Try to figure out if anyone still standing is connected to those that are sitting. Continue until everyone is sitting.
- If there is time left over, play the Predator/Prey game (attached).

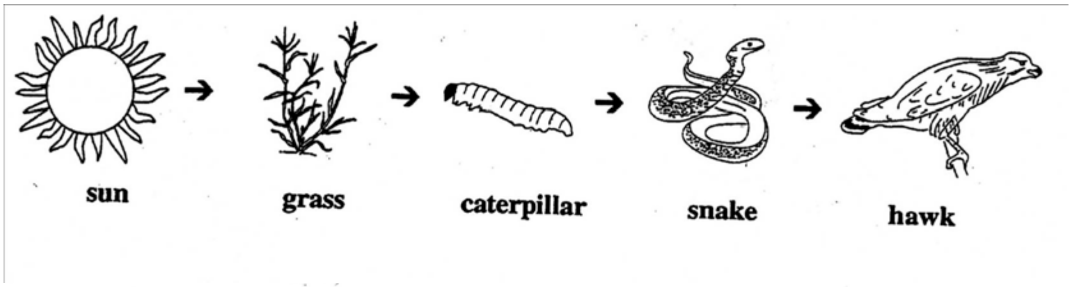
Let's Review

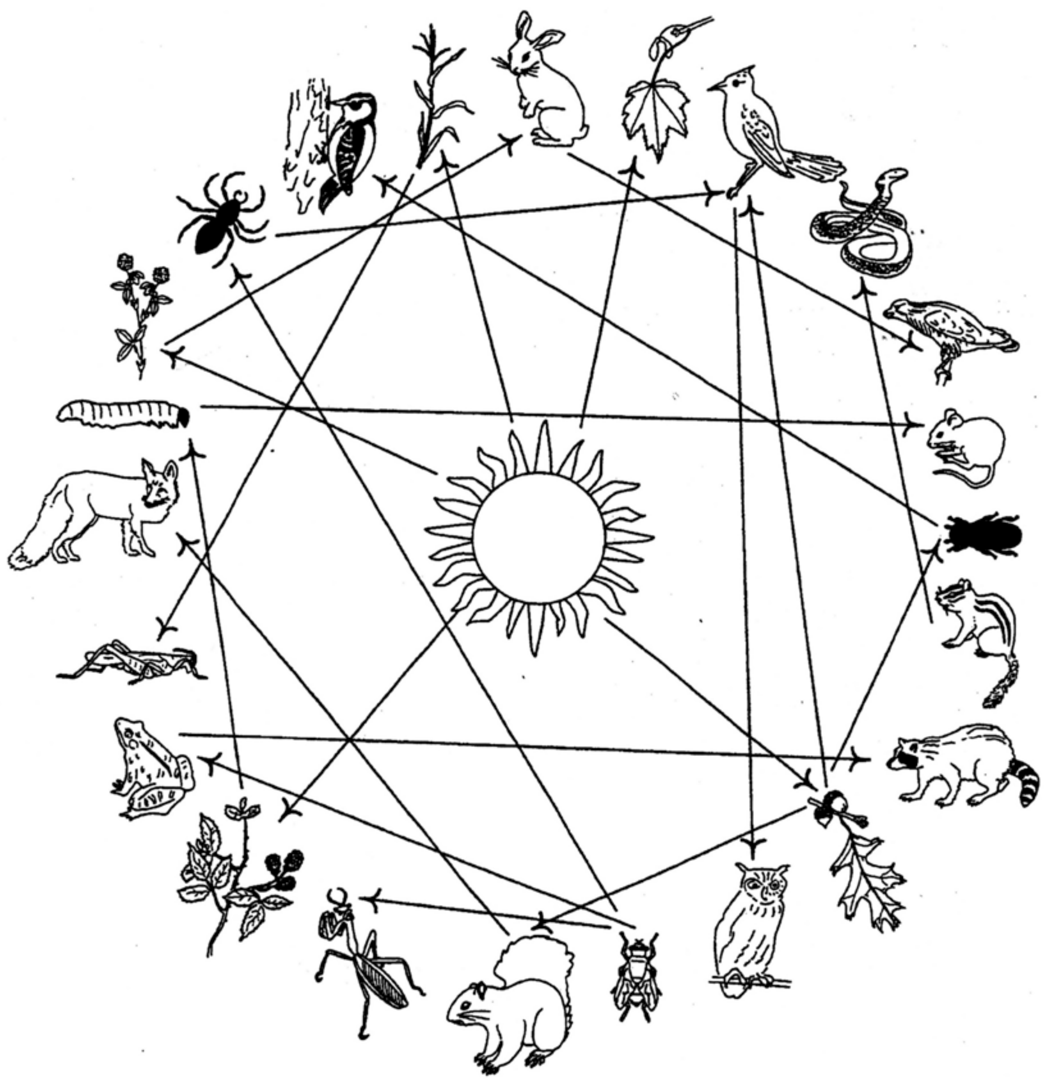
- How is everything in nature like a web?
- What if there was no sun? Would anything be able to live?

