Project GROWS

Living Dirt!

Exploring the Origins of Fruits and Veggies

Summer 2013 Curriculum

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Week 1: Life of Seed/Plant Care

Objectives:

- Students will be able to recognize the life cycle of plants by end of teaching.
- Students will demonstrate correct plant care during teaching.

State of Virginia: SOL's

Science - Elementary: K.7, Second Grade: 2.4, 2.5, Third Grade: 3.7, Fourth Grade: 4.4

Health – Elementary: K.1.

Materials: Print out activity (see last page), watering cans

Ice-breaker: (Choose from any)

1. Group rock paper scissors

Directions: Everyone in the group pairs up with one other person and plays one game of rock paper scissors. The loser of the pair gets behind the winner and holds on to their shoulders (like a train), following them around. The winner then challenges another winner to rock paper scissors, and the loser of that match-up must take their whole train and join the winners train. Train members must cheer the front person on. Eventually there will be two long trains, with a final match-up between the heads of each line. Once there is an ultimate winner, break up and play again!

2. Simon Says

Lesson

<u>Life Cycle of a Seed:</u>

Open up with asking kids examples of seeds in their food, and where the seeds come from.

THE SEED

- A plant begins as a simple seed. Inside the seed are all of the parts of the future plant, waiting in their immature form. There is an immature root, stem and small leaves. When planted in the ground, the seed will germinate and begin to grow. The tiny root will work its way down into the soil as the tiny stem works its way up.

THE SEEDLING

- The small plant that first makes its appearance is the seedling. It has a small, vulnerable stem with a few small leaves. With sunlight and water, this seedling will grow larger and more mature. The stem and root will grow longer, and new leaves will appear on the plant.

FLOWERING PLANT

- When the plant reaches maturity, flowers will form. The flower is different for each plant, yet all contain the same basic parts. Most flowers use color and scent to attract insects to help them pollinate. Once pollinated, the flowers will begin developing seeds. Some plants protect the seeds inside a fruit that houses the seeds until they are ready.

RELEASING NEW SEEDS

- When the new seeds are ready, they will be released back out into nature. For some plants, this means dropping fruit onto the ground to rot or be eaten by animals. Other plants release their seeds in unique ways, such as being blown by wind or by sticking to animal fur.

SEED AGAIN

- At this point the cycle begins again, with a small seed finding its way into the ground. This seed will sprout and grow into a new plant that looks like its parent plant. When this seed begins to grow, the cycle will start over again.

<u>Types of plants</u>

ANNUALS

- Annual vegetable plants need only one growing season to go through an entire life cycle. They quickly sprout from seeds and grow into adult plants, and they die after producing that season's vegetables and seeds. Annual vegetables include **peppers, lettuce and beans.**

BIENNIALS

- Biennial vegetables need two growing seasons to complete their life cycle. In the first year, they grow from seeds into a structure that stores energy (the taproot). These roots can be harvested for eating. If they are left in the ground, however, they will grow more and produce seeds in the second year, completing their life cycle. **Carrots and onions are common biennial vegetables.**

PERENNIALS

- Perennial plants are those that live for longer than two years, including the categories of shrubs, trees and herbaceous perennials.
- Herbaceous perennials have above-ground sections that die off each year, but their root structure remains alive and produces new growth in following years. **Asparagus plants are an example.**

Plant Care/Nutrition:

Just like humans, plants need food to grow and live. What do you think they like to "eat?"

(answer: Plants require sunlight, water, nutrients, carbon dioxide, and space to grow)

Soil

- "grocery store" for plants; it is a warehouse of plant nutrients (The plants go "shopping" in the soil and get what they need. Just like it is with humans, if plants do not get all of the nutrients they need, they do not stay healthy.)
- top layer of the earth's surface
- formed from the weathering of rocks and the decomposition of organisms
- consist of mineral materials, organic matter, water, and air
- nutrients include carbon, oxygen, hydrogen, nitrogen, phosphorous and potassium
- roots grow in the soil, absorb nutrients and water required by the plants
- farmers and gardeners must make sure that the soil plants are grown in contain all of the required nutrients (nutrients can be added to the soil when necessary, see Fertilizer)

Fertilizer

- any substance that is added to the soil or water to increase the amount of nutrients available to plants

- can be man-made or natural substances
- Manure, composted plant materials, and store-bought man-made fertilizers are all considered to be "fertilizers".

Water

- plant, like all living organisms, needs water to live and grow.
- carries nutrients from the soil to all parts of the plant and carries food from the leaves back to the roots
- also needed to create the pressure that holds up a plant.
- without water, the plant will wilt and eventually die.

**Generally, you want the soil to be moist, not wet, after watering. You then let the soil dry out before the next watering

Sunlight

- plants have the ability to make their own food by using carbon dioxide, water, and minerals using sunlight
- chlorophyll, the chemical responsible for making plants green, is needed to convert the ingredients to plant foods (sugars and starches)

- chlorophyll only exists in the presence of light, therefore plants need light energy so that chlorophyll is available to the plants.

Space

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- if space is small, the plants will be small and stunted
- big plants need big spaces for their roots and branches
- weeds and other plants that are too close take up water and nutrients that the plant needs to grow

Hands-on activity:

(Choose from list)

1. Print out/Copy the life cycle of a pea plant cards, cut, and give one to each student or break up in groups and give a set to each group for them to place in order
2. Have the students help water the plants
3. Have the students help weed around the plants
4. Show the students plants in various stages of the life cycle that are growing in the garden, help them identify seeds on the different plants

Debrief/Recap

Review the Lesson:

- Ask them to list the steps of the life cycle
- Ask them about what plants need to survive

Resources: http://www.cfaitc.org/lessonplans/pdf/401.pdf

Parts of Plants Scavenger Hunt:

Each clue (below) is read by a member of the group and then the group travels around the garden to locate the item described: root, flower, fruit, leaves, stem, and seed.

Takes in water and nutrients.

Attracts pollinating insects.

Protects or holds seeds.

Collects sunlight and makes food for the plant.

Transports nutrients, water, sugar, and starches.

Contains the embryo.

LIFE CYCLE OF A PEA PLANT (annual) **can start from any point since it is a cycle

Seeds germinate and a small root grows.	A small shoot grows out of the ground.
Underground the root is growing. Bumps on the roots trap nitrogen in the soil.	Flowers are developing and tendrils help the plant cling onto taller plants near by.
The shoot grows bigger with a stem and leaves.	The pea pods grow and inside the peas start to swell.
The pod becomes dry and splits, throwing the dry peas to the ground.	The dried peas are the seeds for next year's plants.

