



Healthy Bodies, Healthy Gardens

Lesson

Goals

Students will learn what nutrition is and why it is important. They will also begin to learn the connection between healthy bodies and healthy gardens.

Objectives

Students will discuss what nutrition is and brainstorm ways to keep bodies and gardens healthy. Students will tour the garden to identify what makes a garden healthy.

Standards

Science: Life Science

GR.5-S.2-GLE.2

Comprehensive Health: Physical & Personal Wellness in Health

GR.1-S.2-GLE.1

GR.2-S.2-GLE.1

GR.3-S.2-GLE.1

GR.4-S.2-GLE.1

GR.5-S.2-GLE.1

GR.6-S.2-GLE.1 & GLE.4

Total Time – 60 minutes

Materials

- Seasonal fruits & vegetables (or images)
- Healthy snack

Did you know?

Breakfast eaters consume more calories in a day than those who skip it, but they are less likely to be overweight. Eating breakfast also improves children's concentration, memory, test scores and school attendance.

Vocabulary

concentration

diversity

improve

memory

nutrition

nutrients

seasonal

Mentor Texts

- *Roots, Shoots, Buckets, & Boots.* Sharon Lovejoy, 1999.

Method

Introduction (15 minutes)

1. Write the words nutrition and nutrient on the board. Ask the class: *What is nutrition?* Nutrition is the study or practice of understanding that what we eat affects our health. *What are nutrients?* Nutrients are the food we eat, including vitamins, minerals, carbohydrates, proteins, fats and water. Nutrients keep our bodies functioning and give us energy to grow, work, play, think and learn.

- a. Discuss with the class: *One way to be healthy is to eat a variety of foods. Nature gives us a wide variety of colors and kinds of food. You can choose to eat fresh, whole foods that are closest to the way they grow. When we learn about nutrition we learn about how to take care of ourselves. A great way of having good nutrition and taking care of ourselves is to eat the food we grow. We can have healthy bodies by having healthy gardens.*
2. Make two columns on an anchor chart. One labeled, “Healthy Bodies” and the other labeled, “Healthy Gardens.” Have the students come up with as many ideas as they can of how to keep a healthy body and how to keep a healthy garden.
 - a. Have the class take five minutes to copy in their journals the lists they created on the anchor chart.
 - b. You could also create a Venn diagram based on the two lists to emphasize that there are overlaps in maintaining a healthy body and garden.

Activity (30 minutes)

1. Bring the class out to the garden to discuss what healthy seasonal vegetables the garden brings us in the fall.
2. Have the class identify as many plants and vegetables as they can.
 - a. If your garden does not have many vegetables, bring samples or images of seasonal foods. See: http://www.coloradofreshmarkets.com/crop_calendar.html for ideas.
3. Ask the class what they observe in the garden that makes the garden healthy. You might discuss: the diversity of crops, healthy soil amended with compost, crops that are harvested before they are over mature, use of herbs and flowers to repel insects, enough space between plants to allow for air circulation, etc.
4. Have the class draw in their journals their favorite fall crops.

Conclusion (10 minutes)

Have the class discuss and then journal: *What is nutrition? How can we have good nutrition? How does gardening connect to being healthy?*

Snack (5 minutes)

Hand out the apples and almond butter. Discuss how apples are a fall fruit, but can easily be stored through the winter to be eaten year round. Discuss with the class: *Apples are rich in dietary fiber, which is good for our digestive systems, and vitamin C. Almond butter with no added sugar is a good source of protein and fiber, keeping us fuller for a longer period of time.*

Assessment Tools

- Journals
- Participation in brainstorming and plant/vegetable identification

Modifications

- Have students draw and label a healthy garden in their journal.

Extensions

- Have students compare and contrast the vocabulary words “nutrition” and “nutrients” in their journal.

Apples and Almond Butter

Try to get organic apples, if possible. Apples are number one for pesticide residue in all fruits and vegetables. Use no sugar added almond butter. You can use other types of nut butter, but be aware of allergies.

- Apples
- Almond butter

Preparation (5 minutes): Cut and core apples. Dip apples in almond butter and enjoy!

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Be Healthy!

Lesson

Goals

Students will learn how to interpret MyPlate and will be introduced to the idea of growing and eating healthy foods.

Objectives

Students will compare healthy and non-healthy behaviors and activities through brainstorming. Students will begin to make connections between eating healthy and growing healthy foods by looking at the food groups outlined in USDA's MyPlate.

Standards

Science: Life Science

GR.5-S.2-GLE.2

Comprehensive Health: Physical & Personal Wellness in Health

GR.K-S.2-GLE.1

GR.1-S.2-GLE.1

GR.2-S.2-GLE.1

GR.3-S.2-GLE.1

GR.4-S.2-GLE.1

GR.5-S.2-GLE.1

GR.6-S.2-GLE.1 & GLE.4

Did you know?

Today, chips and french fries make up half of all of the vegetables children eat. Children who eat fast food tend to weigh more than their peers who do not, even if they are active.

