

Outline of Lesson
Healthy Soil, Healthy Plants, Healthy People
Unit 2, Lesson 3
Grade 4-5

Lesson Time: 60 Minutes

Lesson Outline:

1. Soil and Minerals

- Soil detectives: learn what soil is made of
- Role of minerals in plant health

2. Minerals and Human Health

- Source of minerals in the human diet
- Role of minerals in human health

3. Hand Washing and Critical Thinking Activity

- Drawing Activity

4. Insect Snack

- Students create snacks that look like living soil organisms, made from foods high in Calcium, Iron and Magnesium

Student Learning Objectives:

By the end of this lesson students will:

- Be able to identify the ingredients of healthy soil.
- Identify at least 3 dietary sources of minerals.
- Have a basic understanding of the role of minerals in the health of plants and people.

References:

- Linus Pauling Institute. <http://lpi.oregonstate.edu>
- Hamilton, Geoff. The Organic Garden Book: The Complete Guide to Growing Flowers, Fruit, and Vegetables Naturally. DK Publishing, 1993.

This material funded in part by USDA-Food Stamp Program, state and local government agencies. *Basic Food* assistance helps people with low incomes. Cooperative Extension programs and employment are available to all without discrimination. Evidence of noncompliance may be reported through your local Cooperative Extension office.

Healthy Soil, Healthy Plants, Healthy People

Overview (for Teacher)

Pre-Class Preparation	Get students into learning teams of 4 – 5 prior to CHANGE class.
Teacher Involvement During Class 	<ul style="list-style-type: none">• Assist with behavior management of students.• Dismiss teams to wash hands.
Post-Class Teacher Responsibilities	None
Vocabulary	<p>Soil- the home for plants. It is where plants grow and receive all of their nutrients.</p> <p>Minerals- a substance found in nature that plants and people need to stay healthy.</p> <p>Absorb- to soak up something. Like a sponge absorbs water.</p> <p>Microorganism- a living thing that is too small to be seen without a microscope.</p> <p>Organic matter- dead plant and animal material.</p>
Critical Thinking Activity	Draw a garden showing the soil line. Draw plants growing above the soil line and roots, rocks, and dead plants below the soil line. This is where we will put our soil critter snacks after they are made.
Supplementary Activities	Food for Thought Writing Question
Web Resources	None
Suggested Books for Reading in the Classroom	None

Healthy Soil, Healthy Plants, Healthy People

EALR & GLE Alignment

EALR	GLE	Lesson Applications
<p>Science</p> <p>1.1 Understand how properties are used to identify, describe, and categorize substances, materials, and objects and how characteristics are used to categorize living things</p> <p>1.2 Understand how components, structures, organizations, and interconnections describe systems</p> <p>1.3 Understand how interactions within and among systems cause changes in matter and energy</p> <p>2.1 Developing the knowledge to do scientific inquiry</p>	<p>1.1.5 Understand physical properties of Earth materials including rocks, soil, water, and air</p> <p>1.2.1 Understand that things are made of parts that go together and how these parts depend on each other</p> <p>1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives</p> <p>2.1.2 Understand how to plan and conduct simple investigations following all safety rules</p>	<ul style="list-style-type: none"> • Soil and Minerals: Soil Detectives • Minerals and Human Health • Soil and Minerals: Soil Detectives • Soil and Minerals: Soil Detectives
<p>Health and Fitness</p> <p>2.1 Recognize patterns of growth and development</p>	<p>2.1.1.c Describe the influence of nutrition on health and development</p>	<ul style="list-style-type: none"> • Minerals and Human Health
<p>Writing</p> <p>2.2 Write for different purposes</p>	<p>*GLE not available at this time</p>	<ul style="list-style-type: none"> • Supplemental Activities: Worm Bin Detectives and Food For Thought
<p>Reading</p> <p>1.3 Build vocabulary through wide reading</p> <p>3.2 Read to perform a task</p>	<p>1.3.2 Understand and apply content/academic vocabulary</p> <p>3.2.1 Understand information gained from reading to perform a specific task</p>	<ul style="list-style-type: none"> • Read all overheads with teacher • Soil Critters Snack • Supplemental Activities: Castaway Castings, A Day in the Life of a Worm, Wacky Worm Facts

Healthy Soil, Healthy Plants, Healthy People

Preparation Outline

Activity Supplies

⊗ *Items marked with this symbol may not be purchased using FSNE funding, nor included as part of cost share.*