Keep Exploring

- Create more web of life cards with different things on them. Play the game several times making more connections each time.
- Start with an animal or plant on the board.

FOOD CHAINS AND THE FOOD WEB*





*From Ag In The Classroom, USDA

Predator/ Prey Game

1. Everyone gathers into one group outside.

2. Explain that Predators are those creatures that eat other creatures for food. Prey are those that are caught for food. Both the predators and prey must be very observant and clever in order to survive.

3. Discuss some skills that predators and prey could have for survival (speed, good eye sight, camouflage, etc.)

4. To start the game, make a circle, in which everyone can easily fit, using a rope or thick cord.

5. One person is chosen to be the predator, and the rest are the prey.

6. The predator turns around, closes his or her eyes, and slowly counts to 20.

7. The prey hide. They must be able to see the predator from their hiding places.

8. The predator then turns around and starts looking for the people who are hiding. The predator must stay in the circle.

9. The prey people come to stand in the circle with the predator as they are spotted. At this point they cannot help the predator to find others.

10. When the predator finds everyone possible, he or she, plus everyone else in the circle (they are now also predators), turns around with eyes closed, and counts to 20 again.

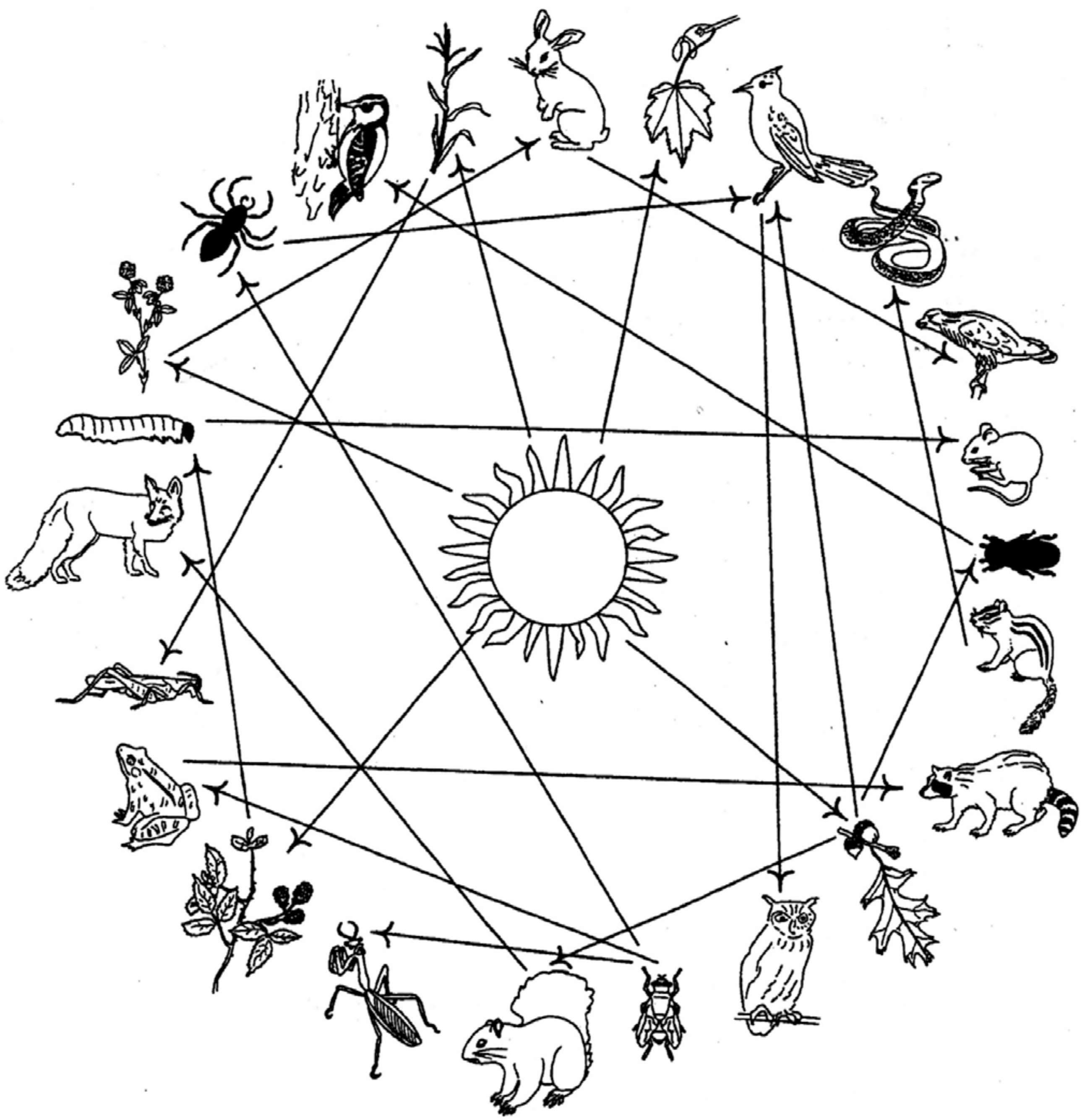
11. The people remaining who are prey must come 5 feet closer to new hiding places where they can still see the predators.