Total Time – 60 minutes

Materials

- MyPlate nutrition poster
- MyPlate Handouts (Available on DUG's curriculum website: <http://dug.org/school-garden-curriculum/resource-sheets/myplate-information.html>)
- Crayons, markers or colored pencils (optional)
- Journals
- Various seed packets

Vocabulary

connections

gardening

MyPlate

recipe

dairy

grains

nutrition

vegetables

fruits

ingredients

protein

Mentor Texts

- *Rookie: Grains*. Carol Alexander, 2005.
- *Rookie: Fruits and Vegetables*. Susan DerKazarian, 2005.
- *Rookie: Dairy*. Susan DerKazarian, 2005.
- *Rookie: Proteins*. Justine and Ron Fontes, 2005.
- *Rookie: Fats, Oils and Sweets*. Carol Parenzan Smalley, 2005.

Background for Teachers

This is a great introductory lesson to get your students to begin thinking about gardening and nutrition and the connection between the two and their own health.

In June 2011, the USDA's nutrition guidance tool changed from MyPyramid to MyPlate. For more information on this new tool, please visit: <http://www.choosemyplate.gov/>. The *My Plate* lesson on our website goes into more detail about this new tool.

http://dug.org/storage/school-garden-curriculum/My_Plate.pdf

Method

Introduction (20 minutes)

1. Begin by explaining that the class will be learning about nutrition and gardening. The focus of the classes will be to learn how to prepare, eat and grow healthy food.
2. Introduce and hand out the garden/nutrition journals to the class. Explain that they will be used for taking notes, writing stories or poetry and collecting recipes. Have each student write on the cover his/her name and Garden Journal (or other appropriately named title).
3. On the board draw two columns labeled "Healthy" and "Not Healthy." Have the class start by brainstorming actions/behaviors that they know are healthy. Then have the students come up with actions/behaviors that they know are unhealthy. Go back and forth between the two sides as students continue brainstorming.
 - a. Encourage them to think real hard by stating a goal: *I challenge you to come up with at least 15 actions/behaviors, can you do it?*
 - b. Let the behaviors and actions they come up with lead to discussion and more creative higher level thinking. Such as asking the class: *What can we do to make watching TV more healthy (exercise during commercials)? Should you use an elevator or take the stairs? Etc.*
4. Transition the activity to MyPlate.
5. Display the brightly colored plate for all the students to see. Discuss the different food groups to help the class understand what grains, dairy, fruits, vegetables and protein entail.
6. Hand out the MyPlate worksheet.
 - a. Have students work in groups or on their own to correctly label the food group sections on the MyPlate worksheet. Students can color the plate if time allows.

Activity (15 minutes)

1. Tell the students that you can hold at least 200 carrots in one hand, while holding about 100 lettuces in the other. Have the class problem solve on how this would be possible.
2. After the students guess, pull out your seed packets and hold them in your hands explaining that each seed turns into a whole plant—one little lettuce seed can grow into a head of lettuce.
3. Explain to the class that all of our fruits, vegetables and grains are plants that are grown from seeds. Get them excited about seeds by telling them they will get to plant lots of seeds and grow their own fruits and vegetables later in the year. This is a good way to connect eating

healthy and growing healthy food in the garden.

4. Have the students write in their journals about what they learned and what they hope to plant later.

Snack (10 minutes)

While students are eating, discuss how the snack they are enjoying connects to the discussion on healthy behaviors, MyPlate and growing food in their garden. (*Did they find seeds in the fruit they are eating? What parts of the salad go into which part of MyPlate? Are all of the sections on MyPlate filled up by the snack?*)

Conclusion (15 minutes)

Have students create their own MyPlate in their journal. The students will put the ingredients of the salad in the proper sections. Students will complete their journal activity with a sentence reflecting on why the Glorious Fresh Fruit Salad was chosen for today's snack.

Assessment Tools

- Journal
- MyPlate Worksheets
- Participation

Modifications

- Have students only draw the ingredients of the Glorious Fresh Fruit Salad on their MyPlate worksheet.
- Have students help make the snack by having different teams cut up the various types of fruit (using a butter knife).

Extensions

- Challenge students to add one more ingredient in each of the MyPlate sections to make the today's salad healthier.
- Discuss and demonstrate how to use measuring cups and spoons (this is an easy and great way to incorporate math into the lesson). Discuss how to read recipes and how to double or reduce recipes is another great way to incorporate math. Challenge students to rewrite the recipe for today's snack by either doubling it or reducing it by half.
- Discuss with the class general cooking and cutting techniques. Show the class how to safely use their knives and teach them cutting terms such as cut, slice, julienne, dice, etc. Have them practice their new vocabulary.

Glorious Fresh Fruit Salad

Kids love fruit. Feel free to experiment with other fruits that may be in season.

