

AccurateAg Books ELEMENTARY

SEED SOIL SUN

Earth's
Recipe
for
Food

Cris Peterson



Photographs by David R. Lundquist

“This set of activities and poster really complements the content and theme of my book.”
—Chris Peterson, author of *SEED SOIL SUN*

EDUCATOR'S GUIDE

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Athens Elementary - Athens, WV.

Nebraska Agriculture in the Classroom - Lincoln, NE.

"This educators guide and classroom poster are a great complement to my book SEED SOIL SUN. The accuracy of the information and standards aligned activities are a sure hit for educating about agriculture."

—Chris Peterson, author of SEED SOIL SUN Earth's Recipe for Food



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Activity One

Have You Seen My Seeds?

GRADE LEVEL

First – Third

SUBJECTS

Reading in the content area, science and language arts

OBJECTIVES

By the end of these activities, the students will be able to:

- Read for understanding
- Understand the science of seed germination
- Record and interpret data
- Apply knowledge of seeds, soil and sun to the larger concept of agriculture
- Answer questions and make predictions based on given data

NATIONAL LEARNING STANDARDS

- NL-ENG.K-12.2 Reading for Understanding
- NS.K-4.1 Science as Inquiry
- NS.K-4.3 Life Science
- NM-REP.PK-12.1 Create and Use Representations to Organize, Record, and Communicate Mathematical Ideas

MATERIALS

- Clear plastic cup (6"-12"), black construction paper, paper towels (1 each per student)
- Pea or Bean Seeds
- Additional Seed packets
- Magnifying Glass (hand lens)

BOOK

SEED SOIL SUN Earth's Recipe for Food
– by Cris Peterson ISBN# 978-1-59078-713-7

GENERAL INTRODUCTION

Option 1: If volunteer producers are conducting this lesson, introduce yourself and describe your farm or agricultural business.

Option 2: If classroom teachers are conducting this lesson, proceed to activity introduction.

ACTIVITY ONE



INTRODUCTION

Read the entire book *SEED SOIL SUN Earth's Recipe for Food* and show students the pictures. Refer back to the first page that shows all the hands holding different types of seeds (as pictured above). This page starts the section of the book that deals with seeds and how much of our food comes from seeds planted in the spring by farmers and what it takes for a seed to germinate.

ACTIVITY BACKGROUND

A great amount of the food that humans and animals eat starts from seeds. Every spring farmers plant millions of seeds in the soil. Inside each seed is a new plant waiting for the right conditions to grow. With moisture from water or rain and heat from the sun those seeds swell and split open. From the seed a root grows down into the soil



and a shoot (or primary leaf) grows up to the sun. The soil provides a home for the seed to grow into a plant. There are many types of seeds that grow into the food we eat.

ACTIVITY INSTRUCTIONS:

Have You Seen My Seeds?

Make sure each student has each of the following:

- clear plastic cup (6"-12")
- half sheet of black construction paper
- paper towels, pea or bean seeds
- magnifying glass (hand lens)

Use a clear plastic cup that is 6-12 inches tall. Cut black construction paper so that it fits inside, up against the cup walls. The black construction paper serves as a background to show the seed's germination. Fill the center with wadded up paper towel. "Plant" bean seeds between the cup walls and construction paper, about 1/2 - 2/3 of the way down. Water the paper towels and keep moist. Bean seeds will grow and you can view root growth, what happens to seeds, etc. They can grow quite large and will be fine as long as you keep the paper towels moist.

PLANTING SEEDS

Plant a variety of seeds including pea and bean seeds and keep track of their daily growth. Plant them in clear plastic cups so the root system can be observed. Chart how many days it takes each type of seed to sprout.

SEED OBSERVATION

Using a magnifying glass, observe a variety of sizes of seeds.

LESSON EXTENDER:

1. Show students the different types of seeds you have provided, but do not tell them which kind of seed/plant they are. Give each student one seed. Allow the students to examine the seeds for physical characteristics.
2. Discuss that different seeds have certain characteristics. Some seeds are round or oval, some brown, black or even striped, etc.
3. Have students stand up as you describe their seed. Example: How many of you have a seed that is round in shape? Ask students to get into groups, according to the characteristics of their seeds. You may do this by using a Venn diagram where characteristics overlap like round and black. You may also choose to form a simple human (student) bar graph, for example, students with black seeds all line up in one row, white or striped seeds in another, side by side.
4. Finally, allow the students to make an educated guess as to which plant this seed will grow into. Then reveal the answers and observe how even though the seeds may look the same they grow into many different plants.