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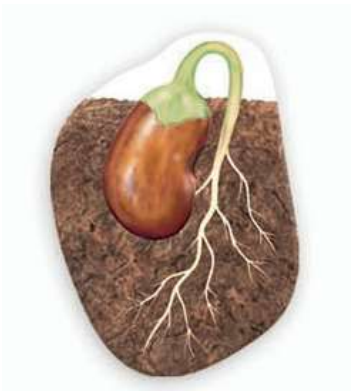

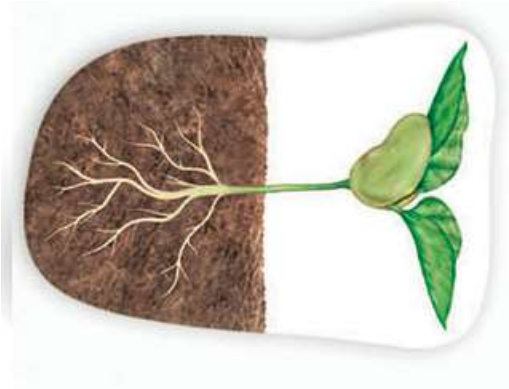

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Week 2: Soil/Compost

Objective:

1. To identify the components of soil
2. Understand the benefit of composting and its effects on soil

State of Virginia: SOL's

Science - Elementary: K.6, K.7, First Grade: 1.4, Second Grade: 2.5, Third Grade: 3.6, 3.7, Fourth Grade: 4.4, 4.5.

Ice Breakers:

Toss-A-Name-Game The objective of this activity is to gradually learn the names of all those in the group. This is achieved by first throwing a soft object (small soft objects, balls, or toys) around/across the circle, with each person saying their name when they catch the object. After a few minutes of this, as well as saying their own name, participants then also say the name of the person they choose to throw to. Participants cannot throw to the person directly beside them. Eventually, the game can be made more difficult by throwing in more objects.

Red Light Green Light: especially if the group is active

Summary: Run when the person says green. Freeze if the person says red.

Goal: Be the first person to tag the person in the front.

***Note: Before playing, let everyone know the boundaries of the playing/running area. If anyone exceeds those boundaries, they will*

*automatically be out of the game.***

- **How to Play Red Light Green Light:**

    1. Start the game out as being the person at the front. Have the kids line up at and end of the yard

    2. Rules of the game: If you turn your back and say "green light", the kids try to run and tag you. If you jump to face forward and say "red light", then the kids have to freeze- if you see anyone moving while there's a "red light", you need to call the person by name and they have to start over from the beginning.

    3. The first person to tag you is the winner of the game- this person can be "it" and be in front of the room to start a new game.

    4. **Variation:** - To make things more interesting, you can ask the kids to hop on one foot, crab walk, jump backwards, skip, or other actions to reach you.

Teacher background

Soil is composed of minerals and organic matter. Sand, silt, and clay are the mineral particles derived from rock broken down over thousands of years by climatic and environmental conditions (rain, glaciers, wind, rivers, animals, etc).

- The largest, coarsest mineral particles are **sand.** These particles are 2.00-0.05 mm in diameter and feel gritty in your fingers.

- **Silt** particles are 0.05-0.002 mm and feel similar to flour.

- **Clay** particles are extremely fine -- smaller than 0.002 mm -- feel sticky in your fingers when wet, and clump to the point that you can't see an individual particle without a microscope.

- **Organic matter** is the decayed remains of once-living plants and animals. Good plant growth and development depends on the mineral and nutrient content of soil, as well as its structure.

- Soil is teaming with life, including microorganisms like bacteria and fungi (billions in a single teaspoon!) and larger animals such as worms and sowbugs.

- Many of these underground inhabitants feed on remains of plants and animals, breaking down their tissues. In the process, they create pore space and release nutrients that plants need and the cycle begins again.

- Pore space -- the arrangement of soil particles in relationship to each other -- is an important

component of soil structure.

- In an optimal situation about 50 percent of the volume of the soil would be pore space, with half of that filled with water and half filled with air.
- The other 50 percent would be sand, silt, clay, and organic matter.
- Roots need air as much as they need water; plants can actually suffocate or drown if they are completely submerged in water for extended periods of time.
- The proportion of these different-sized particles affects the amount of air, water, and nutrients available to plants, and how the soil 'behaves.'
- The smaller the soil particles, the more they stick together when wet. Thus clay soils can be sticky and difficult to work.
    - Having fewer air spaces, they drain poorly and roots may suffer from a lack of oxygen, but clay soils can be rich in minerals.
- In contrast, sandy soils can drain water too quickly and be low in nutrients, but they are easier to work.
- **Adding organic material can offset many of the problems associated with either extreme.**
    - **This point drives home the importance of composting**
- While there's no such thing as a perfect soil, particular plants grow best in particular soils.
- In general, common garden plants prefer **loam** -- soils with a balance of different-sized mineral particles (approximately 40 percent sand, 40 percent silt, and 20 percent clay) and ample organic matter and pore space, but some common plants grow better in sandy conditions, while others are well adapted to clay soils.

Materials

- White board or large sized poster on easel
- Markers
- Large Mason Jars with lids
    - (#) depending on how many groups, each group will have 3 kids
- Masking tape and pencils for labeling
- Newspaper

- Water
- Trowels to dig soil samples
- Quart zip lock bags for collecting
- Alum (used for pickling can be purchased in drug/hardware stores

Description

In this activity students will collect samples of soil from various locations around the PG site, and then conduct a "soil shake" test to observe soil components.

Guiding Question

What is soil made of? Do different soils "shakes" make for better plant growth?

Big Idea

Soils are made up of a variety of materials. The ratios of these materials determine your soil type. Your soil type determines its characteristics for growing plants.

Preparation:

1. You will want to prepare the sites in which the children will take soil samples for their jars.
2. Make sure that the area is safe and clear of any poisonous plants.
3. Removing the sod before the children start to dig will speed up the process and make it easier for them to get to the dirt!
4. It would be helpful to have all of the supplies organized for each group (maybe in piles to the side).

Introducing the Lesson

Activate prior knowledge:

- Ask if students ever made mud pies when they were younger, or dug a pit in the soil, or dug a garden.
    - What did they notice about the soil?
    - Did they notice what it was made of?
- If you have a white board on hand you could ask the children to call out things they think are in soil and write them on the board.
- Explain that soils are not just "dirt" and are made up of a variety of materials, including rocks, coarse sand, silt and clay, and organic matter made up of dead leaves, twigs, stems and even parts of animals and plants.
- Different soils have different amounts of each of these things.
- This is why some soils are better to grow some plants or vegetables in than others.

Engage Student Interest:

- Tell them you are going to be soil scientists, and go around the PG farm digging small holes to bring back samples for us to study.