12. All of the predators turn around and look for the prey. Repeat moving closer with each round until only one prey person is left. That person is the winner and becomes the solo predator to begin the next round.

27. Food Web- K

Name______________________Date______________

Color in these parts of the food web.
Follow the arrows to see all of the connections.



May

28. Let's Take a Good Look!

K

Objectives:

- Sharpen observation skills
- Practice matching geometric shapes and colors to real life objects

Materials

- 20 colorful clothes pins
- 6 index cards
- Assortment of colored markers
- Checklists (attached)
- Clipboard and pencil for each student

Preparation

- Prepare index cards:
  - 3 cards each with the word for these colors: yellow, red, and brown. Use other colors if these are not currently in the garden and change the checklist.
  - 3 cards each with these shapes drawn and filled in: circle, rectangle, and triangle
- Place the clothespins in the garden area. Attach to plants so that clothespins are located in high, low, and medium heights. Have the area to be explored along a path and make some of them more difficult to see than others. Create two separate spaces.
- Print out checklists

Procedure

Bring the students out to the garden and explain that they are going to practice being "Outdoor Detectives and Scientists".

- Divide the students into 2 groups.
- Explain that they will follow the adult leader and walk <u>silently</u> along the path.
- As they walk they try and spot the clothespins (not pick them up), but not point them out to anyone else. They can count them in their head.
- At the end of the path, ask the students to whisper in your ear the number of clothespins that they spotted.
- Then go back through the path with students raising their hands and pointing to the location of the clothespins so that everyone can find them.
- They will be surprised how many more clothespins were along the path that they didn't find at first glance.

Come back to a circle. Explain that they will now use their careful observation skills to go on a hunt to find the objects that are on journal sheet number one.

- Hand out the sheets, pencils, and clipboards.

- They will work in groups and circle each object on the page as they find it.
- Demonstrate the procedure using one of the objects as an example.
- Divide into groups and go on the hunt.

Come back to the circle again and have a brief discussion about the plant hunt. Explain that their eyes are getting sharper and that they will go on one more hunt.

- Show the cards that have the shapes and colors on them.
- Explain that they will look now for objects in the garden that look like the shapes and that have the colors on the cards.
- Have the students turn their page over for the next hunt.
- Demonstrate the procedure by finding an example and circling it on the page.
- Go out in the same groups to look for the matching objects.
- Let the students know that they will probably find more objects than those on the checklist. They can add those on the back of the paper if they wish.