- 2 apples
- 1 cup seedless grapes
- 1 banana
- 1 can (16 oz) pineapple chunks, drained
- 1 cup cantaloupe
- 1 kiwi
- ¼ cup low fat sour cream
- 1 cup low fat cottage cheese (creamed)
- 1 cup low fat vanilla yogurt
- 1 Tbsp honey
- 2 tsp limejuice

Preparation (10 minutes): To make the dressing, combine sour cream, cottage cheese and yogurt. Mix well. Blend in honey and limejuice. Peel the banana, kiwi and cantaloupe. Cut all fruit into bite-sized pieces. Combine first five fruits with a little dressing. Garnish with slices of kiwi and serve with extra dressing.

Sources

United States Department of Agriculture. *USDA's MyPlate*. Web. 27 June 2011.

<http://www.choosemyplate.gov/tipsresources/printmaterials.html>.

Mott's Fresh Apples. *Salad Recipes*. Web. 27 June 2011. <http://www.mottsfresh.com/salads.asp>.

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BE HEALTHY!

DENVER URBAN GARDENS' SCHOOL GARDEN AND NUTRITION CURRICULUM



Adapt a Seed

Lesson

Goals

Students will learn about various seed dispersal mechanisms.

Objectives

Students will investigate different types of seeds and how they travel. Students will then use their imagination and team building skills to invent their own seeds.

Standards

Science: Life Science

GR.1-S.2-GLE.2

GR.2-S.2-GLE.1 & GLE.2

GR.4-S.2-GLE.1 & GLE.3

GR.5-S.2-GLE.1

Total Time – 60 minutes

Materials

- Assortment of seeds (or pictures) that are dispersed in different ways
- Hand lenses
- Traveling seed cards, cut out (end of lesson)
- Healthy seed-based snack

Did you know?

Some plants distribute their seeds by violently ejecting them so that they fall far away from the parent plant. Examples of this include plants from the pea family. As the two halves of the pod curl back, they suddenly release like a tense spring and flick out the seeds in an explosive manner.

Background for Teachers

This lesson works best as a follow up to the *Seed Collecting* lesson.

Method

Introduction (10-15 minutes)

1. Tell the class that you need help solving a gardening mystery. Plants cannot move, yet some new plants have recently appeared in the garden. Can the students help you discover how the new plant seeds have found their way into your garden? Show a selection of two or three different types of weed seeds. Pass out one seed to every two students. Have them examine these seeds carefully, using hand lenses and looking specifically for features that help the seeds travel. Discuss the students' ideas about how these different seeds might have found their way into your garden.
2. Before moving on to the activity, make the connection between healthy plants and healthy bodies. Remind the students that only healthy plants are able to disperse their seeds so they can spread and continue living. Ask the students about things a plant needs to be healthy (air, water, soil and nutrients in the soil). Ask the students what people need to be healthy.

Activity (30 minutes)

1. Explain that even though plants do not move, seeds do travel. Challenge the students to invent or design their own seeds that travel in different ways. Explain that each group will be choosing a traveling seed card that will describe a particular seed's way of being dispersed. Ask them to use their imagination and the materials provided to create a seed on the go that fits this description.
2. Divide the class into small groups and have a member of each group pick a traveling seed card (see end of lesson). The students will create their seeds and then test them to make sure they meet the dispersal requirements detailed on their cards. Each group should give their seed a name and think about the life history of the plant from which the seed came.

Snack & Conclusion (15-20 minutes)

1. When everyone is finished, gather the students together and have them demonstrate how their invented seed travels. Have them tell their seed's name and parent plant's story. Compare their seeds to the real seeds they examined earlier. Do they see and similarities? Can they think of other seeds that travel?
2. Have seed based snack, such as peas, beans, peanuts, etc.

Assessment Tools

- Group work
- Participation

Possible Modifications and Extensions

- Discuss how plants in the same family have similar looking seeds.
- Have the students write about and draw their invented seed in their journals.

Suggested Products

- Some seed ideas include:
 - Helicopters – maple and ash samaras
 - Air Passengers – cherries, berries and grapes
 - Parachutes – milkweed and dandelions
 - Hitchhikers – burdock and bidens
 - Animal Express – blueberries, raspberries and apples
 - Boats – coconuts and cranberries

Sources

Parrella, Deborah, and Cat Bowman Smith. *Project Seasons: Hands-on Activities for Discovering the Wonders of the World*. Shelburne, VT: Shelburne Farms, 1995.

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ADAPT A SEED

DENVER URBAN GARDENS' SCHOOL GARDEN AND NUTRITION CURRICULUM

Traveling Seed Cards

Make a seed like a helicopter, which can spin, twirl or fly through the air when dropped from a height of 8 to 10 feet and land at least one foot away.

Make a seed that is carried by the wind like a parachute for at least 10 seconds.

Make a seed that can hitchhike on a person or animal by sticking to it and going wherever it goes.

Make a seed that looks good enough for a bear to eat.

Make a seed that is thrown through the air like a cannonball and lands at least two feet away.

Make a seed that can float like a boat for at least one minute.

Make a seed that a bird might eat. This seed travels as an air passenger.



Let's Make Compost

Lesson

Goals

Students will experience the process of decomposition and the nutrient cycle.

Objectives

Students will build a compost pile.