Break

Activity #1:

1. Have students **divide into small groups** (four per group) and take soil samples:
    a. From the garden (an area where plants are prolific and maybe a spot where things are not growing well
    b. The field
    c. A spot near the gravel lot
    d. Woods

e. Compost pile

f. Other places around the PG site

2. Instruct the groups to **dig about 4-6 inches deep** into the ground

   a. Explain that this is necessary in order to get most of the layers of soil.

   b. Also explain that the sod has been removed in order for them to get the soil

   c. Remember to tell them to remove surface debris that might be in their spot.

3. After they have collected their soil sample they will **place the contents in the bag** and head over to the gathering spot or wherever the instructor decides

4. Have the groups stay in their designated area (so that the samples stay separate)

   *the following instructions are for the children to do.

5. **Lay out newspaper** onto the ground or tables

6. **Spread the soil** sample onto the newspaper

7. **Crush any lumps** and **remove** large rocks, sticks or trash.

8. Ask one person from each group to **label the jar** (with masking tape and marker) according to where the soil was collected (i.e. the woods)

9. For each soil type/sample, **fill a quart jar, 1/4 full with soil.**

10. **Add water** until the jar is **3/4** full.

11. Add one tablespoon of **alum**.

12. Close the lid and **shake hard**.

***Make sure that the groups are sharing tasks between their members,

that way everyone can get involved. It might be a good idea to assign someone as the water person, another as the soil person, another as the alum person**

- ❖ The next section of the activity involves waiting for the soil to separate
- ❖ This might be a good time to do the composting activity which is listed as 2nd activity.

13. Let the jar stand for several minutes. (10 mins.)
14. Students will see that the mixture separates into layers.
15. The larger particles, such as coarse sand or rocks, will settle to the bottom of the jar.
16. The finer particles of silt and clay will form the next layer.
17. The material left floating on the top of the water is organic matter.
    a. It is made up of dead leaves, twigs, stems and parts of animals and plants.

Regroup and Discuss:

- As a group discuss how long it took for all the particles to settle?
- Did some soil samples take longer to separate than others?
- What do you think caused this to happen?
- Which soil had the most organic matter? Especially look at the compost jar!
- Which soil had the most rocks?

- The most clay?
- In which soil do you think plants would grow best?
- Draw a diagram of the layers of the board. (optional)

Wrap up:

- Have each group draw a picture of their soil jar, labeling the different layers.
- Make these into posters if there is time.

Activity #2

This activity focuses more on composting than the 1st activity. You could incorporate this activity into the 1st activity during the waiting time (when the components of the soil are settling in the jar) by just doing the action portion. Otherwise this lesson could stand on its own as one big lesson.

Lesson:

1. **Explain what compost is!**
    a. Decomposition is a big word for some students. Help them break it down (pardon the pun), and they'll find that de-(reverse) + compose-(put together) means "to take something apart."
    b. All living things -- an oak leaf, a moth's wing, a carrot top -- are constructed from basic building blocks, such as proteins and starches.
    c. Eventually, all die and become food to multitudes of bacteria, fungi, insects, and worms.
    d. In the process, these once-living materials are transformed into nutrients for plants, which provide oxygen and food for everything else on Earth.
    e. In this cycle, Nature exhibits no waste, and that's a good lesson for all

of us.

f. But she doesn't make haste -- **it can take millennia for decomposers to create a single inch of life-giving organic topsoil!**

f.i. That is what makes it is so valuable!

2. **A closer look at compost… the recipe!**

- Let's take a look at our own compost bin (take the kids over to the compost pile at the PG site)
- This type of set up allows for control of the four factors that affect the speed of decay
- Ask the kids… "Can anyone think of what these four factors might be?"
- The four factors to speed of decay are oxygen, water, food and temperature.
- Composting in a bin really speeds things up!
    - Remember before I said that it can take hundreds of years for the process of decomposition to occur?
- **Oxygen:** There must be plenty of air in the pile in order for the decomposition to work. Air circulation is an important factor in making a compost pile.
- **Food**: What are we feeding the compost pile?
    - There are two main groups of food we feed the compost pile: Brown and Green
    - The **'brown'** stuff is rich in carbon. (this is the base)
        - Carbon gives the micro-organisms energy to do their jobs.
    - Can anyone give me an example of a 'brown' food we would feed the compost?
        - Some examples: leaves, straw, grass clippings, shredded paper,

coir fiber, wood pellets, or sawdust

- The **'green'** stuff is rich in nitrogen. (then comes this layer)
  - The compost pile needs nitrogen in order to help the micro-organisms work properly.
- Any examples of green stuff?
  - Vegetable scraps, coffee grounds, grass clippings or manure

- There needs to be a good balance of these two materials to form good quality compost. Too much of either one will result in poor compost.
- A good compost pile is about ¼ **green matter to ¾ brown matter**.
- **Water**: The pile must be moist! This sustains microorganisms and helps them move from layer to layer.
  - This comes after the green layer; then you repeat starting with the brown layer.
  - **Temperature:** When all of this matter decomposes, heat is produced. The more heat the faster the decomposition of the pile! It is important for the compost pile to be just the right temp: not too cool and not too hot!

3. **How does it work? Why is it important?**
   a. All of these nutrients and micro-organisms add a lot of good things to soil
   b. It is a natural fertilizer and it's FREE!
   c. Another way to recycle instead of throwing more waste into the landfill
   d. A compost pile or bin makes a great home for earthworms, which make our garden super healthy!

Action:

1. Can you make your own compost pile?
2. Get into your assigned groups and see if you can stack these layers of the compost pile!
3. Hand out the cut-outs to the groups and have then build their own pile

Regroup and Discuss:

- When they are done explain to them the order once again the layers
    - Brown, green, water, brown, green, water, etc.
- Who can remember the benefits of composting?
    - Have kids shout out answers
- Ask the children if any of them could start compost pile at their house.
    - If so, ask them how they would do it!

Wrap up:

- Have the group members collect the cut-outs and place them in a pile
- If you are doing this while waiting on the jars to settle, now would be a good time to go back and check on them!

Resources

- http://www.benefits-of-recycling.com/howdoescompostingwork/
- http://www.dlm-online.net/portfolio/compost.jpg
- http://www.kidsgardening.org/node/1130
- http://tlc.howstuffworks.com/family/science-projects-for-kids-soil-experiments1.htm
- http://www.michigan.gov/kids/0,4600,7-247-49067-62499--,00.html

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This is the picture that will be used for the 2nd activity.

Cut out the blocks that build the pyramid. They might do well laminated so that they last longer.

Week 3: Eating From the Farm

Objectives:

- Students will be able to identify eight plant groupings by the end of teaching.
- Students will be able to list at least one food per grouping.