Let's Review

- Share new discoveries that the students made such as an object that looked like a circle or yellow flowers that they had not spotted before. Later in the classroom they can draw pictures of plants matching the shapes and colors.

Keep Exploring

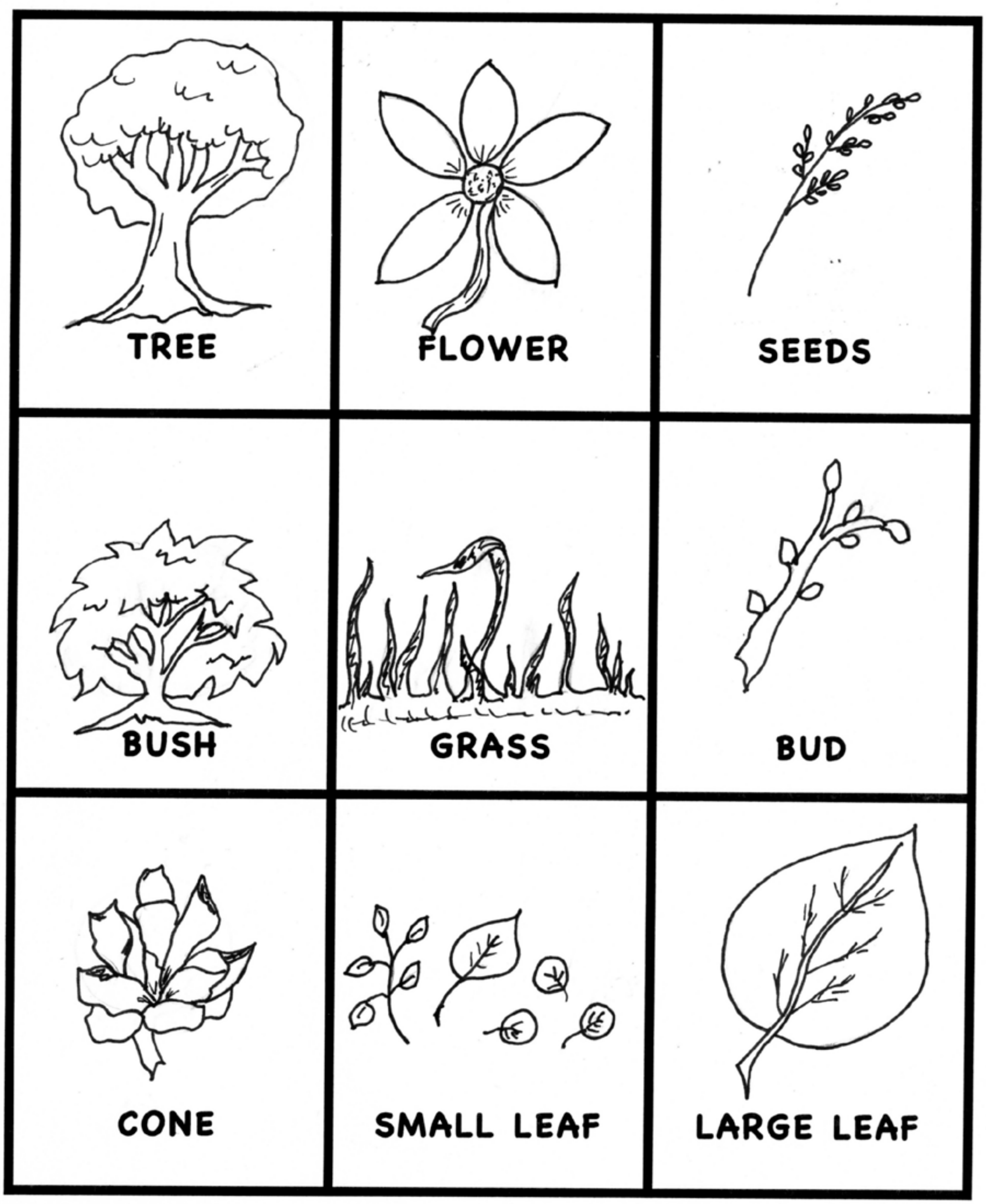
- Go on more scavenger hunts:
  - Look for objects with different characteristics such as soft, scratchy, smooth, etc.
  - Look for objects to bring back to the classroom to put in a science or observation area.
  - Look for plants that provide food and shelter for animals and insects.

