LESSONS ABOUT BUGS AND DECOMPOSITION

Lessons compiled by

The New Jersey Agricultural Society's

LEARNING THROUGH GARDENING

Program

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BEES ~ THE GREAT POLLINATORS

A lesson from the New Jersey Agricultural Society Learning Through Gardening program

OVERVIEW & PURPOSE

Students play a game in which they pretend to be honeybees and flowers. In the process, they learn about plant pollination.

GRADES: 3-5

BACKGROUND INFORMATION:

Honeybees are extremely important pollinators. They collect pollen and nectar from flowering trees and plants and transfer pollen from flower to flower. Bees pollinate 95 different crops, helping to create nearly one-third of the world's food supply. When bees visit flowers, they are mostly looking to collect nectar, not pollen. Nectar is a very sweet liquid made by flowers to attract pollinating insects. Flowers produce nectar in a part called the nectary, which is located inside and at the bottom of the petals. When gathering the nectar, pollinators brush against the stamen and the pistil, the parts of the flower that are used for reproduction. When pollen is transferred from the stamen to the pistil, fertilization takes place, and the flower can make seeds. Honeybees use the nectar they gather from flowers to make honey. Honey is made from nectar, not pollen. Honey is the only commercial food produced by insects that is normally eaten by humans. Honeybees do collect some pollen, which they mix with nectar in the hive to make bee bread. Bee bread is fed to the hive's newborn larva to help them develop into bees. Pollen is also mixed into food called royal jelly that is fed to larvae that will turn into queen bees.

OBJECTIVES

The student will be able to:

- Define pollination and pollinators.
- Describe the important role of bees in pollination.

MATERIALS NEEDED

for a class of 25)

- mini (5mm) orange pompoms (about 100)
- 16 large (1") yellow pompoms

- 16 small paper or plastic cups
- Yarn
- 16 drinking straws
- 16 jewelry or snack Ziplock bags

PREPARATION

Punch a hole in each bag in the middle above the zip lock.
Cut 16 pieces of yarn long enough for a necklace.
Thread the yarn through the hole in the zip lock bag.
Tie the ends of the yarn together to make a necklace.
Optional thirty-two black chenille stems
Construction paper, twenty-five pieces.

INTRODUCTION

Most plants need to be pollinated to produce seeds or fruits. Pollination happens when pollen grains in flowers are transferred from the stamen (male part) to the pistil (female part). Without pollination, plants will not produce fruit or seeds. Many plants are pollinated by insects such as bees, ants, flies, butterflies, and wasps. Bats and birds such as hummingbirds also can pollinate flowers. The insects and animals usually have wings and fly quickly from flower to flower. The pollen of one flower sticks to their hairs, feathers, or scales. Then when the insect or animal flies to another flower, the pollen falls off, causing pollination.

ACTIVITY

Ask students what they know about bees and why bees are important to people. Ask: Why do bees visit flowers? What do they get from a flower? What is nectar? What does a bee get on its legs and body hair when it flies into a flower to get its nectar? What happens to the pollen collected on a bee's body when it flies into another flower? What happens when a flower is pollinated? What would happen if the flower were not pollinated?

Tell students they are going to play a game to dramatize how flowers are pollinated. For a class of twenty-five students, choose 8 students to represent flowers, 16 students to represent worker bees, and 1 student to represent the queen bee.

The numbers of flowers and worker bees may vary according to class sizes. Extra students can also represent the worker bees and drones that remain in the hive.

OPTIONAL:

Students can create construction paper headbands to differentiate flowers, worker bees, and the queen bee. Draw and cut out flowers to glue onto the flower headbands. Create antennae using chenille stems to staple onto the worker bee headbands. Cut out a crown-shaped headband for the queen bee.

Choose a large area, preferably outdoors, to serve as the “garden” and a smaller area to the side of the garden to serve as the “beehive.” Each flower will hold one container of mini pompoms to represent pollen and one small paper cup of water to represent nectar. The flowers will choose a location inside the garden in which to stand. Ask each flower to count and record the number of mini-pom poms before the game starts.

Each worker bee will carry one large yellow pom pom to represent the bee's hairy body. Each worker bee will wear one small ziplock bag tied with yarn and worn as a necklace to represent the honey sac. (To make playing the game easier, the students should unzip the bag before the game starts.)

The worker will carry one straw to represent the proboscis, the bee's long, narrow mouthpart. The worker bees will begin at the beehive with the queen, drones, and other workers whose duties require them to work inside the hive.