State of Virginia: SOL's

Science – Elementary: Kindergarten: K.7, First Grade: 1.5, Second Grade: 2.5, Third Grade: 3.5, 3.10, Fourth Grade: 4.5.
Health – Elementary: Kindergarten: K.1, First Grade: 1.2, Second Grade: 2.2, 2.5, Third Grade: 3.1, 3.2, Fourth Grade: 4.1, 4.4, Fifth Grade: 5.2 Middle School: Seventh: 7.2. High School: 9.2, 10.1.

Description: Familiarization with the foods on the farm and classifying foods by what part is eaten.

Materials:

Icebreaker 1	Icebreaker 2	Activity 1	Activity 2	Lesson
• Tape • Food cards	• Paper with name ideas	• Paper • Paint • Paintbrushes • Food items for "stamps" • Knife • Pens	• 3 Plates • 3 Containers (envelopes) • Food cards	• Activity sheets (as desired) • Pencils • Plant Parts Poster

Preparation: Determine ice breaker and activity choices. Gather materials. Familiarize self with lesson plan and objectives. Prepare print outs of desired worksheets.

Ice Breakers:

Option 1: Guess the plant – tape a plant picture to each child's back. Either allow a free-for-all or put the students in pairs. Have them help each other figure out what fruit/vegetable/etc… they are without saying the name. After both children figure out their plants they should sit down. See who can get done first. Can place description categories like: how you would eat it, what is it normally eaten in, or what it looks like.

Option 2: Name game - go around in a circle where everyone has to say their name and a fruit/vegetable/etc that starts with the same letter. (Ex: Kathryn-Kale, Tessa-Tomato, Eva-Eggplant, Madelyn-Mango, David-Dill). Then go around the circle again and see if everyone can remember the name and fruit/vegetable/etc of the person next to them (right or left). Have some options up for each letter that the kids can see in case they cannot think of any. If there is no option-have child pick their favorite.

Lesson: Eating From the Farm: Identifying Foods by the Parts we eat.

- Ask kids about the plants that they eat and create a list.
- Ask kids if they eat the whole plant.
- Discuss picture of plant parts & classifications of foods according to the parts of the plant eaten.
  - Parts: Root, Stem/Stalk, Leaves, Fruit, Seeds/Pods, Flowers/Buds, Tubers, Bulbs
- Provide definitions of the parts:
  - Fruit: items where seeds are surrounded by fleshy parts we eat
  - Vegetables: leaves, stems, immature flowers of plants
  - Roots: underground portion of plants that collect minerals & water from soil
  - Tubers: not a vegetable, underground swollen stem
  - Bulbs: underground stem and leaves
  - Seeds: the parts of the plants that can make new plants

  Definitions from: http://www.beagsmart.org/docs/lesson-plans/plant-parts-we-eat.pdf
- Refer back to list and have kids classify multiple foods by the part they eat.
  - Utilize a sheet of paper so kids can write down what goes in what category.

Learning Activity:

Option 1: Food Art: Supply a food in each category of plants (root, stem, leaves, fruit, seeds/pods, flowers, tubers, bulbs). Cut items to make "stamps" for the kids to dip in paint. Have children stamp each type into a collage and encourage them to verbalize the plant part they are using (potato is a tuber, etc…)

<u>Option 2</u>: Healthy Meal Relay: Divide group into three smaller groups and designate each a meal (Breakfast, Lunch, Dinner). Have the kids line up in their groups to start the relay. Place a plate and container with "foods" at desired distance from the kids. Encourage the kids to create a healthy meal with the food options in the containers. Encourage the use of as many different groups from lesson as possible. Have each child run to the plate, choose one food item to place on plate, run back and tag next child in their line to go. Repeat till all children have a chance to go (kids can sit down when they are done).

Wrap-Up:

- Ask kids to list the eight plant parts discussed during the lesson.
- Provide kids with a matching activity sheet to reinforce learning.
- Ask kids to explain how they would describe different plant parts to their brother/sister/mom/dad/grandparents/etc…

Bulbs	Roots	Tubers	Stems/Stalks

Leaves	Seeds/Pods	Buds/Flowers	Fruit

Match-Up!

