



The Big Garden 2018

Grow-Your-Own

Summer Curriculum



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Welcome!

How To Use This Curriculum –

The Big Garden Children & Youth “Grow-Your-Own! Curriculum is a toolkit that provides basic education and lesson plans in organic gardening sustainable agriculture practices for garden educators. This curriculum can be used at urban and rural garden sites and can be adapted for all types of community garden sites --

school gardens,
neighborhood gardens,
non-profit agency gardens,
church and faith community gardens,
group home gardens,
or in your backyard home garden.

This curriculum is meant to be active and engaging, as well as informative in areas relating to sustainable agriculture practices. The lessons in this curriculum are designed to appeal to ages three through eighteen, with alternative activities within each lesson catered to the specific age groups.

Each lesson includes the following sections –

Lesson Overview
Lesson Objectives
Key terms
Activities
Garden Care
Handouts and Resources

We hope you have fun using “Grow Your Own! A Sustainable Agriculture Curriculum for Children & Youth.” Please feel free to contact us if you have questions or would like further support.

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Lesson One

I Love Soil!

Lesson Overview

This lesson covers the basics of what soil is made of, why it is important to care for and protect our soil, and how can be good stewards of one of our most important resources.

Lesson Objectives

Participants will learn the three components that make up all soils — sand, silt, and clay.

Participants will understand that soil is living and is home to many soil organisms.

Participants will learn how to prepare their soil for the growing season.

Participants will identify one practice for keeping soil healthy.

Time Needed

1 hour

Staff Needed

2 Garden Educators

Key Terms

Soil

Soils are complex mixtures of minerals, water, air, organic matter, and countless organisms that are the decaying remains of once-living things. It forms at the surface of land – it is the “skin of the earth.”

Soil Horizons

There are different types of soil, each with its own set of characteristics. Dig down deep into any soil, and you’ll see that it is made of layers, or horizons (O, A, E, B, C, R).

Humus

The organic component of soil, formed by the decomposition of leaves and other plant material by soil microorganisms.

Dirt

Loose soil or earth

Soil Compaction

Soil compaction occurs when soil particles are pressed together, reducing pore space between them. Heavy equipment and tillage implements can cause damage to the soil structure. Soil structure is important because it determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity.

Double-digging or Broad-forking

Double digging is a gardening technique used to increase soil drainage and aeration. It involves the loosening of two layers of soil, and the addition of organic matter.

Tools for Healthy Soils

Broadfork

Pitchfork

Compost or Compost Tea

Vermicompost or Vermicompost Tea

No-Till

Activity One - Discovering Soil

Materials // A table for setting out your materials, glass jars with lids, hand trowels, garden gloves, different types of soil in labeled glass jars (examples: potting soil, soil from the garden, soil from a nearby farm, sandy soil, silty soil, and clay soil)

Ages // All Ages

Time // 15 - 20 minutes

Activity Description // Have participants go out into the garden and fill their glass jar with soil, leaving a little room at the top. Return back to the group or if you have a larger group (20 or more) split into two groups. Have participants compare their soil and invite them to use their senses.

Ask - "What does it smell like? Feel like? Look like? Taste like? What is in the soil? Do you see anything living in the soil?" Compare the garden soil with the other soils you brought. Ask for their observations. Ask participants which soils they think their garden plants would prefer, why? Mention that soils need to be loose in order for our roots to grow strong and deep into the soil. Roots need to grow straight down and the healthier the soil, the healthier the roots and the healthier the plant.

Ask — What is Soil Made Of?

Describe — All soil is made of a mixture of sand, silt, and clay. Show them the separate jars of sand, silt and clay. Have each participant put some soil they collected from the garden in their hand and try to form a ball. The best soil for growing edible plants is a rich, dark soil with lots of nutrients. It should come together and somewhat form a ball when squeezed into your hand, but it should also fall apart easily. This type of soil is called a loam soil. We do not want a heavy or dense soil (that is a heavy clay soil).

Soil is a living breathing thing. It is an organism, often called "the skin of the earth." In order to protect it we need to treat it like it is a living breathing thing.

Interesting Facts to Share!