When the queen bee gives the command, the worker bees will leave the hive in search of nectar from flowers. When worker bees find a flower, they will land their large yellow pom poms into the container of mini pom poms. The workers will then simulate gathering nectar with their proboscises by filling a straw with a little water, using their finger to create a vacuum. They will deposit this water into the ziplock bag. When the worker removes the large pom pom from the container, the tiny pom poms will stick to the larger pompom much the same way pollen sticks to the hairs of a bee when it visits a flower.

After collecting nectar and pollen from one flower, the worker will find a new flower to visit. Here, the workers will brush off some of the pollen collected from the previous flower into the new flower's container. They will then collect more nectar and pollen before visiting another flower. Once the worker bee has filled their honey sac with nectar, they will return to the hive with the sac and the pollen that remains stuck to their bee body

For this simulation, the worker bee must collect nectar and pollen from each flower before visiting a flower a second time, and only two bees may visit the same flower at once. Trade roles and repeat the simulation so everyone has a turn to be a bee.

EVALUATION:

Ask students to draw a sequence story of the bee game, including how plants are pollinated. Ask students to write a paragraph or essay describing why bees are important in the pollination process. Ask students to research what conditions could impact pollination such as cold, drought, or rainy weather, or a disease in the hive.

EXTENSION:

Read books about bees, such as:

- The Beeman, by Laurie Krebs and Valeria Cis
- The Honeybee Man by Lela Nargi and Kyrsten Brooker
- The Honey makers by Gail Gibbons
- Give Bees A Chance by Bethany Barton

NEW JERSEY LEARNING STANDARDS

Science: 3: LS1.B 4:LS1.A 5:LS1.C English Language Arts: 3:W.3.2.A-D, W.3.4,8 4:W.4.2.A-E, W.4.4,8 5: W.5.2.A-E; W.5.4,8

Lesson courtesy of National Agriculture in the Classroom

DANCING LIKE BEES

A lesson from the New Jersey Agricultural Society Learning Through Gardening program

OVERVIEW & PURPOSE

Get your students moving with this lesson that teaches them how bees communicate with each other. Teach them the “Round” Dance and the “Waggle” Dance and send them out to find a treat.

GRADES: 2-5

OBJECTIVES

The student will be able to:
• Demonstrate how bees communicate the location of food through different movements.

MATERIALS NEEDED

- Bags of treats (candy, cookies, honey sticks, raisins)
- The number of bags depends on the number of teams – you'll need one bag per team.
- A copy of Honey, I'd Love to Dance sheet for each student.

INTRODUCTION

Ask students how humans communicate non-verbally (body language, hand signals, facial expressions). Have a few of them demonstrate in a charades-type manner.

Have students read the Honey, I'd Love to Dance sheet or read it aloud as a class. Review the messages bees communicate through their dances. Review and model both dances and what each movement means. Tell the students they now could find food (treat bags) and to communicate its whereabouts to fellow team members.

ACTIVITY

This activity requires a lot of room – do it outdoors if possible. Divide the class into teams of four. Have each team choose a scout – the bee that originally found the food source and needs to communicate its whereabouts through bee dances to the team members.

Give each scout written directions to a different treat bag and send the scouts out to find them. Do not let the other students see their search. When the scouts return, have them communicate the direction and distance of the treat bag to their team members using either the Round Dance or the Waggle Dance.

No verbal or “human” body language is allowed. Once all the teams have found their reward, follow-up with a class discussion about the ease or difficulty of communicating through dance. Is it difficult to judge distance without a tape measure or other tool? Do they believe honeybees are intelligent creatures?

EVALUATION:

Successful completion of the dancing bees activity.

NEW JERSEY LEARNING STANDARDS

Science: 2:LS2.A 3:LS1.B 4:LS1.A 5:LS1.C

Honey, I'd Love to Dance

Honeybees communicate with each other by dancing. After a honeybee has found food, she tells the other bees the location of the food when she returns to the hive. The bee will dance on the honeycomb, while the other bees feel the dancing bee's movements and learn where the food is. By smelling the dancing bee and getting a taste of her load of nectar, the other bees can tell what type of flower she has visited.

Different dances are done used when the food is close to or far away from the hive. Bees have receptors on their feelers and legs that they use to feel the dance.

There are several bee dances, but the most common are the Round Dance and the Waggle Dance.

Round Dance

When food is close to the hive (less than one hundred yards), a worker bee performs the Round Dance. She goes round and round, first one way and then the other. The round dance does not show the exact location of the flowers so fellow worker bees must fly out in a circular pattern near the hive until they find the flowers.

Waggle Dance

If the flowers are more than one hundred yards away from the hive, the returning bee performs the Waggle Dance. The dancing bee makes a figure-eight. She waggles her body in the middle. If a bee waggles straight up, the other bees fly toward the sun to find the flowers.