Draw a line from the items on the left to the classification on the right

Carrot

Onion

Lettuce

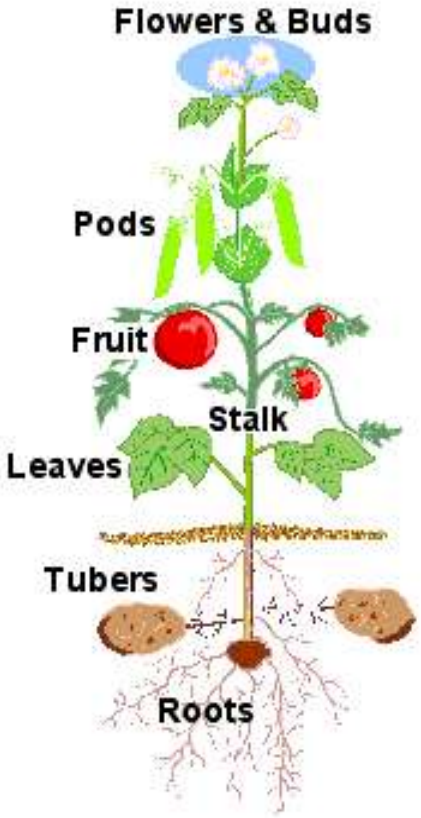
Celery

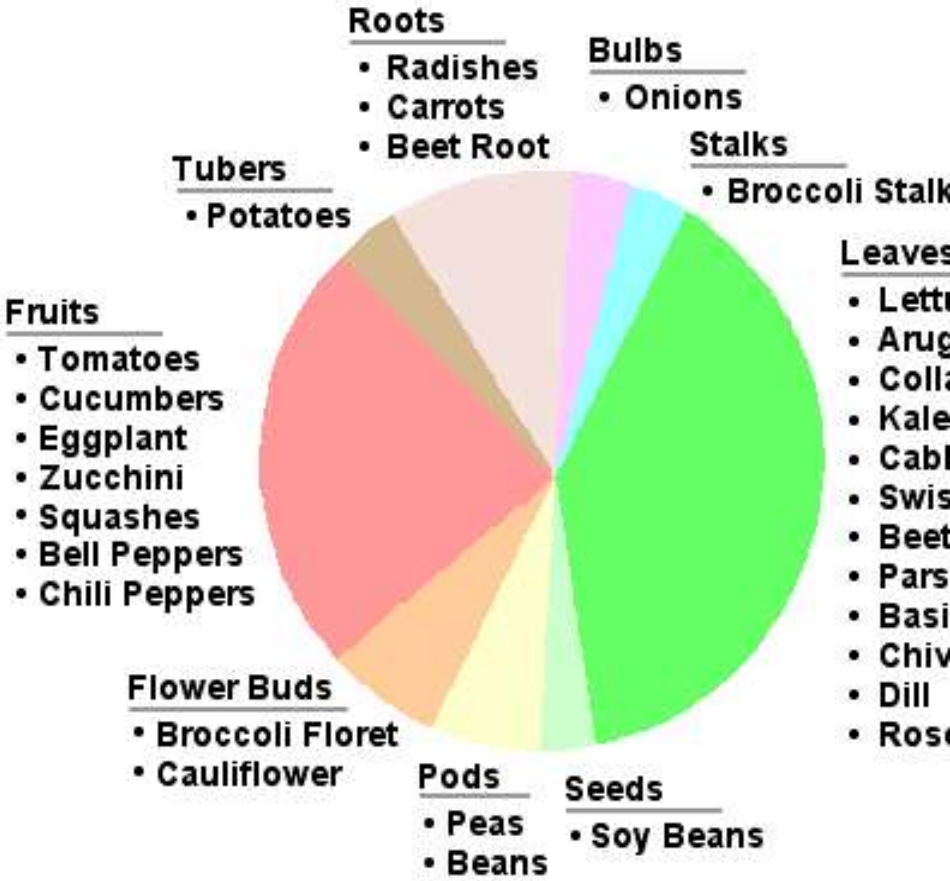
Peas

Broccoli

Tomato

Potato





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Week 4: Flowers and Plant Growth

Objectives:

- Kids will be able to identify functions of roots, shoots, stems, and leaves by end of teaching.
- Kids will be able to name and define the plant life cycle, to be assessed at end of teaching.

State of Virginia: SOL's

Science – Elementary: Kindergarten: K.7, K.9, First Grade: 1.4, 1.5, 1.7, 1.8, Second Grade: 2.4, 2.5, 2.7, 2.8, Third Grade: 3.5, 3.6, 3.7, 3.8, 3.10, Fourth Grade: 4.4, 4.5, Life Science: LS.6, LS.8, LS. 11.

Icebreaker/Activity #1 Options:

- Calming game (5-10mins): Kids pair off in groups of 2 (may need one group of 3). Pairs have 1-2 mins to ask questions and learn about the other. The group comes back together and pairs take turns telling the group good things about the other person. 15-30 seconds per person.
- Calming game (3-5mins): Stand in a circle. A teacher will start as an example by listing their name, and something interesting about themselves. Go around the group and everybody will do the same. Afterwards see if anyone can remember every name in the group and the interesting fact!
- Active game (5-10mins): Kids play freeze tag. 1-3 persons are "it" and a boundary is designated. Kids who are "it" chase and tag others. If a person is tagged they have to "freeze" where they are. "Unfrozen" people can tag them to "unfreeze" them. The people who are "it" win if they can freeze everybody at once. The game can also be ended by the teacher when needed (can carry on).

Main Lesson:

1. Plant Anatomy & Growth

Basic vascular plant parts

- Roots: Two main functions
  - Anchors the plant.

- Transport system from soil to plant. Brings water and nutrients to support plant growth.

Hints: Have a kid or another leader stand in front like a plant and ask them to be really steady. Then gently push them off their footing. Compare to a plant and the importance of roots.

- Shoots: Growth

  - Tender plant tissue enabling the plant to grow taller.
  - Allows the plant to access more light for energy.
  - Stems and Leaves part of the shoot system.

  Hints: Find an example in the garden to hold up and show.

- Stems: Structure

  - Provides mechanical structure for the growing plant.
  - Supports continued outward and upward plant growth.
  - Full of transport pipes called *xylem* and *phloem.*

  Hints: Have the kids stand up straight. Now tell them to pretend they have no bones and no muscles. Relate this to the need for stems as structure.

- Leaves: "Solar Panels"

  - Capture sunlight for energy in a process called *photosynthesis.*
  - Use water and nutrients for work.
  - Produces sugar for the plant.
  - Richly veined for this import/export through *xylem* and *phloem* pipes.

  Hints: Ask kids to think about a sunny day when they were wearing a black shirt. Think about how you can feel the suns heat being absorbed into the shirt. Relate this to how a leaf needs leaves with a big area to soak up the sun for energy. Alternatively if the sun is shining ask kids to tip their faces up and close their eyes to feel the sun on their skin, and then relate that back.

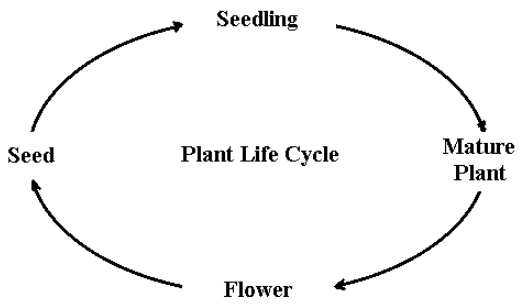
Resource info: #1

http://www.dummies.com/how-to/content/plant-biology-roots-shoots-stems-and-leaves.navId-323259.html?print=true

2. Plant Life Cycle

- Seed: Created from male and female structures in flowering plants.
- Seedling: A seed that has sprouted.
- Mature Plant: Plant has reached adulthood.
- Flower: Part of a mature plant that has male and female parts to start the cycle over!

Hints: Hold up Plant Life Cycle Diagram. At the end and ask if kids can raise their hands to describe one of the stages.



Resource Info: #2

http://www.kean.edu/~fosborne/resources/ex6c.htm

Activity #2 Options:

- Scavenger Hunt (5 mins): In teams of 3-4 kids will have to go and find a root, shoot, stem, and leaf to bring back and show (outside the garden). Instruct that kids should only take dead or fallen samples (could be difficult to find, but up to teachers discretion).
- Life Cycle Skit (7-15 mins): Kids split into groups of 3-4 and are instructed to act out the life cycle of the plant creatively and incorporating what they have learned. 3 mins for planning, 30 seconds to show the group.

References

Mikulecky, P., Gilam, M., & Peterson, B. (2008, March). Plant biology: Roots, shoots, stems, and leaves. Retrieved from http://www.dummies.com/how-to/content/plant-biology-roots-shoots-stems-and-leaves.html

Osborne, F. (2005). Plant Life Cycle. Retrieved from http://www.kean.edu/~fosborne/resources/ex6c.htm

Week 6: Insects/Bees/Pollination

Objectives:

1. To understand the importance of pollination and how insects facilitate that process.
2. To identify insects that are helpful and harmful to a garden

State of Virginia: SOL's

Science - Elementary: Kindergarten: K.7, K.9, First Grade: 1.4, 1.5, 1.8, Second Grade: 2.4, 2.5, 2.8, Third Grade: 3.5, 3.8, 3.10, Fourth Grade: 4.4, 4.5, Life Science: LS.4, LS.8, LS.11.