Standards

Science: Life Science

GR.1-S.3-GLE.1

GR.2-S.2-GLE.1

GR.3-S.3-GLE.1

GR.6-S.2-GLE.2

Science: Earth Science

GR.6-S.3-GLE.3

Did you know?

In the United States, each person generates about 4.3 pounds of trash every day equaling 195.7 million tons. About two thirds of our trash is biodegradable and could be composted. So reduce your garbage by composting!

Total Time – 60 minutes (plus time for follow-up observations, measurements and care of pile)

Materials

- Compost materials
- Shovels and spading forks
- Wheelbarrow
- Water access
- Meter stick
- Soil thermometer
- Healthy snack

Background for Teachers

Before beginning the lesson, select a permanent area outdoors for your compost pile. The ideal location is close to the garden for easy hauling as well as easy access. You will also need to collect compost materials. See the end of the lesson for what materials work best. This is a great follow up lesson to The Rotten Truth lesson

http://dug.org/storage/school-garden-curriculum/The_Rotten_Truth.pdf.

Method

Introduction (5 minutes)

1. Ask the class: *What types of materials decompose* (materials that have been alive)? *Why is it important for these materials to decompose* (they become nutrients for other plants)? *Is this a cycle? What are the parts of this cycle* (living plant or animal grows, dies, decomposes, provides nutrients for another living plant or animal to grow)? *What is this cycle called* (nutrient cycle)? *Do you think we can create a nutrient cycle in our garden?*

Activity (45 minutes)

1. Demonstrate building a miniature compost pile with samples of carbon, nitrogen and soil prior to building the actual pile. Discuss the different ingredients that can be used in the pile. Stress the importance of the size, ingredients and moisture level.
2. Divide the students into groups for carbon, nitrogen and soil. Assign one student to water. Equip the students with shovels, spading forks and a wheelbarrow.
3. Using the spading forks, have students loosen the ground where the pile will be. The area should be a minimum of 4' x 4'.
4. To build the compost pile, have students gather materials that are higher in carbon (tougher, less water, garden plants that have woody stalks, fall leaves, etc) and those that are higher in nitrogen (softer in texture, weeds without mature seed heads, over-ripe vegetables, thinned plants, etc). Chop all materials (with a shovel) into 1-2" pieces.
5. On the top of the ground with loosened soil, spread 4-6" of mixed, chopped carbon material, followed by 2-3" of mixed, chopped nitrogen material. Sprinkle a handful of soil on top and mix all layers with a spading fork.
6. Water the layers until the moisture feels like a wrung-out kitchen sponge. The layers should appear to glisten but the pile should not be saturated.
7. Rotate groups after one round of layering carbon, nitrogen and soil or let each group build their own pile.
8. Continue the process of layering 4-6" of chopped carbon, 2-3" of chopped nitrogen and a handful of soil; mixing and watering until the pile reaches a maximum of 4-5' tall. Have the students measure and record the dimensions of the compost pile. If you do not have enough material to make it that tall, you can continue to add materials at the appropriate ratios until it is large enough.
9. Have the students make a hole toward the center of the pile and take the temperature. Cover the top of the pile with black plastic (to assure that moisture is retained), making sure not to completely cover the whole pile (this would not allow air to enter). Use rocks to keep the cover in place.
10. Make sure to mix your pile once a week. Check to make sure it is wet enough and add water if necessary. Your pile will take about 2-3 months to decompose. Then you will need to let it cure for 3-4 months. If using in the fall, you can add the compost to the garden and let it cure there over the winter.

Snack & Conclusion (10 minutes)

1. Have a healthy snack for the kids. While eating, have the students answer the following questions: *What are the ingredients for a compost pile? What will happen to the organic matter? What will the pile look like in a few months? How will the compost be useful after it is decomposed? What materials could you use at home to make compost?*
2. Draw connections to how our old kitchen scraps will be broken down and turned into nutrient rich compost for our soil so we can grow healthy plants, which are sources of healthy food for our bodies. It is important that the students understand that healthy soils lead to healthy plants, which leads to healthy bodies.
3. This is a great time to introduce the nutrient life cycle. Hand out or display the nutrient cycle (end of lesson) and discuss how the cycle works in the garden.
 - a. *Compost added to the soil provides nutrients for the plants. Seeds are planted; they germinate, grow, flower and produce an edible crop. Food is harvested from the plant. As seeds are produced, the plant's life cycle is completed and it begins to die. Gardeners dig the plants out of the ground, chop them up and add them to the compost pile so they can decompose and become compost. This compost is then added back into the garden.*

Assessment Tools

- Team work and participation

Possible Modifications and Extensions

- Record the temperature of the compost pile every couple of days for the next week and create a graph with the readings. The pile should heat up to approximately 140° F and then start to cool down. Let the students feel the heat from the pile. Discuss how the heat is being produced through the biological activity of the microorganisms.
- In a month, measure the dimensions of the pile again. How has it changed, what layers can you identify?
- Have students observe chunks of the compost at various stages of decomposition through a microscope. Record any changes.