Curricula funding provided by the Daniels Fund for the Salt Lake City School District

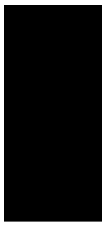
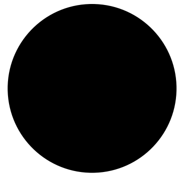
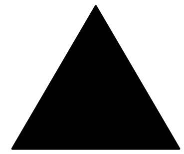
28. Let's Take A Good Look!- K

Name______________________Date______________

Circle what you find in the garden:



Circle a shape, color, and texture that you find in the garden.
Below the shape draw what you found:

		
RED	YELLOW	BROWN

May

29. Invent a Class Plant

K

Objectives:

- Review plant parts, uses, methods of seed dispersal, plant protections, and best growing environments
- Work in teams to finish a task
- Make connections between different modules of knowledge.

Materials

- 5 pieces of 11” x 17” copy or other paper for each group
- 5 index cards
- Pencils or crayons for each person

Preparation

- Write the assignment for each group on an index card:
  - 1. Plant parts: Name and draw all of the plant parts
  - 2. Seed Dispersal: How do the seeds move around?
  - 3. Uses: How do people use this plant?
  - 4. Protection: How does this plant protect itself?
  - 5. Environment: What does this plant need to live?

Procedure

Question: *We have talked a lot about plants this year. What are some of the new facts that you have learned about plants in the classroom and outside in the garden?*

- Take several answers.

Let them know that today they will invent their own class plant using the information that they have learned.

- Explain the five categories that are on the index cards.
- Ask questions to discern what they remember about each category and prompt them to remember the basic facts.
- Divide the class into their 5 table groups.
- Each group gets a piece of copy paper and an index card to remind them of their group’s assignment.
- Each group will draw a picture of the plant information that they will add to the making of the class plant.
- Pick a leader from each group who will present and draw their group’s ideas on the board as the class puts together their newly invented plant.

- Start with the plant part group. The leader will draw a large version of the group's plant picture with all of the parts.
- Take each group in turn with their ideas and have the leader draw them on the board.
- The plant will change to fit all of the groups' ideas so that it is a plant unique to the class.
- Around the plant, the environment group will draw the things needed for growth such as the sun for light.
- All of the ideas need to adhere to correct knowledge about plants.
- Have the students come up with several names for their new plant (not the name of a plant that they already know) and vote on the most popular one.

Let's Review

- Let's look at our plant again, describe it, and name its uses.

Keep Exploring

- Invent plants with other characteristics.

29. Invent A Plant - K

Name______________________Date______________

Draw your class plant:

May

30. Our Last Day!

K

Objectives:

- Assess plant knowledge
- Record students' thoughts about the garden program
- Harvest and eat garlic planted last fall
- Have fun!

Materials

- Cards for Plant Part Relay (attached)-Some are more difficult than others so you can decide how much you'd like to challenge the students!
- 6 buckets with plant part names (attached)
- Voice recorder
- Questions for student feedback (attached)
- For salsa:
    - 6 large tomatoes
    - Bunch of cilantro
    - 3 jalapeno peppers (only if your students like hot food!)
    - 1 lime
    - Bunch of green onions
    - Salt
    - Spring garlic pulled from the garden (it will not have full bulbs)
    - Radish leaves from the garden if radish seeds were planted a few weeks ago
    - Large bag of chips
    - 6 medium bowls for salsa and 6 more for chips
    - 1 large bowl for mixing
    - 1 container for water in which to rinse vegetables
    - Mixing spoon
    - Paper or cloth towels
    - 1-2 cutting boards
    - 1-2 knives for cutting

Preparation

- Shop for and gather materials
- Print out game pieces on heavy paper (laminate if you want to save them) and divide them into two equal groups. Mark the backs of one group with the number 1 and the others with 2. Add cards with the template if you need more.
- Attach plant part names to buckets with tape or clothespins.
- Set up supplies outside in the garden or organize them and carry them out with the class

Procedure

This last day is divided into three parts and requires one adult with each of the three groups of students. The student groups will go around to each adult in turn, finish the activity and move on to the next group when all of the groups have finished that round. Separate the groups as far away from each other as possible. If only two adults are available, divide the class into two groups and go through the activities more slowly with larger groups. Choose the game pieces that are appropriate for your class level of knowledge. Challenge them too!