Materials:

-Visual poster of parts of a plant (or look at a flower in the garden)

-Set of insect/creature cards (beneficials and pests)

-Sunflower head (optional but if available may be helpful in showing the children what pollen is like)

- The Very Hungary Caterpillar by Eric Carl (ice breaker option)

-Insectlopedia by Douglas Florian is another fun book of silly rhymes about different insects. Could be a fun ice breaker option or just fun reading if extra time at the end.

-paper and pen to write D'Juno facts, D'Juno clues, and envelopes (ice breaker option)

-Game bag with supplies to play pollinator game

-10 Velcro bandanas/cloth

-20 ping-pong balls with Velcro attached

-20 Flowers cut out of colorful paper

Ice Breaker:

Option 1: Reading of The Very Hungary Caterpillar (dramatic?)

----------or----------

Option 2: D'Juno (Did you know?)

The Idea: The leader hides an envelope (the D'Juno!) that has garden-related facts enclosed (see samples below). The object of the game is to use clues to discover the location of the envelope containing this new information about the garden, thereby becoming the winner of the D'Juno Award!

Preparing for the Game:

Decide what facts you want hidden in at each site. See below for suggestions to get you started. Write or type each fact and then stick them in envelopes (suggestion of 1-2 facts per envelope) to be hidden at the garden site. They can just be random fun facts or they can pertain to the information you will teach in the upcoming lesson or they can be related to the site where the fact is hidden. The possibilities are endless. **You may want to do this a few days before the activity**

Before the children come, him the D'Juno facts in their respective locations. It may be helpful to label each envelope for a specific group to find to minimize confusion as the search ensues.

When the children have arrived, split them into four groups. Then hand each group one clue (see below).

Explain that the clue will take them to a place where they will find a D'Juno fact. This fact will be shared with the entire group. If they are unable to figure out the location with solely the first clue, hand them the second one. Instruct each group to locate the D'Juno and read it together as a group. Once all the groups have found their clues, have them sit together in a circle and share what they found.

Optional: Ask them what they recalled from previous weeks that helped them locate the D'Junos (feel free to develop your own individual clues too).

Group 1: Location of D'Juno is at the compost bin

1. Where matter breaks down to become new ground.
2. Weeds from the garden, scraps from the table; it all goes here, under this label.

Group 2: Location of D'Juno is at the sunflowers

1. Here I stand, tall and bright. Things with wings to me take flight.
2. I shine as the sun, my color is yellow. My presence in the garden is not unnoticed or mellow.

Group 3: Location of the D'Juno is at the tomato plants

1. I am a vine; up up I climb. And what I produce, well it tastes just fine.
2. By the sun's radiant warmth my produce blushes bright; red is the color of this fine delight.

Group 4: Location of the D'Juno is at the blackberries

1. Though my taste is quite sweet; use caution I warn, small daggers protect, fruit guarded by thorn.
2. Black as the night this fruit may be, but have a taste to experience the goodness you see.

D'JUNO Facts (to be hidden at the sites)

These are ideas to get you started. Feel free to use whatever facts you like!

-An earth worm's body is made up of 80% water![2]

-The hummingbird is one of the smallest birds in the world weighing only 1 oz![2]

-The average caterpillar has 4,000 muscles and 240 in its head alone! Caterpillars are in the larval stage of moths and butterflies. [3]

-Dragonflies can fly up to 20 miles per hour! They can hover and fly backwards too. These insect-devouring hunters are a welcome sight in any garden as they consume gnats, beetles, and mosquitoes. [3]

-You can tell the temperature outside by listening to a cricket! Count the number of chirps in 15 seconds, then add 37. The sum will be approximately (not exactly) the Fahrenheit temperature outside.[3]

-In Italy the tomato is referred to as a *pomodoro*. In Frace they call it a *tomate*.[7]

-The heaviest tomato on record is 7lbs 12oz. It was grown by Gordon Graham in Edmond, Oklahoma in 1986 and he used it to make sandwiches for 21 family members.[7]

-Bees can fly up to 15 miles per hour![5]

-Bees travel a distance of up to 4 times around the earth in order to produce just 2 lbs of honey.[5]

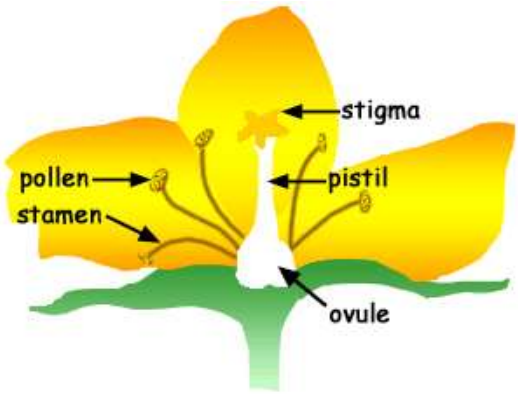
-Honey bees are the only insects that produce food for human consumption. [5]

Lesson Plan/Information:

Teacher Background:

-Pollen is a fine, powdery substance (that is often sticky) produced by certain plants as part of the process of creating seeds. *Why is it important for plants to produce seeds?*

-Pollination occurs when this powder moves from the stamen to the stigma of the plant. The movement can happen several different ways: insects and birds can help transfer it as they come to the plant to eat; the wind can blow pollen from plant to plant; and sometimes people even transfer pollen from one plant to another.



-Flowers that depend on insects or birds to spread pollen are brightly colored and often have a strong scent. This is the plants way of attracting these insects and birds to it.

-Common insects that contribute to the spread of pollen and garden health are bees, butterflies, moths, lady bugs, and praying mantis

-The hummingbird also contributes significantly to the spread of pollen from plant to plant.

-Insects and hummingbirds come to the flowers to eat the nectar (this does not hurt the plant), and as they are getting the nectar, which is at the base of the plant, pollen rubs off onto their body and wings. As they move through the plant, they spread pollen to the stigma. And as they move from flower to flower they also spread pollen from one flower to another, called cross-pollination, which allows for greater variety among plants.

-The relationship that flowers and these beneficial insects share is called symbiosis: the flower is pollinated and the insect is nourished by the nectar.

-Gardens also contain insects and animals that are not beneficial and may cause harm to the plant as it is growing. Some examples of these are: aphid, scale, wasp, cockroach, potato bug, ants, some caterpillars, mice, snails, and slugs. These creatures damage plants in the garden by eating away the leaves or roots, which the plant needs to grow.