If a bee waggles to the left, the other bees fly to the left of the sun. If a bee waggles to the right, the other bees fly to the right of the sun. The distance between the hive and the food is communicated by the speed of the dance and the buzzing sound made by the dancing bee. The faster the worker dances, the closer the food. The waggle dance shows both location and distance of the flowers, so the bees know where to fly.

DECOMPOSITION - HOW NATURE RECYCLES

A lesson from the New Jersey Agricultural Society Learning Through Gardening program

OVERVIEW & PURPOSE

Nature recycles constantly, and a great way to demonstrate this to your students is by making compost. Composting also saves you money because you won't have to buy fertilizer! You don't need fancy equipment, a patch of ground protected from critters or a large storage tub with some holes drilled in will work fine. This lesson explains how compost works.

GRADES: K-5

OBJECTIVES

The student will be able to:

- Explain what decomposition is and why it is an important natural process.
- Explain how gardeners can recycle vegetable scraps, dead leaves, and other plant material in a compost pile to make free fertilizer.

MATERIALS NEEDED

- "Decomposition - How Nature Recycles" New Jersey Agricultural Society PowerPoint presentation, https://youtu.be/_81SRm8mfeE
- One gallon-size baggie per small group of students Green and brown plant material students have brought from home
- One cup of soil from the garden (do not use potting soil)
- Spray bottle
- "This homework is garbage" sheet
- "What can be in compost?" sheet

PREPARATION

Note: For this lesson, the homework assignment "This Homework is Garbage" should be sent home two or three days ahead of the scheduled lesson so that students have time to collect green and brown plant matter for composting.

ACTIVITY

Show and discuss the power point presentation “Decomposition - How Nature Recycles.” Remind students what happens to all the leaves that fall from the trees every autumn. Why don't we have to wade through huge drifts of leaves when we walk through the forest?

A natural process called decomposition breaks down the leaves and turns them back into soil or humus. Molds and microscopic animals called bacteria that live in the soil recycle dead plants and animals. The decomposed plants and animals make compost. Compost added to any soil makes it healthy and better for plants. Humus is the rich top layer of garden soil that helps hold on to water and provides valuable nutrients for plants. Tell students today we are going to learn a way that gardeners can use the decomposition process to make their own supply of rich humus for their plants. The process is a type of natural recycling called composting.

Explain the four key elements of composting: green plant matter, brown plant matter, air, and water. Ask students what might be included in the green and brown plant matter categories. Ask students to put one cup of green plant matter, two cups of brown plant matter, and a cup of soil into a gallon-size baggie. Stir all the materials well. Mist it with water until the plant matter is moist but not soggy. Keep the baggie in the classroom so that students can watch the decomposition process.

NOTE: The decomposition process will be quicker if the plant matter is cut or shredded into little pieces.

Next, ask the students to place the rest of the “homework” green and brown plant matter in the garden in a composting container or area. (See instructions below on how to make a compost bin from a storage container.) You can also simply place the compost in a pile on the ground out of the way of foot traffic. Ask students to mix the plant matter and water it until it is moist. Continue to stir the compost in the baggie every day and add a little water when it looks dry. The bacteria in the soil will turn all the waste material into brown compost in about six to 10 weeks.

EVALUATION:

The student will be able to define humus, compost, and decomposition. The student will be able to list the four key elements of compost and explain how compost is made. Students write a short explanation about why composting is important and how to do it.

EXTENSION:

- Ask students to record the change in the contents of the baggie. Discuss which materials decompose first, which materials take longer to decompose, and why this might happen. Ask students to track the time it

takes for the waste material to decompose and turn into rich compost. Use the compost to plant some seeds.

- Read:
  - Compost Stew by Mary McKenna Siddall's
    Garbage Helps Our Garden Grow, by Linda Glaser.

- Talk to the cafeteria manager about starting a school-wide lunch composting program.

NEW JERSEY LEARNING STANDARDS

Science: K:ESS3.A,C 1:LS2.A 2:LS4.D 3.LS1.B 4:LS1.A 5:LS2.A English Language Arts: K:W.K.2,3 1:W.1.2,7 2:W.2.2,4,8 3:W.3.2.A-D, W.3.4,8 4:W.4.2.A-E, W.4.4,8 5: W.5.2.A-E; W.5.4,8

What Can Be in Compost?

“BROWN”	**“GREEN”**
dry	wet
(carbon-rich)	(nitrogen-rich)
dry leaves	fruit scraps
straw	veggie scraps
dry grass clippings	green grass clippings
shredded paper	coffee grounds
pine needles	tea & teabags

What Should NOT Be in Compost?