Activity Two

Soil is not a Dirty Word!

SUBJECTS

Reading in the content area, language arts, social science, science and math

OBJECTIVES

By the end of these activities, the students will be able to:

- Apply knowledge of the seeds, soil and sun to the larger concept of agriculture.
- Student will be able to determine particles in soil and soil types.

NATIONAL LEARNING STANDARDS

- NL-ENG.K-12.2 Reading for Understanding
- NL-ENG.K-12.6 Applying Knowledge
- NL-ENG.K-12.7 Evaluating Data
- NSS-G.K-12.3 Physical Systems
- NS.K-4.1 Science as Inquiry
- NS.K-4.2 Physical Science
- NS.K-4.4 Earth and Space Science
- NM-MEA.3-5.1 Understand Measurable Attributes of Objects and the Units, Systems, and Processes of Measurement

MATERIALS

- Soil samples brought in by students from home or schoolyard, not potting soil (about a 1-cup sample)
- 1-quart jar
- ruler
- small bowls
- spoons
- water
- alum (optional, found in spice aisle of most grocery stores)
- Basketball
- Baseball or tennis ball
- Golf or ping pong ball

BOOK

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GENERAL INTRODUCTION

Option 1: If volunteer producers are conducting this lesson, introduce yourself and describe your farm or agricultural business

Option 2: If classroom teachers are conducting this lesson, proceed to activity introduction.

ACTIVITY TWO



INTRODUCTION

Read the entire book *SEED SOIL SUN Earth's Recipe for Food* and show students the pictures. Refer back to the middle of the book starting on the page with the emerging seedling (as pictured above). This section of the book deals with soil, what particles make up all soil and the role of organic matter, micro-organisms and pore space in soil makeup and plant growth.

ACTIVITY BACKGROUND:

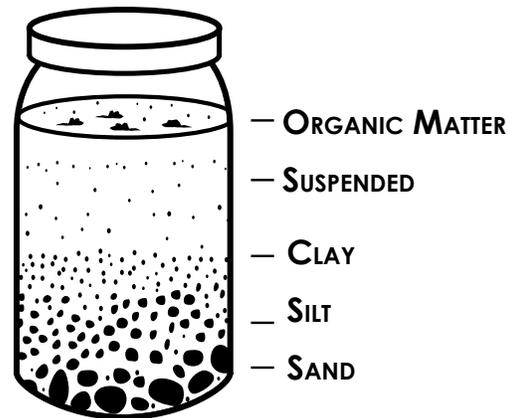
Soil is one of the most important natural resources. Land only covers about one-quarter of the earth's surface; the other three-quarters is water. Of that, one-quarter of land, only about one-thirty second of it is soil we can use to grow food. Most living things on earth depend on the soil for food and habitat. Plants grow their roots into the soil and get nutrients from it as well as help to hold the soil in



place. Humans and animals also get nutrients from eating the plants that grow in the soil. Soil is home to many organisms such as seeds, spores, insects and worms. We build sidewalks, streets, roadways and our homes on the soil. Soil also serves as a filter for our water sources. There are many different kinds of soil. Soil forms very slowly over time and can be destroyed very quickly. That's why it's important that everyone on the earth takes care of our soil.

ACTIVITY INSTRUCTIONS:

1. Divide the students into groups of three or four.
2. Provide each group with a soil sample or instruct each group to use one of the samples brought from home. **Caution!** This activity will not work with most potting soil. Potting soil is made up of mostly organic matter. This activity is designed to determine soil texture. Evaluating soil (mineral) particle size.
3. Place one inch of soil into a one quart jar. Add water until the jar is $\frac{2}{3}$ - $\frac{3}{4}$ full. Add one teaspoon of alum (optional water softener, found in the spice aisle of most grocery stores. It helps the soil settle faster, but is not necessary). Be sure the lid is tight. (You may use 3 or 4 inches of soil if you would like to see "larger" layers. This may facilitate measuring. Be sure to record the depth you start with so you can accurately determine the soil particle by layer.
4. Shake the jar vigorously until all the particles have been sufficiently wet and separated by the water- about 2 minutes.
5. Set the jar down and allow the soil to settle. (See illustration.)
6. After one minute, with the ruler measure the amount of sand on the bottom of the jar. Record this information.
7. Allow the sample to settle for three to four hours, then measure again and record the level of the silt. This is your second layer. This would be a good time to explain/demonstrate particle sizes using the sport balls. Set aside the quart jars with the soil samples and water in them.
8. Explain to students that all soil is primarily made of three types of (mineral) particles - sand, silt and clay. Sand particles can be seen by the naked eye but silt and clay particles cannot. Sand is the largest relative particle size, which we will use a basketball to represent. Silt is the second largest size particle in soil represented by a baseball/tennis ball. Clay is the smallest particle size in soil and is represented by a ping pong/golf ball.
9. When these particles are together in soil their particle size allows air, water, organic matter and micro-organisms to pass between the particles. This is called pore space.