Soil Detectives

- ⊗ 6 plastic baggies of soil. Soil can be from any source; healthy or not
- ⊗ Magnifying glass (1 per student)

Soil Components

- 1 Rock

Drawing Exercise

- blank white paper with no lines (1 per student)

Microorganism Snack

- 6 cooking trays
- 1 box of toothpicks
- 18 plastic containers (3 per learning team; 1 for the calcium group, 1 for the magnesium group, and 1 for the iron group)
- Calcium group
 - 24-1 inch pieces of bok choy (6 per group)
 - 1 ½ cups of thickly chopped kale (1/4 cup per group)
 - 1 ½ cups of cooked white beans (1/4 cup per group)
- Magnesium group
 - 24 spinach leaves (6 per group)
 - 1 ½ cups of thickly chopped Swiss chard (1/4 cup per group)
 - 24 pieces of spoon sized Shredded Wheat (6 per group)
- Iron group
 - 12 tablespoons of raisins (2 Tbsp per group)
 - 6 tablespoons of lentils (1 Tbsp per group)
- 6 microorganism picture handouts in plastic covers (1 per group)

Review

- Classroom Tasting Challenge checklist
- Healthy Person Contract
- Calcium, Magnesium, and Iron pictures for Healthy Person Contract

Overheads

- Soil Ingredient checklist
- Food sources of Calcium, Magnesium, and Iron
- Pictures of Soil Critters

Student Handouts

Food sources of Calcium, Magnesium, and Iron

Teacher Handouts

Student Assessment and Answer Key

Changes for ELL Classes

Leave out details of how the soil organisms make minerals in a soluble form.

Rainy Day Activity Supplies

None

Healthy Soil, Healthy Plants, Healthy People

Outline

Content

Introduction and Lesson Overview (5 Min)

Today we are going to learn about soil and minerals. First, we will talk about what soil is and what ingredients make up healthy soil. Then we will talk about 3 minerals found in soil and plants, and their role in keeping plants and people healthy. Finally, we will make a snack of insects and eat bugs!

Soil and Minerals (15 Min)

- **Soil Detectives**

- **Components of Soil**

What is Soil?

- Soil is the home for plants. It is where plants grow and receive all of their nutrients.
- **Nutrients are** minerals and elements such as Nitrogen, Phosphorus, Potassium, Calcium, Iron, Magnesium, etc. that plants need to grow and be healthy.
- Place a ziploc bag of soil dug up from any source on each of the learning teams tables. As you discuss the components of soil have the students work as Soil Detectives and look for the different soil ingredients.

Components of Soil

- Soil is made up of dead ingredients such as clay, rock, sand, silt, and dead plants and animals (organic matter). These ingredients are where minerals come from.
- Soil is also made of live ingredients such as soil fungi, algae, bacteria, insects, and worms: these “critters” feed on the dead soil ingredients. Their waste provides the plants with food. The “food” the plants eat are the minerals found in the dead ingredients but in a form that the plants can absorb. The “critters” also break up the soil, allowing more air to circulate and water to drain, which makes the plants happy. Some of these living ingredients are too small to be seen without a microscope, we call these **microorganisms**.
- Hold up a rock. This rock has minerals in it that the plants need to grow up healthy and strong, but the plants can’t take the minerals out of the rock without the help of the “critters”. The “critters” can eat the rock and break it down into small pieces that the plant can absorb. The same thing happens in our bodies when we eat food. Vegetables have minerals in them but we can’t get them out until we break them down into small pieces by chewing and digesting the food.
- The soil must have both the alive and dead ingredients to be healthy. The critters eat the dead ingredients and generate waste that contains soluble forms of minerals

and other nutrients that plants can absorb. If your soil is lacking living ingredients, plants cannot utilize the nutrients found in the dead ingredients.

- **Overhead: Soil Critters**

- Put up the soil critters overhead.
- These are some of the critters that can be found in soil.

- **Overhead: Soil Ingredients Checklist**

- Make a chart on the board or put up the Soil Ingredients Checklist overhead. Have teams raise their hands to tell you which ingredients they found in their soil, checking off ingredients as you go.

- **Discussion**

- Ask the students to quickly discuss in their groups what would happen if there were no insects, worms, bacteria and other living ingredients in the soil? Give them 1 minute to discuss and call on groups to discuss their answers.

What are minerals?

- Substances found in nature that plants and people need to stay healthy.