Suggested Products

- Carbon (dried matter): dried leaves, straw, dried grass, branches, corn and sunflower stalks
- Nitrogen (fresh matter): green leaves, over-ripe vegetables, weeds without seeds or flowers, grass clippings without pesticides

Vocabulary Words

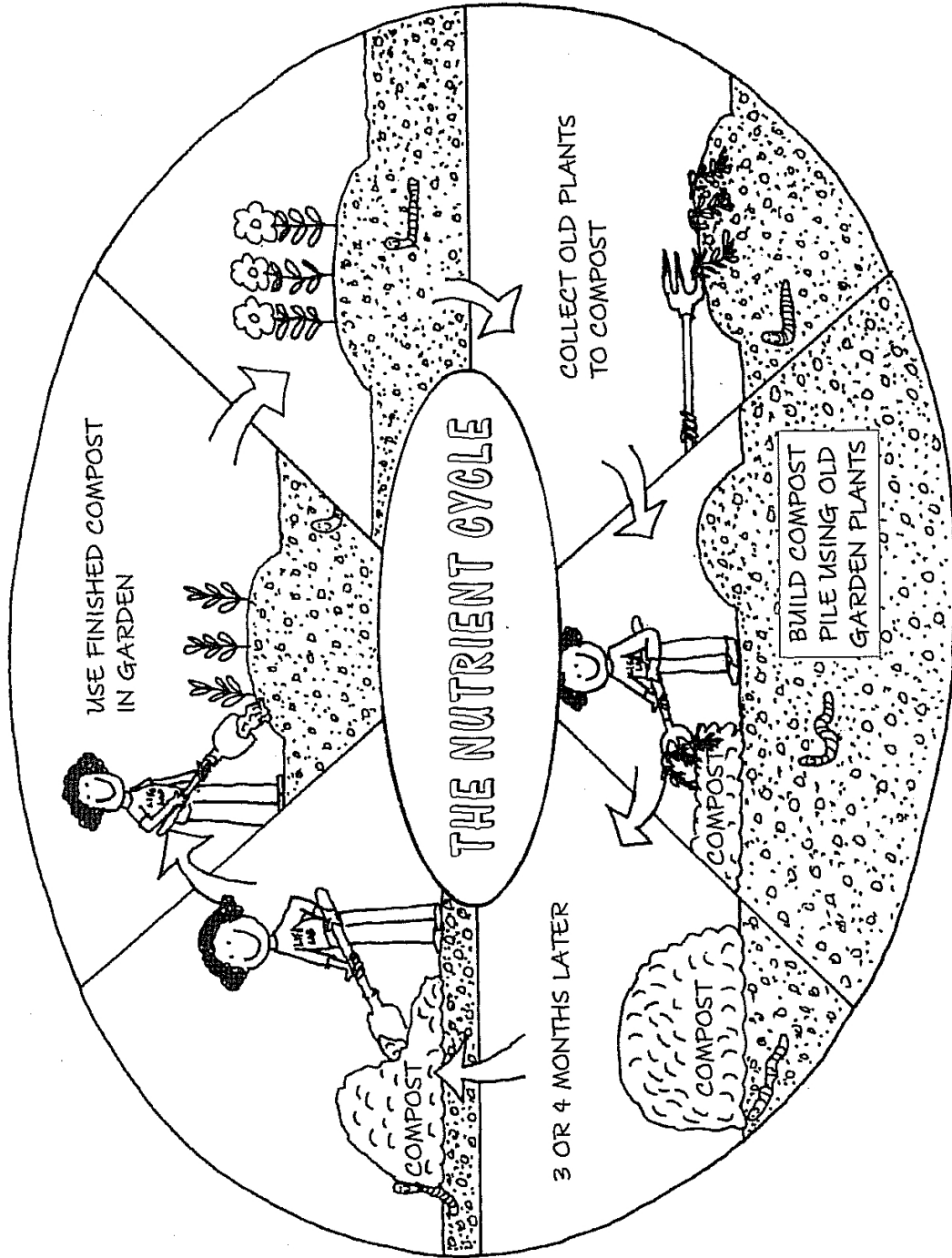
- **Biodegradable** – capable of being broken down by living microorganisms into simpler compounds
- **Compost** – well rotten plant and animal waste prepared by people to be used as a soil conditioner or fertilizer in gardens
- **Decomposer** – an organism that digests organic waste and dead organisms by breaking them down into simpler compounds and absorbing soluble nutrients
- **Decomposition** – the process of breaking down dead plants, animals and animal waste into simpler nutrients
- **Humus** – dark organic matter found in topsoil that consists of decayed vegetable matter; humus increases water retention of soil and provides nutrients important for plant growth
- **Non-degradable** – material that cannot be broken down by natural processes
- **Nutrient** – any element an organism needs to live, grow and reproduce
- **Photodegradable** – material capable of being broken down by exposure to sunlight
- **Recycling** – the process of collecting matter from garbage or the waste stream so that it can be made into new products
- **Reusable** – a produce that can be used over and over again in the same form

Sources

Jaffe, Roberta, and Gary Appel. *The Growing Classroom: Garden-based Science*. South Burlington, VT: National Gardening Association, 2007.