SAND

Soil particle that is classified between 2.00 and 0.05 mm



SILT

A soil particle that is between 0.05 and 0.002 mm



CLAY

Any soil mineral particle less than 0.002 mm.

- Sand is a large particle so it has large pore spaces and allows water to pass right through it. So a sandy soil does not hold water very well for plants to use. This is also why sand feels gritty.
- Silt is a smaller particle so it will have smaller pore spaces and hold water better. Silt feels smooth, soft or slick.
- Clay is the smallest, so the pore spaces are smaller and it holds water very well. Clay feels sticky and can rub off on your fingers. Has anyone ever worked with clay in art class or at home?

10. The next day the rest of the soil (or clay particles) should have settled, depending on the amount of clay in the sample. Allow students to observe and measure the layers and record their results.

11. Students can use their observations and results to encourage discussion about the three main particles (sand, silt and clay) in all soil types and textures.

DISCUSSION

1. Why do the larger particles settle first?

(larger particle size)

2. What is the stuff floating in the jar?

(organic matter: leaves, wood)

3. How does each person's sample compare?

(layers, color)

4. How is soil important to today's food system?

(humans and animals eat plants & plant parts grown in our soil.)



Activity Three

The Plant Parts We Eat

GRADE LEVEL

First – Third

SUBJECTS

Reading in the content area, physical and life science, science, language and creative arts

OBJECTIVES

By the end of these activities, the students will be able to:

- Apply knowledge of the seeds, soil and sun to the larger concept of agriculture
- Understand the process of photosynthesis and identify plant parts that humans and animals use for food.

NATIONAL LEARNING STANDARDS

- NL-ENG.K-12.2 Reading for Understanding
- NL-ENG.K-12.6 Applying Knowledge
- NL-ENG.K-12.12 Applying Language Skills
- NS.K-4.1 Science as Inquiry
- NS.K-4.2 Physical Science
- NS.K-4.3 Life Science
- NS.K-4.4 Earth and Space Science
- NPH-H.K-4.1 Health Promotion and Disease Prevention

MATERIALS

Assorted examples of fresh vegetables that are roots, leaves, stems, seeds and flowers.

- **Stems:** *celery, asparagus*
- **Flowers:** *cauliflower, broccoli*
- **Root:** *radish, carrot, potato, beet*
- **Seeds:** *peas, soybeans in pod (edamame), corn on the cob*
- **Fruit:** *eggplant, cucumber, tomato, pumpkin*
- **Leaves:** *lettuce, cabbage, spinach*

BOOK

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ACTIVITY THREE

INTRODUCTION



Read the entire book *SEED SOIL SUN Earth's Recipe for Food* and show students the pictures. Refer to the last few pages, beginning with the page that pictures the leaf (as pictured above). This section of the book explains the sun and its role in seed germination. It also talks about a plant's ability to make and store its own food through photosynthesis. Demonstrate the different plant parts and how different plant parts are used for food for animals and humans.

ACTIVITY BACKGROUND:

Humans and animals eat plants as part of our daily diets. Plants are the only living things that use the sun's energy to grow. Plants do this by making their own food in a process called photosynthesis. Cells within the leaves of the



plant absorb energy from sunlight, carbon dioxide from the air, and water from the plant's roots. All these ingredients combine in a chemical reaction that creates sugar for the plant to use as food to help it grow. This is photosynthesis and as it occurs the plant also releases oxygen into the air for people and animals to breathe. Plants not only make their own food, but they provide oxygen and food for us to eat as well!

Which parts of the plant do we usually eat? The seed? The fruit? When we eat asparagus, we are eating the stem of the plant. When we eat spinach or lettuce, we are eating the plant's leaves. We eat the fruit of squash, cucumber and tomato plants. When we eat corn or peas we are eating seeds, and when we eat a radish or carrot, we are eating roots. Cauliflower and broccoli plants produce flowers we like to eat. With some plants we eat more than one part. The root of the beet plant is what most people like to eat, but the leaves are also good to eat in salads, when the leaves are young and tender, and cooked like spinach when they get bigger. We eat the root of the onion plant, but can also eat the stems, for a milder flavor. Some of the plants we eat are poisonous if we eat the wrong part. The leaves of tomato plants are poisonous. For many years people would not even eat tomatoes because they thought the entire plant was poisonous. Now we know that tomatoes have vitamins that are very good for us and even prevent some diseases. They are also delicious—sliced or chopped fresh into salads, cooked into spaghetti sauce or processed into ketchup.