In a thimble full of soil - about a gram weight - you can expect to find

- 100 million to 1 billion bacteria
- Several yards to several miles of fungi depending on whether you have agricultural or forest soil
- Several thousand protozoa and up to several hundred thousand in forest soils

Activity Two - What is In the Soil?

Materials // Laminated signs of all macro & micro nutrients and what they do on the back side, laminated signs with each soil organism and what they do on the back side.

Ages // All Ages. For younger ones (2-5) read about the different organisms and invite each person to wear a laminated soil organism sign. Then invite them to wiggle around and pretend they are living in the soil.

Time // 30 minutes

Activity Description // Ask — Does anyone know what lives in the soil? Can you name something that is living in the soil? There are millions of soil organisms and microorganisms living in the soil. Some we cannot see with our eyes, and others are visible. Some Soil Organisms are - Earthworms, Nematodes, Protozoa, Fungi, Bacteria and different arthropods. The decomposition of organic matter by soil organisms has an immense influence on soil fertility, plant growth, soil structure, and carbon storage.

Ask — What are nutrients? Humans receive nutrients from the good foods we eat, especially plants
Describe — All soils also contain micro nutrients and macro nutrients. All plants need these nutrients to feed them and help them grow and thrive. Soils that are lacking nutrients will not grow healthy plants. Have the macro & micro nutrient laminated signs as well as all the things that live in the soil. Invite participants to display the different nutrients & living things. Explain their roles.

Macro Nutrients - Nitrogen, Phosphorus, and Potassium, Calcium, Magnesium, Sulfur.

Macronutrients can be broken into two more groups: primary and secondary nutrients. The primary nutrients are N-P-K. These major nutrients usually are lacking from the soil first because plants use large amounts for their growth and survival. The secondary nutrients are Ca-Mg-S.

Micro Nutrients - Iron, Manganese, Copper, Zinc, and Boron
Micronutrients are those elements essential for plant growth which are needed in only very small (micro) quantities. Recycling organic matter such as grass clippings and tree leaves is an excellent way of providing micronutrients (as well as macronutrients) to growing plants.

Nitrogen (N) is a part of all living cells and is a necessary part of all proteins, enzymes and metabolic processes involved in the synthesis and transfer of energy. Nitrogen is a part of chlorophyll, the green pigment of the plant that is responsible for photosynthesis. Helps plants with rapid growth, increasing seed and fruit production and improving the quality of leaf and forage crops.

Phosphorus (P) Like nitrogen, phosphorus (P) is an essential part of the process of photosynthesis. Involved in the formation of all oils, sugars, starches, etc. Effects rapid growth. Encourages blooming and root growth. Phosphorus can be added to the soil with bone meal.

Potassium (K) Potassium is absorbed by plants in larger amounts than any other mineral element except nitrogen and, in some cases, calcium. Helps in the building of protein, photosynthesis, fruit quality and reduction of diseases. Potassium is supplied to plants by soil minerals and organic matter.

Calcium (Ca) an essential part of plant cell wall structure, provides for normal transport and retention of other elements as well as strength in the plant. It is also thought to counteract the effect of alkali salts and organic acids within a plant. Sources of calcium are dolomitic lime, gypsum, and superphosphate.

Magnesium (Mg) is part of the chlorophyll in all green plants and essential for photosynthesis. It also helps activate many plant enzymes needed for growth. Soil minerals, organic material, fertilizers, and dolomitic limestone are sources of magnesium for plants.

Sulfur (S) Essential plant food for production of protein. Promotes activity and development of enzymes and vitamins. Helps in chlorophyll formation. Improves root growth and seed production. Helps with vigorous plant growth and resistance to cold. Sulfur may be supplied to the soil from rainwater or gypsum.

Game — Go through each nutrient and/or soil organism by reading the descriptions from the back of the laminated card aloud to all participants, or take turns reading them aloud if participants are interested in reading. Then pass them out with each participant only looking at the description of the nutrient or soil organism. At this time everyone tries to guess which one they are. Flip the laminated cards to the other side to reveal the correct answer. With other participants you can play this game (similar to the “headbands” game) a few times until they are able to guess the correct answers.