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☀️ Nutrient Cycle





Seed Collecting

Lesson

Goals

Students' understanding of the connection between healthy bodies and healthy gardens will be reinforced through a fall activity of seed collecting in the garden.

Objectives

Students will discuss how a healthy plant will make seeds and that seeds help plants continue the life cycle. Students will then collect seeds, describe seeds and identify seeds to package up for spring planting.

Colorado Academic Standards

Science: Life Science

- GR.2-S.2-GLE.1
- GR.2-S.2-GLE.2
- GR.3-S.2-GLE.1
- GR.4-S.2-GLE.1
- GR.4-S.2-GLE.3
- GR.5-S.2-GLE.1

Did you know?

If you grew 100 apple trees from the seeds of one tree, they would all be different.

Total Time: 60 – 80 minutes

Materials

- Egg cartons (one for each pair of students)
- Small paper and plastic bags
- Mailing labels
- Crayons or markers
- Healthy snack
- Journals

Method

Introduction (10 minutes)

1. Ask the class how healthy bodies and healthy gardens are connected (as we care for the garden, it produces healthy plants that provide healthy food for our bodies).
2. Draw a new connection for the students to see that we can live long lives by staying healthy. Ask the class how plants and a garden can stay alive after the winter. Discuss how most garden plants are annuals and only live one season, and if they are healthy, they create seeds. They then spread their seeds in order for new plants to continue the life cycle.

Activity (20-40 minutes)

1. Tell the students that they are about to embark on a search for one of nature's wonders—seeds.
2. Divide the class into pairs and give each pair an egg carton, where they can put their collected

seeds. Explain that their mission is to fill each of the 12 compartments with a different type of seed.

3. Head to the garden or a field in search of seeds. Give the class enough time to find a variety of seeds.
4. When you get back to the class have the students share their biggest, smallest and favorite seeds. Ask the students to also try to identify the seeds they collected.
5. If any of the seeds are the ones the students want to plant in the spring, have them place the seeds in paper bags if they are moist, or in plastic bags if they are dry.
6. Label the bags. For paper bags use crayons or markers. For plastic bags use mailing sticker labels. If there is enough time, have the students decorate the labels.
7. Store the seeds in a cool (room temperature) dark place (a drawer). Properly stored seeds can then be planted in the proper growing season to extend the concept of seed to seed.

Snack & Conclusion (15 minutes)

1. Have the students write in their journals about the seeds they found and how they found them. You may want to have the students draw their favorite seed and write why it is their favorite.
2. Have a healthy snack. Discuss the seeds of the snack and talk about how these seeds are sometimes planted to produce new trees or vegetables.

Assessment Tools

- Journals
- Seed collection

Suggested Products

- For the snack consider having fruit such as apples, pears, peaches, etc, where the seeds are noticeable. Or you may want to have a seed-based snack, such as peas, sunflower seeds, pumpkin seeds, corn, beans, etc.

Source

Parrella, Deborah, and Cat Bowman Smith. *Project Seasons: Hands-on Activities for Discovering the Wonders of the World*. Shelburne, VT: Shelburne Farms, 1995.

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The Rotten Truth

Lesson

Goals

Students will learn about the decomposition process and the importance of composting and recycling.

Objectives

Students will investigate the process of decomposition by conducting hands-on experiments with various food items. They will learn what happens to various items when they are thrown away.

Standards

Science: Life Science

GR.6-S.2-GLE.2

Science: Earth Science

GR.1-S.3-GLE.1

GR.3-S.3-GLE.1

GR.6-S.3-GLE.2

Total Time – Day one: 60 minutes, Day two: 60 minutes

Did you know?

We would all be knee-deep in garbage without decomposition. In one spoonful of soil there are more bacteria and fungi than all the people on Earth.

The typical American throws away about five pounds of trash every day.

Materials

- Various decomposable and non-decomposable items (suggestions at end of lesson)
- Plastic Ziploc bags
- Soil or compost
- Spray bottle
- Journals

Vocabulary

bacteria

decomposition

nature

resources

biodegradable

fungi

organisms

decay

microscopic

recyclers

Mentor Text

- *Compost Happens*. Mike Peters, 2000.

Background for Teachers

Have enough decomposable and non-decomposable items for each student to have one each. To save time have the items cut into one-inch or smaller pieces before the lesson.

Two great follow up lessons are Let's Make Compost

(http://dug.org/storage/school-garden-curriculum/Lets_Make_Compost.pdf) and Worms Are Our Friends (http://dug.org/storage/school-garden-curriculum/Worms_Are_Our_Friends.pdf).

Method – Day One

Introduction (10 minutes)

1. Ask the class to name some of the things they have thrown away over the past two days. *What happens to these things? Do they disappear? Or remain in the soil forever?*
2. Review the terms “biodegradable,” “non-biodegradable,” “decompose” and “compose.”
3. Create two headings on the board “Biodegradable” and “Non-Biodegradable” and have the class come up with items that fit under each term.
4. Explain to the class that they will conduct an experiment to learn the fate of some commonly thrown away items.