FLOWER BUDS

Did you know that eating broccoli or cauliflower means that you are eating flowers? The white head of the cauliflower is made up of little white flowers. We can eat them raw in salads or cooked in various dishes. The little green buds of the broccoli plant are also delicious to eat either raw or cooked.

FRUIT

Tomatoes, peppers, cucumbers and pumpkins are plant fruits that we eat. Fruit vegetables grow on vines or on separate plants. Tomatoes are smooth, round and juicy with a slightly acidic taste. Each are green at first and become red, orange or yellow when they ripen. There are many different kinds of peppers and they can be sweet, mild or spicy. Like the tomatoes, some peppers are green when they are young and change color at maturity. Cucumbers can be used to make pickles or can be eaten raw. Pumpkins are used to make pies, breads and cookies. Most importantly, pumpkins ripen in the fall just before Halloween so that we can carve them!

LEAVES

The tasty leaf plants that we eat can be eaten raw or cooked, depending on what our taste buds crave. Lettuce, parsley and basil are usually eaten raw in a salad. Cabbage and spinach are usually cooked before eating. Some leaf plants like spinach have loose leaves. Leaves of a cabbage head are packed very tightly next to each other. At the grocery store or farmer's market, you can find many different kinds of leaf vegetables!

ROOTS

If you are eating carrots, sweet potatoes, turnips or beets, you are eating roots! How did these roots get so fat? It is because the plant ends up taking in more food than it can use, and so it stores the extra food in its roots. These roots all grow underground and get bigger and bigger until we harvest them. Bulbs are thin, tightly folded layers of leaves attached to a short stem. Bulbs are a type of root that grows underground. A good example of a bulb is the onion. Onions are so strong in flavor that they can make you cry if you are slicing them. Another bulb-type vegetable that we eat is garlic. It has a very different flavor from an onion and it is probably one of the strongest flavors of all roots.



SEEDS

When you eat peas, kidney beans, lima beans or sweet corn, you are eating the plant's seeds. These can be eaten both dried and fresh depending on how you like them. Corn is a popular seed in many people's diets. It can be made into bread, tortillas or cooking oils.

STEMS AND STALKS

The stems and stalks of a plant support its leaves, flowers and fruits. We eat the crispy celery stalk and the stem of the asparagus plant. Celery sticks are a healthy snack, especially if they are eaten with peanut butter! When green asparagus stems come through the ground, they are cut just below the top of the soil. We eat the stalks of asparagus plants and they grow back every year!

ACTIVITY PREPARATION:

You may tailor this to the time and budget available for your particular classroom. Pictures on page 10 and 11 (or the accompanying *The Plant Parts We Eat* poster) can be used to represent the plant parts as well.

1. Set up a small table with a large bowl in the center. Fill the bowl with an assortment of salad ingredients. Place six labeled bowls around the table. For each bowl containing a part of a plant, create an index card answer key that lists the salad ingredients in the large bowl that are from that part of the plant. Attach them to the plant part bowls.

ACTIVITY PROCEDURE:

1. Have the students work in pairs. Direct them to sort the salad ingredients from the large bowl into their proper plant part categories in the smaller bowls. Have them check their answers with the cards attached to the smaller bowls.

2. Hand out student worksheet - "What Plant Part Am I?" (page 9) Read the worksheet with your class and discuss the different plant parts. Help students identify the plant parts we eat.
3. Discuss the colors of the plant parts we eat. Have students color the pictures on their worksheets.
4. When students complete the worksheet and as a culminating event to the activity allow them to make a salad with the ingredients from the lesson.

ADDITIONAL ACTIVITIES:

- Display and review the accompanying *The Plant Parts We Eat* poster.
- Bring grocery ads to class and have students find the price for one pound of roots, one pound of stems, one pound of fruit and one pound of flowers. Have students create math problems using the prices.
- Bring samples of some vegetables students might not ordinarily eat, e.g., turnips, kale, mustard greens, etc., and invite students to taste them and guess which part of the plant they came from.
- Take a trip to the produce section of a grocery store or a farmer's market and have students identify vegetables and designate which part of the plant is eaten.
- Early in the fall or spring, help students plant some fast-growing, cool weather vegetables (radishes, lettuce, spinach, peas, beets, etc.) to harvest and eat.
- Write the school cafeteria menu on the chalkboard. Look at the vegetable of the day and have students say whether it is a stem, seed, flower, etc.