“I along with fungi are the primary decomposer in the soil. That means they breakdown virtually everything from your lunch to a Mac Truck. I along with fungi, are the workhorses of the compost pile.” - Soil Bacteria

“I pass both soil and organic matter through their guts, in the process aerating the soil, breaking up the litter of organic material on its surface, and moving material vertically from the surface to the subsoil.” - Earthworms

“Like protozoa, I am important in mineralizing, or releasing, nutrients in plant-available forms. When nematodes eat bacteria or fungi, ammonium is released because bacteria and fungi contain much more nitrogen than the nematodes require.” -Nematodes

“ I play an important role in mineralizing nutrients, making them available for use by plants and other soil organisms.” -Protozoa

“I am a vital part of healthy fertile soil. We already know their role as decomposers, recycling nutrients back to plants. I infuse the soil with a mat of hyphae that serve to hold the soil in place. I can absorb and hold up to 30,000 times their mass and are in large part the generators of humus soils throughout the world.” - Fungi

“I shred organic material. I increase the surface area accessible to microbial attack my shredding dead plant residue and burrowing into coarse woody debris. I help control pests in the soil. - Arthropods

Activity Three - Soil Has Layers

Materials // Dry erase board and markers, soil horizon visual aid

Ages // All Ages

Time // 20 minutes

Activity Description // Teach about the different “soil horizons.” Use a Soil Horizon visual-aid (laminated card with a picture of all the soil horizons or draw on the white board). Explain that soil is made up of distinct layers, called horizons. Each layer has its own characteristics that make it different from all of the other layers. These characteristics play a very important role in what the soil is used for and why it is important.

O HORIZON- This is the top layer of soil that is made up of living and decomposed materials like leaves, plants, and bugs. This layer is very thin and is usually pretty dark.

A HORIZON- This is the layer that we call "topsoil" and it is located just below the O Horizon. This layer is made up of minerals and decomposed organic matter and it is also very dark in color. This is the layer that many plants roots grow in.

B HORIZON- This is the layer that we call "subsoil" and it is located just below the A Horizon. This layer has clay and mineral deposits and less organic materials than the layers above it. This layer is also lighter in color than the layers above it.

C HORIZON- This is the layer that we call "regolith" and it is located just below the B Horizon. This layer is made up of slightly unbroken rock and only a little bit of organic material is found here. Plant roots are not found in this layer.

This activity is usually followed up with making “soil layer” snacks. This allows participants to engage in a hands-on activity that further emphasizes the concept of multiple layers.

Activity Four - Soil and Water

Materials // Jars of soil from the garden, garden pots with holes in the bottom, and watering cans or empty jars to fill with water

Ages // 6-18 (school age)

Time // 10 minutes

Activity Description //

Say - Now we are going to talk about soil and water retention. Ask - Why do we need water in our garden? What is its function?

Explain that earlier we mentioned our ideal soil would form a ball in your hand and be able to retain or absorb water well. We also need it to have good drainage so that water does not pool up. We don't want standing water in our garden, which could mean that our soil is too thick or heavy to absorb the water. A healthy soil is living and porous.

Have participants explore what happens when water interacts with soil. Pour a little bit of water into some of the jars they collected soil in and see how the soil responds. Also have them put some garden soil into garden pots with drainage holes at the bottom. Notice what happens. Is the soil absorbing water and draining well? Try out a few different types of soil. At the end of the lesson check the jars again to see which jars dried out and which jars are still moist. Also note if you can see the different layers of the soil in their jars. These are the different parts settling - sand, silt & clay.

Interesting Facts to Share!

Soil acts as a filter for underground water, filtering out pollutants

Activity Five - Which Soils Do Plants Like?

Materials // Different types of soils (potting soil, compost, garden soil, soil from a farm), seed trays, seeds, popsicle sticks for marking the seed trays

Ages // All Ages

Time // 15 minutes

Activity Description // Provide participants with a few different types of soil and seed trays, such as –

Potting Soil

Straight Compost

Soil from the garden

Soil from a local farm

Have the participants fill the seed trays with dirt. Place seeds in the holes and mark which type of soil is used. Bring the seed trays back to the garden in a week and two weeks to observe how the seedlings are growing. Which ones grow best?