-To promote garden health and keep pests away, you should remove dead flower heads and leaves from living plants and remove leaves that have aphids on them. Here at the farm we use Remay or floating row cover on our seedlings to protect them until they are large enough to endure some pest abuse. Bacillus Thuringiensis (Bt) is an organic pesticide we use to control cabbage looper on our cabbage, kale, collards, and broccoli. Entrust (spinosad) is another common organic pesticide used to ward off unwanted pests. Diatomaceous

earth is another method of organic pest control that can be used as well as insecticidal soap. There are also some plants that flower early which may attract animals which ward off pests. An example is planting buckwheat which attracts parasitic wasps. These wasps lay eggs on pests like the cabbage looper and tomato hornwarm. We avoid the use of chemicals because it can harm our crops and the environment.

Discussion (approx 10 min):

Start in a round circle discussion. May move around garden as helpful. Have visual aids available.

-Explain to children what pollen is. Maybe use a sunflower head to show them pollen?

-Discuss how pollination happens (spread through certain insects, hummingbirds, and wind). A diagram of the parts of a flower may be helpful for this too as well as pictures of insects.

-Ask children to look around and list how many colors they see in the garden. Ask them why the garden might be this colorful. Then (preferably standing next to plants that have a particularly strong scent) ask the children to close their eyes and take a deep breath through their nose. What do they smell? Then ask them how this might be important to pollination (attracts insects so the pollen can be spread)

-Why do you think pollination is important? Do you think we could eat apples or bananas or (whatever food you want to say) without pollination?

-Next, ask children if they think all insects they see in a garden are beneficial. Talk about insects/creatures that are harmful (have cards with pictures to provide visual aids): aphids, scales, caterpillars, slugs, ants, wasp, potato bug/beetle

-Show pictures of beneficials and pests and have the children categorize them together as a group.

Optional discussion points:

-Discuss what we do at the farm to cut down on the amount of pests here

-Discus what we do at the farm to attract pollinators.

Interactive Activity:

Pollination Game

From: http://treeonline.wordpress.com/kindergarten/activities/the-pollination-game/

Background:

Many plants need to be pollinated in order to produce seeds and/or fruit. Pollination is the transfer of pollen grains from one plant to another. Insects like bees or butterflies pollinate many plants. Bees are especially used in agriculture: some farms have their own beehives to pollinate their crops, or have beehives brought in to pollinate. Bees visit flowers to collect nectar, which they turn into honey, and some pollen, which they eat for food. When a bee lands on a flower to do this, extra pollen sticks to the tiny hairs on its body (see pictures below). When the bee then flies to another flower, some of this extra pollen falls off on the new plant, and thus the plant is pollinated!

When bees collect pollen to bring back to the hive and eat, they collect pollen into "baskets" by their knees (See pictures). This is why the Velcro strips are tied to the students' knees in this activity.

Game:

Warm Up

Ask students how many of them like to eat fruits and vegetables, honey, or enjoy looking at flowers. Using background information, explain that almost all fruits and vegetables need bees in order to grow! Explain that many flowers have something called "pollen" (see Pictures section of this document for helpful visuals). As bees fly from flower to flower to drink nectar—a sugary drink, like they would drink juice or Gatorade—the balls of pollen stick to their bodies. Explain that bees make honey from the nectar they collect as part of this process.

Activity

Tie Velcro bandanas gently around the knees of students (smaller groups of 5 to 10 students taking turns is easiest, although each student can get one bandana and have ~20 students at once). Spread ping pong balls around and explain to students that the **ping-pong balls represent the much smaller balls of pollen on a flower**. Optional: cut large flowers out of paper and spread out in open space, with ping-pong balls on top of flower. If you have a blacktop area, try drawing the flowers on the pavement and concentrating the ping-pong balls on top of each flower. This is not necessary but helps drive home that the pollen is located ON flowers in nature.

Explain to students that **they need to pick up the balls by bending their knees, and not using their hands, as bees don't have hands to pick up the pollen either**! Ask students what sound bees make as they fly around, and then have them buzz as they run. You can either limit the number of ping-pong balls each student picks up so everyone gets an equal chance, or have a competition to see who can get the most. Maybe divide children into teams of four and have a basket or bucket (their "hive") where they bring the pollen to. You can play a few rounds to allow for more teams to have opportunities to win.

Depending on how many students you have, you can repeat this activity multiple times. If the students seem to grasp the activity well so far, try adding other variables like spreading the pollen out further (as if the flowers/trees were farther apart) or make the children run slower as if it were cold outside. Also try having random moments where you yell "Cross-pollination". When this happens, each child that has a ping pong ball attached must move it to a different flower rather than return it to their hive. The next piece of pollen they

pick up must then be from a different flower. Another element that could be added is the option of stealing pollen from the hive (this happens when bees are distressed, as I understand). This would require the teams to come up with strategy as they collect pollen. It may work well to set a time limit on the collection and play multiple rounds.

Wrap Up:

Collect all game materials. Ask children to help collect flowers and ping pong balls. Once materials are collected, sit in a circle for closing discussion.

Have students describe how pollen gets on bees. Ask them why pollen and bees are important (needed to get the fruits and vegetables we all enjoy!). Ask them what their favorite fruit is (strawberries, cherries, etc.) to help them really understand that they need bees in order to enjoy these fruits. Ask them if we should be afraid of bees or if bees help us. *What insects are concerning to the health of the garden (optional).*

Snack Suggestion: Fresh fruit (such as apples, strawberries, black berries, etc) that is pollinated bees

Digging Deeper:

-Read The Very Hungary Caterpillar or Insectlopedia

-Do a variation of the D'Juno game as time allows if it wasn't used earlier.