Activity (40 minutes)

1. Give each student a plastic Ziploc bag. Students should put one of each item into their bag, so that each student has the same contents. Have the students write their name and today’s date on the bag.
2. Have only a few students add a sprinkling of soil or compost and a light misting of water to their bag. Every student should lightly breath into their bags before carefully sealing them.
3. In their journals, have students record exactly what they are putting into their bags. They should also note their predictions of what will happen to each item over time (Rot? Smell? Stay the same?). If the students put soil/compost or water in their bags, make sure they include their predictions of what effect these variables may have.
4. Explain that they will leave their bags for 2-8 weeks. You may decide to keep all of the bags together, or place them in various locations with differing conditions (hanging in a sunny window, hidden inside a dark closet, in a cool entry way, etc). In their journals, have the students record their predictions related to the various locations.

Snack (5 minutes)

Enjoy the Asian Slaw.

Conclusion (5 minutes)

Discuss the various parts of the slaw and whether or not the students think they could be recycled or composted. Also review what section on MyPlate the salad ingredients belong.

Method – Day Two (2-8 weeks later)

Introduction (10 minutes)

1. Ask a few of the students to share some of their predictions for their bags. Have them explain why they made those predictions.

Activity (30 minutes)

1. Bring the class outdoors with their bags. Have the students sort through their bags and record any items still identifiable in their present state. Are any of the items missing? Provide spray bottles so items can be cleaned off for closer observation and identification.

2. How did the results compare to the predictions? Have the students record the results on the same page in the journal as where they wrote their predictions.
3. Define and discuss the process of decomposition or decay. Explain how certain materials are broken down by microorganisms, mainly bacteria and fungi, into basic nutrients and recycled back into the soil. Talk about composting as an alternative to the garbage dump or garbage disposal for certain items. Review the vocabulary terms: biodegradable, non-biodegradable, recyclable and reusable. Have the students sort the items in their bags into these categories.

Conclusion (10 minutes)

Have students share their findings. Discuss with the class how decomposition relates to the garden and healthy eating.

Snack (10 minutes)

Have a healthy snack.

Assessment Tools

- Participation
- Predictions and observations in journals

Modifications

- You can try having students put different items in their bags.
- Have students bring scraps from their lunches to put into their bags.
- Have students write a list of all the items they have thrown away in the past day in their journals. Then have the students predict which items are biodegradable and non-biodegradable.

Extensions

- Have students create a product list for a subsequent experiment to ensure understanding of which objects are biodegradable and which ones are not.
- Kitchen waste composes the most significant amount of a landfill. Have students brainstorm ways to reduce the amount of kitchen waste.

Suggested Products

- Suggested items to put in bags: paper bags, celery sticks, leaves, newspaper, plastic bags, cabbage, carrots, twist ties, etc.

Asian Slaw

This is a great alternative to the traditional cole slaw and kids love it!

- 1 Tbsp vegetable oil
- 1 tsp sesame oil
- 3 Tbsp rice vinegar
- 3 Tbsp honey
- 3 tsp soy sauce
- 3 cups shredded cabbage
- 2 carrots, shredded
- ¼ cup sunflower seeds

Preparation (15 minutes): Combine first 5 ingredients in medium sized mixing bowl and mix well to make dressing. Add the rest of the ingredients and mix together well. Cover and refrigerate until ready to serve, up to 24 hours.

Sources

Parrella, Deborah, and Cat Bowman Smith. *Project Season: Hands-On Activities for Discovering the Wonders of the World*. Shelburne Farms, 1995.

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Worms Are Our Friends

Lesson

Goals

Students will learn about Red Wiggler worms, composting and decomposition.

Objectives

Students will begin to explore garden friends and garden foes by starting a worm-composting bin.

Standards

Science: Life Science

GR.6-S.2-GLE.2

Science: Earth Science

GR.1-S.3-GLE.1

GR.3-S.3-GLE.1

GR.6-S.3-GLE.3

Total Time – 60 minutes (plus weekly care)

Did you know?

Red Wiggler worms:

- Consume their weight each day in raw organic matter.
- Live about one year.
- Do NOT turn into two worms when cut in half.
- Take only six weeks to grow from hatchling to adult.

Materials

- Container (wood or plastic)
 - Drill about 30 holes along the long sides and bottom (1/4" holes)
- Newspaper (black and white only)
- Red Wiggler worms
- Fall leaves
- Food scraps (Old bread, eggs shells, fruit and vegetable peels, coffee grounds, etc. Do not use meat, fat, dairy, junk food or citrus.)
- Magnifying glasses
- Journals
- Healthy snack

Vocabulary

cocoon

cold-blooded

compost

erosion

fertilizer

hatch

improvement

invertebrates

moisture

oxygen

recycle

vermicomposting

Mentor Text

- *Compost Happens*, Mike Peters, 2000.
- *The Worm Café*, Binet Payne, 1999.
- *Wormology*, Michael Elsohn Ross, 1996.
- *Composting with Willie the Worm*:
<http://www.michigan.gov/kids/0,4600,7-247-49067-62499--,00.html>

Background for Teachers

This lesson covers:

1. How garden friends can help decompose material and turn it into compost.
2. Why compost is good for garden soil.
3. How to recycle for the garden and why recycling is good.
4. How to care for worms.