Activity Six - Double Digging & Broadforking to prepare our growing spaces

Materials // Garden forks, broad fork rakes & shovels

Ages // 6-10, for younger ones you could bring the shovel and broad fork and talk about how these tools are used.

Time // 30 minutes

Activity Description // Explain to participants that it is really important for the soil we grow our food in to have air and to not be compacted – that way the roots can grow down deep and make healthy plants! Each season it is crucial to “prepare your garden beds” and there are a few ways to do that and not disturb the soil. One way is to use the double digging method. Another method is to use the broadfork. Each season we also want to add compost to our beds. This is called “top dressing” and gives our soil a jump start of nutrients to feed our plants throughout the season.

If our plants are growing in packed soil, what will happen to them? Can you think of ways we can loosen hard, packed soil? We are going to learn a method called double digging. There are many different methods used to prepare a garden plot. Our two steps will be loosening the soil and adding nutrients to the soil.

If the garden in a raised bed garden, explain that we already added compost to the soil mixture, but that compost should be added every year at the garden site to increase soil health and organic matter. Demonstrate double digging using a flat filled with soil, two spoons, and one fork, before getting started in the real garden.

METHOD Double digging instructions:

- Dig out a trench across the width of one end of a bed about one foot deep and one foot wide. Pile this soil at the end of the bed, not on the bed. This soil will be used later.
- Standing on the un-trenched part of the bed, try to dig the digging fork into the trench another 12 inches. Put the fork down as far as it will go and wiggle it, trying to loosen the subsoil, but not remove it. Do this across the entire trench.
- Dig another trench behind the first one.
- Use this soil to fill the first trench.
- Loosen the subsoil.
- Continue along the bed until it is complete.
- When you have emptied the very last trench and loosened the subsoil, fill that trench with the soil you laid aside from the first trench.

METHOD Bed Prep with broadfork instructions:

- Use the broad fork gently every 12 inches throughout the growing space to aerate the soil.
- Apply a top layer of compost.
- Rake the bed smooth to get it ready for planting.
- Plant the bed right after broad forking

Activity Seven - All About Cover Crops

Materials // Cover crop seed, cover crops planted into a seed tray or two pots (buckwheat and peas work great), seed tray with mulch on top, an empty seed tray, plastic bowl, cover crop seed.

Ages // 6-18 (school age)

Time // 20 minutes

Activity Description // Ask “Has Anyone Heard of Cover Crops?” Explain -- A cover crop is something we plant to cover our soil when it is bare (not planted). We plant cover crops in early spring if we will not plant until mid-Spring or Summer. We plant cover crops when our plants are done producing in late Summer, or we plant cover crops right before winter. When we have our soil covered, the roots work to hold down the soil.

Pull out buckwheat plant and pea plant.

Hold over a plastic bowl and pour water on it. Note how the water looks like.

Try to pull out a block of empty soil, note that it just falls apart. Pour water over it in your hand. Note what the water looks like.

Say “This is why we don’t want our soil to be bare or naked. It will just wash away. This is called erosion. When our soil erodes it gets in our waterways and causes flooding. We also lose the soil we need to grow food to eat.”

We need roots in the soil to keep it in place. We need a cover of plants or mulch over our soil to keep it in place and safe. If we have bare soil it has the potential to wash away or “erode.” Our goal is to create more soil by

1. Keeping our soil in place and
2. Building organic matter

Show the different types of cover crops

Buckwheat and Field Peas

Show participants how to broadcast cover crop seed. Seed in center of palm, palm up, circular motions over the soil. Let participants take turns trying this technique over the soil bin. If there are empty spaces in the garden sow some cover crops.

Activity Eight - Mud Pies & Soil Painting

Materials // Bucket, dirt, waxed paper, five gallon buckets, large sheet of drawing paper, paint brushes, glue

Ages // 2-5 (mudpies) 2-10 (soil painting)

Time // 15 minutes

Activity Description // Mud Pies!