Part 1-Plant Relay

- This is a relay race type game, but the winner is not the team that finishes first, but rather the one that gets the most correct answers.
- Divide the students into two groups in single file lines.
- Give a card to each of the players.
- They must decide what plant part it is and can ask their teammates for help.
- The first player, at the Go signal, runs and puts his or her card in what they think is the correct bucket, run back, tag the next player, and go to the back of the line. The next player repeats the same thing until everyone has put his or her card in a bucket.
- Quickly hand out the next set of cards and the players continue until all of the cards have been used.
- Go to each bucket and check to see how many plant parts each team correctly identified. Have the students help to decide which answers are correct and which are incorrect.
- You can hand the correct ones to one student and the incorrect ones to another, then count up the totals to get the winning team.

Part 2-Garden Class Feedback

- Sit in a circle with the group and talk about the year's activities. See which classes and activities they remember.
- Remind them of some that have been forgotten.
- Now read to them some of the questions and ask them to sit quietly for a few minutes to think about their answers. Let them know that you'd like to hear their own thoughts, and not have everyone repeat what the person before them said.
- Now go around, ask the questions and record their answers. You can transcribe the answers later to get ideas about future class planning.

Part 3-Make and Eat Salsa

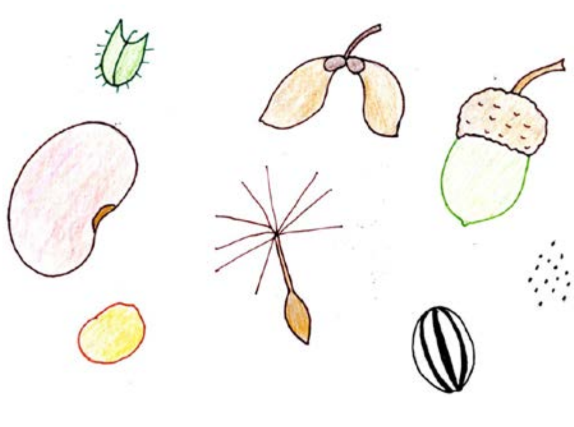
- Have each group go and pick a garlic plant.
- Divide up the rinsing, chopping, and stirring jobs of the salsa making.
- The last group will divide the large bowl of salsa into the smaller bowls.

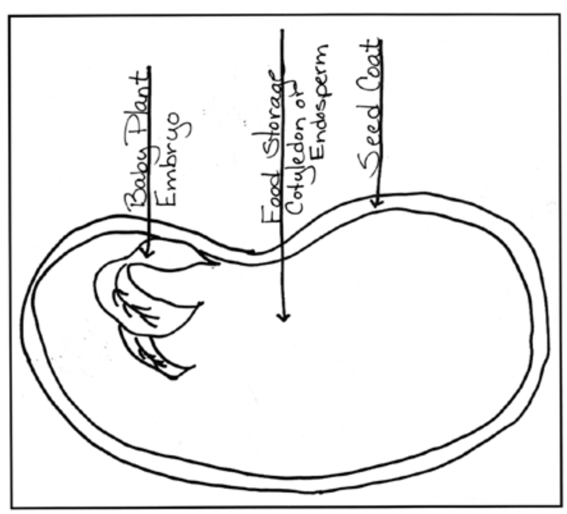
When every group has done each activity, have everyone come to the salsa area, divide the three groups into smaller groups, have everyone sit down in their new groups. Hand out the bowls of salsa and chips and ENJOY!

WOODY AND HERBACEOUS	RADISH
LETTUCE AND SPINACH	CAN TURN DIFFERENT COLORS IN THE FALL
TOMATOES AND APPLES	USE TO MAKE PEANUT BUTTER

CONTAINS SEEDS	FOOD STORAGE
PULLS UP WATER AND MINERALS FROM THE SOIL	HOLDS UP THE LEAVES
PLANT FOOD FACTORY	WHERE POLLINATION HAPPENS

WORKS LIKE A STRAW	CONTAIN CHLOROPHYLL
HAS PETALS, PISTILS, AND STAMENS	HOLDS UP THE PLANT
PROTECTS THE SEEDS	CONTAINS A BABY PLANT




Baby Plant
Embryo
Food Storage
Cotyledon or
Endosperm
Seed Coat

Garden Club Class Student Evaluation

Please spend about 2 minutes per question. Each group will have 10 minutes to answer all four.