Week Six: Printable Resources

1. Where matter breaks down to become new ground.

2. Weeds from the garden, scraps from the table; it all goes here, under this label.

3. Here I stand, tall and bright. Things with wings to me take flight.

4. I shine as the sun, my color is yellow. My presence in the garden is not unnoticed or mellow.

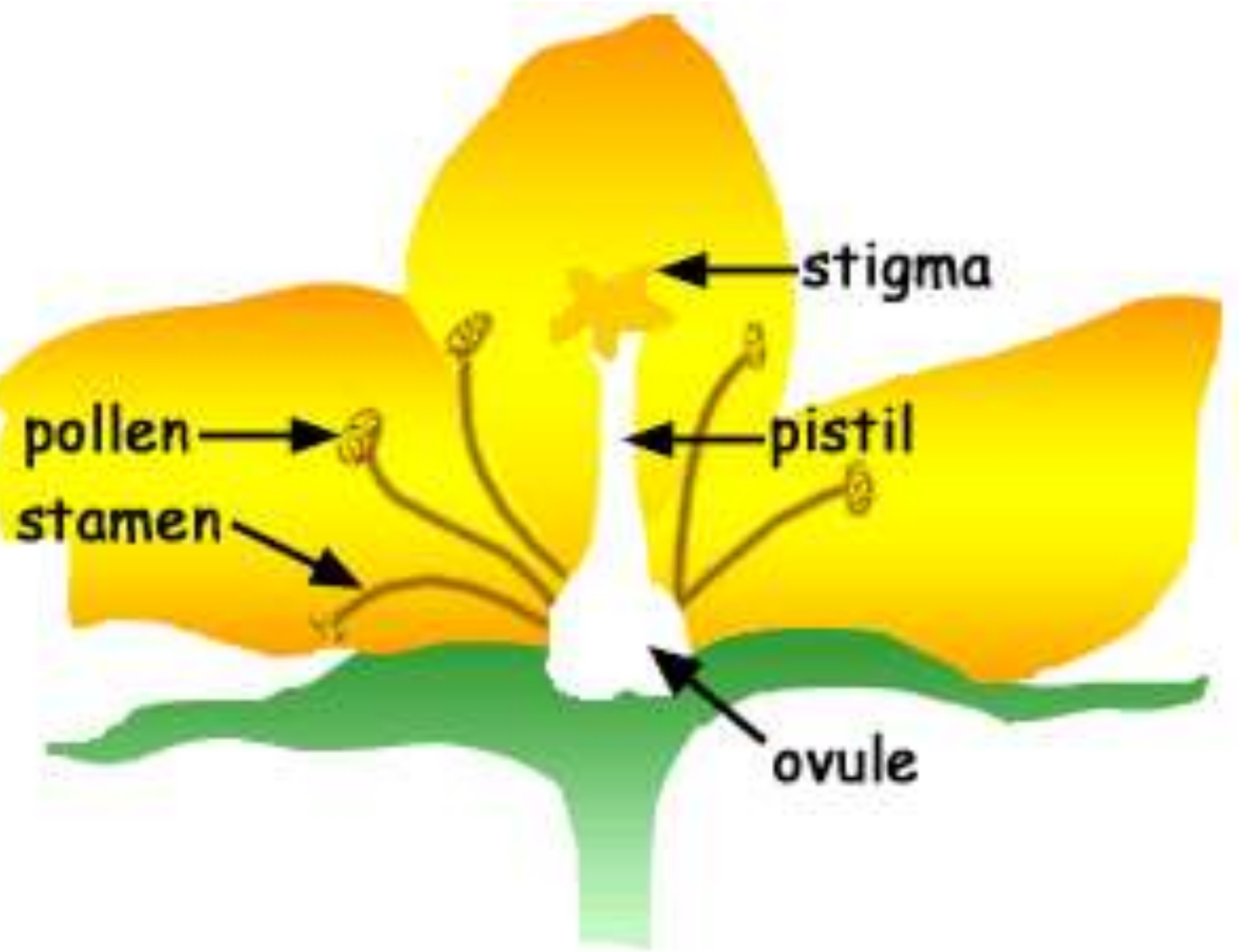
5. I am a vine; up, up I climb. And what I produce, well it tastes just fine.

6. By the sun's radiant warmth my produce blushes bright; red is the color of this fine delight.

7. Though my taste is quite sweet; use caution I warn, small daggers protect, fruit guarded by thorn.

8. Black as the night this fruit may be, but have a taste to experience the goodness you see.

PROJECT GROWS
Grow. Eat. Enjoy.



Insect Cards: to Print

PROJECT GROWS

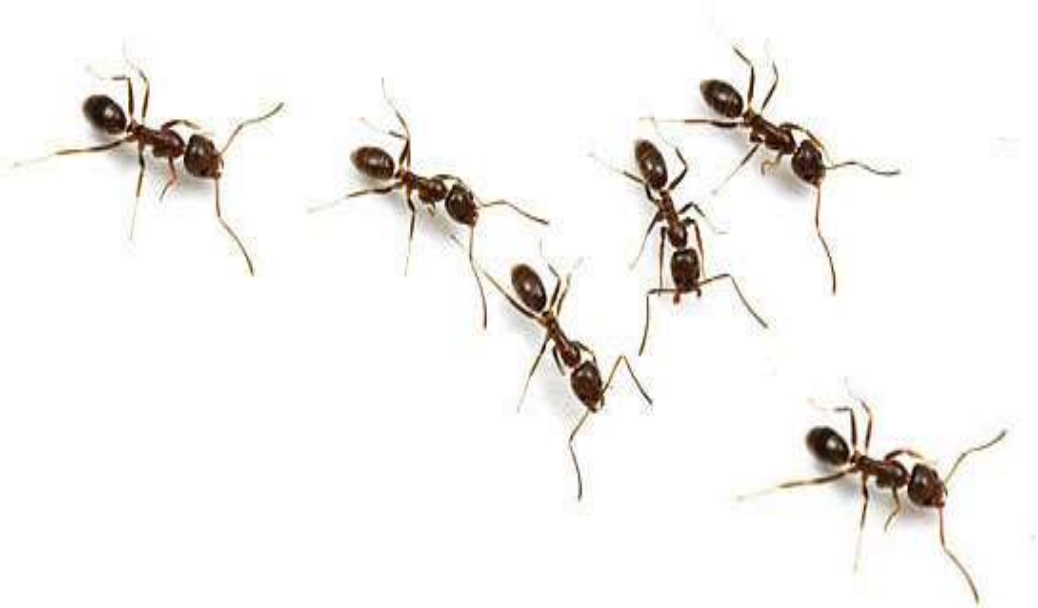
Grow. Eat. Enjoy.

Insect cards to print

Insect cards to print

GROWS
Grow. Eat. Enjoy.

Insect cards to print



Insect cards to print

Insect cards to print

PROJECT GROWS
Grow. Eat. Enjoy.

Resources

[1]Coevolution Institute. (2003). Pollinator gardens and habitat programs: Curriculum and activities. Retrieved April 2013 from: http://www.pollinator.org/Resources/CoE%20Gardens%20Curriculum.pdf

[2]Gardening with children (2013). Fascinating facts. Retrieved April 2013 from: http://www.gardeningwithchildren.co.uk/kids-zone/fascinating-facts/

[3]Leland, T. (2008). Did you know? Fun facts in the garden. Retrieved April 2013 from: http://davesgarden.com/guides/articles/view/1781/#b

[4]Missouri Botanical Gardens. (2009). Biology of plants: Pollination. Retrieved April 2013 from: http://www.mbgnet.net/bioplants/pollination.html

[5]No author (2013). Bee product facts. Retrieved April 2013 from: http://www.bee-propolis.com/bee-facts/

[6]Strickler, K. (2007). What is pollination: Some definitions. Retrieved April 2013 from: http://www.pollinatorparadise.com/what_is_pollination.htm

[7]TomatoDirt.com. (2012). Tomato facts: Fun information and trivia. Retrieved April 2013 from: http://www.tomatodirt.com/tomato-facts.html

PROJECT GROWS
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