What Plant Part Am I?

Circle the part of plant that each of these comes from

Beets



- root
- seed
- leaf
- fruit
- flower
- stem

Tomato



- root
- seed
- leaf
- fruit
- flower
- stem

Corn



- root
- seed
- leaf
- fruit
- flower
- stem

Peas



- root
- seed
- leaf
- fruit
- flower
- stem

Broccoli



- root
- seed
- leaf
- fruit
- flower
- stem

Potato



- root
- seed
- leaf
- fruit
- flower
- stem

Asparagus



- root
- seed
- leaf
- fruit
- flower
- stem

Cabbage



- root
- seed
- leaf
- fruit
- flower
- stem

Eggplant



- root
- seed
- leaf
- fruit
- flower
- stem

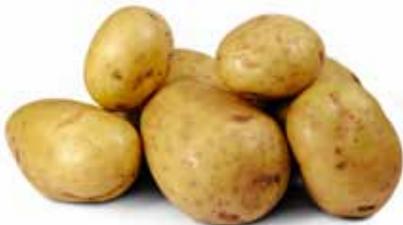


Stems: *celery, asparagus*

Flowers: *cauliflower, broccoli*



Root: *radish, carrot, potato, beet*





Seeds: *peas, soybeans in pod (edamame), corn on the cob*



Fruit: *eggplant, cucumber, tomato, pumpkin*



Leaves: *lettuce, cabbage, spinach*





FURTHER READING

The Vegetables We Eat by Gail Gibbons (Holiday House, 2008)

Our Generous Garden by Anne Nagro (Dancing Rhinoceros Press, 2008)

Eating the Alphabet: Fruits and Vegetables: from A to Z by Lois Ehlert (Harcourt, 1994)

Dirt: Jump Into Science by Steve Tomnecek (National Geographic Society, 2002)

Dirt: Scoop on Soil by Natalie Rosinsky (Picture Window Books, 2003)

From Seed to Plant by Gail Gibbons (Holiday House, 1991)

A Handful of Dirt by Raymond Bial (Walker, 2000)

How a Seed Grows by Helene J. Jordan (HarperCollins, 1992)

Life in a Bucket of Soil by Alvin Silverstein (Dover, 2000)

Living Sunlight: How the Sun Gives Us Life by Molly Bang and Penny Chisholm (Blue Sky Press, 2009)

Photosynthesis: Changing Sunlight into Food by Bobbie Kalman (Crabtree, 2005)

Roots Shoots Buckets & Boots: Gardening Together with Children

by Sharn Lovejoy (Workman, 1999)

A Seed Is Sleepy by Dianna Hutts Aston (Chronicle, 2007)

Seeds by Ken Robbins (Atheneum, 2005)

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Dirt: Secrets in the Soil, Utah State Extension, Utah Agriculture in the Classroom

Growing Healthy Habits, University of Maryland Extension-College of Agriculture and Natural Resources

Fundamentals of Soil Science by H.D. Foth (Wiley, 1990)

The Nature and Properties of Soils by Nyle C. Brady and Ray R. Weil (Pearson Prentice Hall, 2008)

Photosynthesis by D.W. Lawlor (Garland Science, 2000)

Principles of Field Crop Production by John H. Martin, Richard P Waldren, and

David L. Stamp (Pearson Prentice Hall, 2006)

Teaming with Microbe: A Gardener's Guide to the Soil Food Web by Jeff Lowenfels and

Wayne Lewis (Timber Press, 2006)

Classroom Resources . . .



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Go to www.agfoundation.org and click on Classroom Resources for Agricultural Literacy for more information. The Foundation's website explains the ordering procedure for the numerous resources we have for educators and volunteers who want to tell the story of agriculture to young people in their schools and communities.



To purchase the "I met a Farmer today!", "I met a Rancher today!" or "I like Vegetables!" stickers go to www.agfoundation.org and click on *Resource Orders*



Take a journey and experience this interactive, online game which educates as it entertains. Built for educators, learners and their families with free downloadable Educator Resources and Fun Family Activities to explore.

www.myamericanfarm.org

If you want to connect with your county or state Agriculture in the Classroom (AITC) Program please visit www.agclassroom.org. There you will find a list of state AITC contacts, free resources and state by state agricultural profiles, perfect for your program or classroom.



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