1. What was your favorite thing about Garden Club classes?
   (ex. an experiment, a specific class, going outside, etc.)
2. Is there anything you didn't like about Garden Club classes?
3. What did you learn about plants this school year in Garden Club classes?
4. How were Garden Club classes different than other classes at school?

Curriculum Connections

Garden and plant based classes connect to a wide variety of state and national curriculum areas. The most obvious one is science, but also covered are many standards of literacy, math, social studies, and art. Included is a chart showing the direct connections between the WCG garden classes and the relevant Utah state standards of science. These follow the new (2011) national core curriculum standards.

The other curricula areas are not charted here, but are implicit in the lessons. For example, in regards to Language Arts, students develop language through listening, speaking, and through viewing a variety of media presentations. As they learn new vocabulary words by listening, reading, and discussing a variety of genres, they also practice using context to determine and explain meanings of unknown key words. They keep an ongoing garden lesson journal in which they write and/or draw every week, and often give presentations of their findings to their classmates.

Math is threaded throughout many of the lessons as well. Students measure, collect and organize data in a variety of ways, and problem solve using basic algorithms. Students use math in real, hands-on life experiences: measuring space to plant, using recipes, graphing soil organisms found, charting coordinates of garden treasures, planning a budget for a shopping trip, and more.

In addition, students learn about their place in their community and family, nutrition facts, research techniques, and more. As mentioned in the introduction, many of the lesson objectives are based on the Salt Lake City School District Curriculum Standards 2011. A great source of information, from the U.S. Botanic Garden and the Chicago Botanic Garden, about connecting plant-based education with the national standards can be found at http://www.schoolgardenwizard.org/ under the heading "Make The Case". More ideas about how to strengthen and enhance your classes in the garden are under the heading "Learn In The Garden".

Kindergarten: Science Curriculum													
	Stan.1	Obj. 1	Obj. 2	Obj. 3	**Stan. 2**	Obj. 1:	Obj. 3	**Stan.3**	Obj. 1	Obj. 2	**Stan. 4**	Obj. 1	Obj. 2
1. Let's Get Growing	x	x	x	x							x	x	
2. Our First Experiment	x	x	x	x				x	x		x	x	x
3. Do Plants Hibernate Too?	x	x	x	x	x	x	x				x	x	x
4. Did ou Just Eat a Root?	x	x	x	x							x	x	x
5. From the Beginning	x	x	x	x	x	x					x	x	x
6. Hey, Where Are You Going?	x	x	x	x	x	x		x	x		x	x	x
7. Growing a Foundation	x	x	x	x	x	x					x	x	x
8.What's Holding This Thing Up?	x	x	x	x				x	x		x	x	x
9. Do Plants Eat Breakfast? - Leaves	x	x	x	x	x	x					x	x	x
10. Do Plants Eat Breakfast? - Food Fac	x	x	x	x	x	x	x				x	x	x
11. Flowers and Pollinators	x	x	x	x							x	x	x
12. Yummy!	x	x	x	x							x	x	x
13. Putting It All Together	x	x	x	x	x	x					x	x	x
14. Let's Experiment!	x	x	x	x				x	x		x	x	x
15. Do We Really Need Plants?	x	x	x	x	x	x		x		x	x	x	x
16. Animals, Insects, and Plants	x	x	x	x							x	x	x
17. It's Crowded In Here!	x	x	x	x							x	x	x
18. Eat a Rainbow!	x	x	x	x							x	x	x
19. Scientists are Observers!	x	x	x	x	x	x					x	x	x
20. Is It Just Dirt?	x	x	x	x	x	x		x		x	x	x	x
21. What Should We Plant?	x	x	x	x	x		x				x	x	x
22. Give Me Some Room!	x	x	x	x							x	x	x
23. Do You Think This Will Work?	x	x	x	x							x	x	x
24. Worms Eat Our Garbage!	x	x	x	x							x	x	x
25. Break It Down!	x	x	x	x	x	x					x	x	x
26. I Eat Dirt!	x	x	x	x	x	x					x	x	x
27. It's All Connected	x	x	x	x	x	x					x	x	x
28. Let's Take a Good Look!	x	x	x	x							x	x	x
29. Invent a Class Plant	x	x	x	x							x	x	x
30. Our Last Day!	x	x	x	x							x	x	x