- **Minerals and Plant Health**

Role of minerals for healthy plants

- There are 3 main roles of minerals in plant health:
 - Growth
 - Food production
 - Disease prevention
- We are going to focus on 3 minerals: Calcium, Iron, and Magnesium. These minerals are important for healthy plants and they are also needed for healthy people.
- These 3 minerals are absorbed by plant roots from the soil. If the plant doesn't receive enough of these minerals from the soil then the plant becomes unhealthy. The same happens to people when they don't eat enough of the same 3 minerals.
- Ask the students "how do you think people can get enough Calcium, Iron, and Magnesium to stay healthy?" (We can eat the plants that have absorbed these minerals from the soil)

Minerals and Human Health (15 min)

- **Overhead: Food Sources of Calcium, Magnesium and Iron**

- Once the plants absorb the minerals from the soil, humans can eat the plants so we can absorb the minerals.
- **Put up the overhead of food sources of calcium, magnesium and iron** and refer to it as you discuss the role of minerals for healthy humans.

Role of minerals for healthy humans

- Calcium is a very important mineral in a healthy body.
 - Calcium is needed to build strong healthy bones.
 - What would happen if we didn't get enough Calcium?
 - Some sources of Calcium in plants are bok choy, kale, and white beans.
- Magnesium is another mineral needed by the body.
 - Magnesium is needed by our body to make energy.
 - What would happen if we didn't get enough Magnesium?
 - Some sources of Magnesium in plants are spinach, Swiss chard, brown rice, and shredded wheat.
- Iron is another mineral needed by the body.
 - Iron is needed to carry oxygen in our blood to all of our different body parts. Oxygen then helps our bodies use the energy from our food.
 - What happens if we don't get enough iron?
 - Some sources of iron in plants are raisins, lentils, and prunes.

Hand Washing and Critical Thinking Activity (10 min)

- **Introduce hand washing**
- **Drawing activity**
- **Set up cooking trays**

- Today we are going to make a snack to eat, so the first thing we need to do is to get into our cooking teams and wash our hands (if sink is available) or sanitize with hand wipes (if sink is not available). We always need clean hands before we touch any food. This means washing with plenty of soap and warm water or rubbing hands really well with a sanitizer cloth. Review where most germs on the hands tend to be for hand washing (knuckles, finger nails, back of hands).
- While learning teams are washing hands have the rest of the class take out a piece of paper. Write the assignment on the board and have students:
 - Draw a horizontal line that divides the paper in half. This is a soil line. Draw plants growing above the soil line and roots, rocks, and dead plants below the soil line.
 - Explain that under the soil line is where their soil critter snacks will be placed after they are made.
- As the teacher has students wash hands and start the drawing activity, set up the cooking trays for making the snack.
- Put cooking tray on each learning team table with instructions not to touch them until they have instructions on how to prepare the snack.

**Soil Critters Snack
(15 min)**

- **Prepare snack**

Cooking Trays

- Whenever we have cooking days, we use these trays to bring you all of the things that your group needs to make your part of the snack today.
- *Do not touch anything on the tray until everyone in your group has clean hands and your teacher tells you to start. When you are done using something from the tray, put it back on the tray, **not** on your desk.*

Teach snack preparation

- On your trays you have 3 groups of foods. The first group is high in Calcium, the second group is high in Magnesium, and the third group is high in Iron.
- There are also pictures of the “critters” found in healthy soil.
- Each student will use toothpicks and foods from each of the three groups (calcium, magnesium and iron) to construct soil critters. Some examples of critters to make are: earthworms, mushrooms, beetles and other insects. As students make their critters, they should place them on their drawings in the area that they think they would find those critters in the garden (under the soil).
- Once you are done making your “critters” write the name of each one on your paper. Then eat your bugs!

Review and Reflection

- **Classroom Tasting Challenge**



- **Healthy Person Contract: Calcium, Magnesium, Iron**

- Ask students to mention a couple of concepts that they learned about soil and minerals.
- **Classroom Tasting Challenge:** After tasting the soil critters snack, ask students to raise their hands to show you how many students tasted the snack, liked it, or did not like the snack. Record the number of students who raise their hands in the appropriate column on your Classroom Tasting Challenge checklist.
- **Healthy Person Contract: Calcium, Magnesium and Iron.** Display the Healthy Person Contract. Have students think about the snack they ate in the class. What important nutrients are found in the foods they ate? How do Calcium, Magnesium, and Iron help the body? (Calcium – helps us grow strong bones, Magnesium – helps us make energy, and Iron – takes oxygen to all the parts of our bodies and helps us use food energy). Call on a student to select a picture of a food high in Calcium, Magnesium, or Iron. Have them tape it to the Healthy Person Contract, and draw a line to the body parts these minerals help.