Animal products: meat, bones, fat, dairy products, and weeds containing seeds

This Homework is Garbage!

On _____ we will be learning about composting -- how when air,
water, and soil mix with the right amount of green and brown plant matter, it results in a process called decomposition.

For our experiment, we will need every student to bring in some kind of plant matter. You can bring green plant matter such as lawn clippings, green leaves, weeds, and vegetable and fruit scraps (cucumber or apple peels, for example). Or you can bring brown plant matter, such as dead leaves, straw, dead grass, cornstalks, sawdust, or shredded newspaper.

Please bring this plant material to school in a bag by _____ so we can start learning about composting, and how compost is great for your garden!

THANK YOU!

EXCELLENT EARTHWORMS

A lesson from the New Jersey Agricultural Society Learning Through Gardening program

OVERVIEW & PURPOSE

Earthworms can be found in warm moist soil throughout the world. They may be different sizes, some maybe only one millimeter long, and some may be 11 feet long!

Earthworms are great recyclers because they take food scraps and other decaying matter in the soil and turn it into nutrients for plants. Whether it is humus, dead plant material, or food scraps, earthworms eat all kinds of things that are soft to chew. This earthworm "food" is digested and then excreted back into the soil in a nutrient rich matter that helps plants grow.

Earthworms also dig through soil and mix it up. Particles of sand, silt and clay make up most of the mineral content of soils. As earthworms dig, they loosen the soil and mix the different types, so plants have a better environment to grow. Earthworms also provide air passages for soil, which helps plants grow. Other organisms found in soil include plant roots, insects, and small mammals.

Grade 3-5

OBJECTIVES

Student will:

- Observe earthworms and learn how they are beneficial to our environment
- Identify and describe characteristics of earthworms

MATERIALS NEEDED

- Two jars
- Lids with holes
- Dark soil
- Sandy soil (light color)
- Two earthworms
- Carrot scraps
- Dark paper (2 pieces)
- Masking tape
- Water
- Optional: LTG's PowerPoint "Earthworms" https://youtu.be/5ysN1PSzPwE

ACTIVITY

In the bottom of each jar, put a layer of dark soil about one inch thick. Then place a one-inch-thick layer of light sandy soil. Keep alternating layers until the jar is three-fourths of the way full.

1. Slightly moisten the soil in both jars with water.
2. Place the two earthworms in **one** jar and then add some carrot scraps to **both** jars.
3. Put a lid with holes on each jar. Label the jar with earthworms, "earthworms" and the other jar "no earthworms."
4. Take the dark pieces of paper and wrap around each jar. Tape tightly. Put the jars aside.
5. Have each student write down their predictions about what they think will happen in each jar.
6. After three days, unwrap the jars. See what has happened!
    1. Possible discussion questions include: describe the soil in each jar. Which jar do you think is a better place for a plant to grow? Why?

EXTENSION:

- Keep putting food scraps in the jar with the earthworms and continue a month-long observation.
- Make a class compost bin.

NEW JERSEY LEARNING STANDARDS

Science: K:ESS3.A,C 1:LS2.A 2:LS4.D 3.LS1.B 4:LS1.A 5:LS2.A English Language Arts: K:W.K.2,3 1:W.1.2,7 2:W.2.2,4,8 3:W.3.2.A-D, W.3.4,8 4:W.4.2.A-E, W.4.4,8 5: W.5.2.A-E; W.5.4,8

GOOD BUGS AND BAD BUGS IN THE GARDEN

A lesson from the New Jersey Agricultural Society Learning Through Gardening program

OVERVIEW & PURPOSE

Are insects and other tiny creatures good or bad for your garden? Well, the answer is they can be good or bad. It all depends on who is visiting your garden. This lesson will show students that some insects are beneficial, some are detrimental, and why.

GRADES: K-5

OBJECTIVES

The student will be able to

- Explain why some insects are good for the garden and some are bad.
- Identify some insects that are beneficial or detrimental for the garden.

MATERIALS NEEDED

- The New Jersey Agricultural Society PowerPoint presentation Good Bugs and Bad Bugs in Your Garden, https://youtu.be/qqxrjjZE0oY

ACTIVITY

Teacher shows and discusses the good bugs/bad bugs PowerPoint. Students attempt to find in the garden the insects identified in the PowerPoint.

EXTENSION:

Students research other insects that could be beneficial or detrimental to the garden.

NEW JERSEY LEARNING STANDARDS

Science: K:LS1.C 1:LS1.A 2:LS4.D 3:LS1.B, LS3.B 4:LS1.A 5:LS2.A