Kindergarten Curriculum Connection

Science

Standard 1: The Processes, Communication, and Nature of Science: Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

- Objective 1: Generating evidence: Using the processes of scientific investigation (i.e. framing questions, designing investigations, conducting investigations, collecting data, drawing conclusions)
- Objective 2: Communicating Science: Communicating effectively using science language and reasoning
- Objective 3: Knowing in Science: Understanding the nature of science

Standard 2: Earth and Space Science: Students will gain an understanding of Earth and Space Science through the study of earth materials, celestial movement, and weather.

- Objective 1: Investigate non-living things.
- Objective 2-not applicable
- Objective 3: Compare the changes in weather over time.

Standard 3: Physical Science: Students will gain an understanding of Physical Science through the study of forces of motion and the properties of materials.

- Objective 1: Identify how non-living things move.
- Objective 2: Describe the parts of non-living things.

Standard 4: Life Science: Students will gain an understanding of Life Science through the study of changes in organisms over time and cell theory.

- Objective 1: Investigate living things.
- Objective 2: Describe the parts of living things.

	Kindergarten: Math Curriculum							
	Stan.2	Obj. 1a	Obj. 1b	Obj. 2d	**Stan. 3**	Obj. 1a	Obj. 3a	Obj. 3b
1. Let's Get Growing	x	x					x	
2. Our First Experiment	x	x	x	x			x	x
3. Do Plants Hibernate Too?	x	x	x				x	x
4. Did ou Just Eat a Root?	x	x	x	x			x	x
5. From the Beginning	x	x		x			x	x
6. Hey, Where Are You Going?	x	x	x				x	x
7. Growing a Foundation	x	x	x	x			x	x
8.What's Holding This Thing Up?	x	x	x	x			x	x
9. Do Plants Eat Breakfast? - Leaves	x	x	x	x			x	x
10. Do Plants Eat Breakfast? - Food Fac	x	x	x	x			x	x
11. Flowers and Pollinators	x	x		x			x	x
12. Yummy!	x	x		x			x	x
13. Putting It All Together	x	x	x	x			x	x
14. Let's Experiment!							x	x
15. Do We Really Need Plants?	x	x	x				x	x
16. Animals, Insects, and Plants	x	x	x				x	x
17. It's Crowded In Here!							x	x
18. Eat a Rainbow!	x	x	x				x	x
19. Scientists are Observers!	x	x	x	x			x	x
20. Is It Just Dirt?	x	x	x				x	x
21. What Should We Plant?	x	x					x	x
22. Give Me Some Room!							x	x
23. Do You Think This Will Work?	x	x		x			x	x
24. Worms Eat Our Garbage!							x	x
25. Break It Down!	x	x	x				x	x
26. I Eat Dirt!							x	x
27. It's All Connected							x	x
28. Let's Take a Good Look!	x	x	x	x	x	x	x	x
29. Invent a Class Plant	x	x	x				x	x
30. Our Last Day!	x	x	x	x				x

Math Curriculum Connections

Kindergarten

Standard 2: Students will sort and classify objects as well as recognize and create simple patterns.

- Objective 1: Identify, sort and classify objects according to common attributes.
  a. Sort objects into groups by attribute and identify which attribute was used.
  b. Describe multiple ways to sort and classify a group of objects.
- Objective 2: Identify, duplicate, describe, and extend simple repeating and growing patterns.
  d. Identify simple patterns in the environment.

Standard 3: Students will understand basic geometry and measurement concepts as well as collect and organize data.

- Objective 1: Identify and create simple geometric shapes and describe simple spatial relationships.
  a. Identify, name, describe, and draw circles, triangles, rectangles, and squares in various sizes and orientations.
- Objective 3: Collect and organize simple data.
  a. Pose questions and gather data about self and surroundings.
  b. Organize data obtained from sorting and classifying objects.