Lesson Materials

Healthy Soil, Healthy Plants, Healthy People

- **Pictures of Soil Critters**
- **Soil Ingredients Checklist**
- **Food Sources of Calcium, Magnesium, and Iron**
- **Calcium, Magnesium, and Iron pictures for Healthy Person Contract**

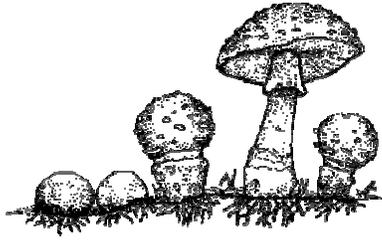
Supplementary Activities

- **Food for Thought**

Soil Critters

Fungi

I'm a small decomposer. I eat dead material and turn it into nutrients that plants can use. There might be several hundred of me in just one teaspoon of soil!



Protozoa

I'm a very small decomposer. I eat dead material and turn it into nutrients that plants like to eat. I also enjoy grazing on other small fungi and bacteria.



Bacteria

I'm a very, very small decomposer. I eat dead material and turn it into nutrients that plants can eat. There might be up to 1 billion of my kind in just one teaspoon of soil!



Nematodes

I'm a grazer. I like to eat all the yummy fungi, bacteria and sometimes plant roots.



Worms

I'm a shredder of plant material and help keep soil full of holes for air and water to come in.



Rolly-polly bugs

I'm a shredder of dead plant material. I help turn fallen leaves into soil by shredding them in smaller pieces for fungi and bacteria to eat.



Pseudoscorpions

I'm a predator of anything that I can get my claws on in the soil. I'm important because I keep everyone else in control.



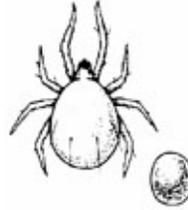
Oribatid Mites

I'm a decomposer of dead plant material and enjoy grazing on fungi and bacteria. In one teaspoon of soil, you can find up to 2,000 of my kind!



Predatory Mites

I love to eat oribatid mites and other other small critters. I'm a predator.



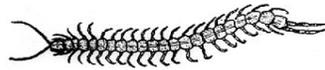
Millipedes

I'm a shredder of dead plant parts. I eat the rotten salads and turn them into food for others.



Centipedes

I'm a fast moving predator that cruises through the soil looking for prey.



Spring Tails

I'm a shredder of plant material. I also enjoy pruning the roots of plants and keeping them healthy. If you scare me, I use my tail to suddenly spring away!



Ground Beetles

I'm a voracious predator. I eat anything that moves. I sometimes even eat slugs!



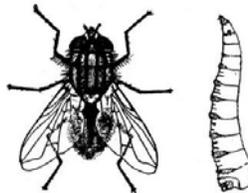
Dung Beetles

I eat animal poop! I help turn animal waste into food for plants. It's a dirty job, but someone has to do it.



Flies & maggots (baby flies)

My babies (maggots) love to eat dead plants. When my babies eat, we help the bacteria and fungi get their food by chewing the plants into smaller pieces.



Soil Ingredients Checklist

	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6
Clay						
Sand						
Rocks						
Dead plants						
Insects						
Worms						
Minerals						

Food Sources of Calcium, Magnesium, and Iron

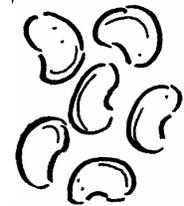
Calcium



Bok choy



Kale



White Beans

Magnesium



Spinach

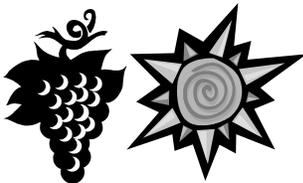


Swiss Chard



Shredded Wheat

Iron



Raisins



Lentils



Prunes

Pictures for the Healthy Person Contract

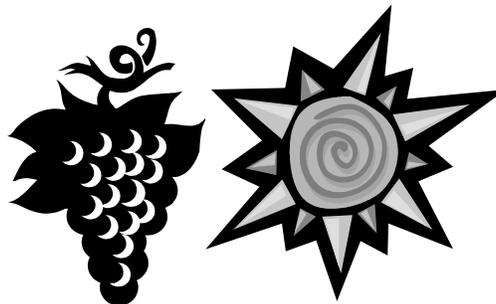
Bok Choy: Calcium



Spinach: Magnesium



Raisins: Iron



Food For Thought

Why is healthy soil important?