See the Worm Composting 101 resource sheet for more detailed information on how to care for your worm bin (http://dug.org/storage/school-garden-curriculum/Worm_Composting_101.pdf).

This is a great follow up lesson to *The Rotten Truth*

(http://dug.org/storage/school-garden-curriculum/The_Rotten_Truth.pdf).

Method

Introduction (10 minutes)

1. Explain the benefits of worm composting (vermicomposting) to the class. Emphasize how worm composting recycles materials.
 - a. Review the basic definition of composting. (Compost is well-rotted plant and animal waste prepared by people to be used as a soil amendment in the garden.)
 - b. About 25% of all trash is yard waste or food scraps—both of which could be composted.
 - c. Compost has the ability to increase water retention in gardens and decrease overall usage.
 - d. Compost reduces erosion.
 - e. Compost reduces or eliminates pesticide and chemical fertilizer usage.
2. Ask the class what they know about worms. Have them make a list or go around the room and give each student a chance to add to the list. Teach them what they do not already know. (See “Did you know?” above.)
 - a. Worms are invertebrates, lacking bones and cartilage.
 - b. Worms are blind.
 - c. Worms breathe by absorbing oxygen through their moist skin.
 - d. Worms have no teeth.
 - e. Worms possess both male and female reproductive organs (hermaphrodites) but require a partner in order to reproduce.
 - f. Worms are sensitive to light and possess organs along their upper side that sense ultra-violet light. After prolonged exposure, breathing becomes depressed and the worm may die.
 - g. If worms are managed properly, it only takes two to three months to produce worm compost (castings).

Activity (35 minutes)

1. Have students tear single pages of black and white newspaper into strips and then into small squares. If time is limited, pre-tear the newspapers.
2. Have students fill the container with the torn newspapers and dry leaves, adding equal amounts of each by volume. Mix them together. Slowly, add lukewarm water to make the bedding moist but not soaking. It should feel like a wrung out sponge. Have a few students

break up all the newspaper to avoid big clumps and to create air space, which will help control odors and provide ideal living conditions for the worms. Thoroughly mix the newspaper and leaves together.

3. Spend some time looking at the worms with the magnifying glass. Have the students try and identify the longitudinal and circular muscles, the clitellum (band or ring) that indicates sexual maturity and explain that the head of the worm is closer to the clitellum.
4. Explain what worms like to eat (decaying organic material).
5. Make a worm sandwich. Using old bread and other appropriate items, make a sandwich. Explain to the class what to put and what not to put into the worm bin and why.
 - a. You can compost non-meat food scraps, such as fruit and vegetable peels, tea bags and coffee grounds. Pulverized eggshells help the worms “chew” their food since they do not have any teeth. This is similar to the way birds use small rocks.
 - b. It is advisable not to compost meats, bones, dairy products and oily foods because of problems with smells, flies and rodents. Do not add junk food, hot peppers or too many onion skins or citrus peels. Only add small amounts of citrus items and grains because too many can promote an acidity problem, leading to an overabundance of pests such as decomposition mites. Be moderate with the amount of fruit added (over-ripe fruit such as bananas left on the kitchen counter are a perfect breeding ground for fruit flies). It goes without saying that worms decompose organic materials only. Therefore, do not add plastic bags, rubber bands, aluminum cans, glass, etc.
 - c. Any food that is to be added to the box is best kept in sealed containers in the refrigerator.
6. Always bury the food waste by pulling aside some of the bedding, dumping the waste and then covering it up with the bedding again to avoid fly and odor problems. Bury successive loads in different locations in the bin.

Conclusion (10 minutes)

Have students brainstorm in their journals what they learned about worms and any new vocabulary words during today’s lesson.

Snack (5 minutes)

Hand out a healthy snack. While students are enjoying their snack, discuss as a whole group the proper ways to care for the worms.

Assessment Tools

- Journals

Modifications

- Have students draw a detailed picture of a worm in their journal and label the parts. You may want to have them look at the worms under a microscope or have a diagram of a worm available.

Extensions

- *Wormology* by Michael Elsohn Ross is a student friendly worm book with many experiments and lesson extension ideas.
- Hand out the worm related resource sheets and review their material (<http://dug.org/school-garden-curriculum/resource-sheets/gardening-tips.html>).
- Weigh the amount of food scraps going into the bin each week. Do various math or graphing projects with the numbers.

Suggested Products

- Roughneck storage containers, 10 gallon size are perfect for classroom worm bins.
- Worms can be purchased by the pound at <http://www.wilsonsworms.com>
- *The Worm Café* by Binet Payne has a lot of great information about worm composting at the school level.

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