You heard it. Use a bucket and mix with dirt. Make mud pies on waxed paper. Flatten them out and stick twigs, leaves, beads, whatever you like in the mud pies. Lay them out to dry in the sun. Make muddy hand print art on large pieces of paper.

Different soils vary in color and texture. Invite students to bring in a small amount of soil from their yards or from places around their communities. Make sure they label where they got the soil. Divide the students into small groups and have them compare and contrast the soil. Why might one soil be darker than the other? What might make one soil reddish in color? Where in the community might you find drier soil or sand? Have students discuss and write down their ideas.

Then have students create soil paintings. They can use glue and their soil samples to create landscapes, abstract paintings, or even portraits. Encourage them to be creative! Then have students share their artwork at the end.



Activity Nine - Protecting the Soil Scavenger Hunt

Materials // Laminated signs with True or False questions about taking care of the soil stapled to wooden stakes (placed around the garden). Make sure they are numbered 1 - 9. Paper and writing utensils for participants.

Ages // All Ages (for younger ones teachers will read the cards)

Time // 20 minutes

Activity Description //

Explain - Now we are going to go over the steps all of us need to take to make sure we need to do to protect our soil “the skin of the earth!” and keep it alive! Split the participants into teams of 3 or 4. Have them walk around the garden and answer the different questions, record their answers on the paper. Try to go to a different number that another team is not at. This is a contest! Turn in your answer sheets to the Big Garden teachers and see if you were correct.

- Sign #1** - Soil is living. True!
- Sign #2** - Large vehicles or tractors driven on top of soil does not harm the soil. False.
Whenever we put anything on top of our soil it compacts it and harms the organic matter and soil organisms. Soil needs air!
- Sign #3** - Adding compost to the soil is a great soil health technique True!
- Sign #4** - It is important to keep your soil bare at all times False.
You want to keep the soil covered at all times
- Sign #5** - Clover is a common cover crop and also great for beneficial insects like pollinators. True!
- Sign #6** - Putting mulch or dried leaves over the soil in the garden is a good practice. True!
- Sign #7** - Spraying chemicals like round-up does not hurt soil organisms. False.
Any chemical, spray, or soil disruption technique (like tilling and plowing) hurts soil organisms.
- Sign #8** - Without healthy and living soil we would not have food to eat. True!
You can't grow food crops without healthy soil.
- Sign #9** - Plowing and tilling do not disturb the soil. False.
These practices significantly disturb and damage our soil and should be used as little as possible.

SNACK // Healthy Dirt Cups

Materials //

pudding:

- 1 cup unsweetened almond milk
- 2 ripe avocados, peeled and pitted
- 1 banana (optional)
- 1/3 cup plus 1 tablespoon unsweetened cocoa powder
- 1/2 cup plus 2 tablespoons pure maple syrup
- 2 teaspoons vanilla extract
- 1/4 teaspoon almond extract (I didn't add this)
- 1/4 teaspoon ground cinnamon
- Pinch of sea salt

1. Put the almond milk, avocados, cocoa, maple syrup, vanilla extract, cinnamon, and salt into your blender and puree on high for 30 to 60 seconds, until smooth and creamy. You may need to stop and scrape down the sides with a spatula.
2. Transfer the pudding to glasses, ramekins, or jars and chill in the fridge for at least 3 hours.
3. To serve, top each pudding with fresh raspberries.

Note-the pudding works best with ripe avocados that don't have any brown discolorations. The pudding is best the day it's made, as the avocados will oxidize and the flavors will change over time.

Topping/Soil Layers:

For the dirt cups you need to cover all of your layers – Bedrock, C Horizon, B Horizon, Topsoil and Organic Matter (Humus).

For the Bedrock & C Horizon – Gluten free chocolate cookies.

For the B Horizon – Vegan chocolate pudding.

For the Topsoil – cookie crumbles or a dusting of cocoa powder

For the Organic Matter – Almonds and Walnuts (if there are no nut allergies) and dark chocolate chips.

Instructions //

In a blender or food processor, blend all of the pudding ingredients on high for 4 minutes, stopping to scrape the sides down before blending again. Cover in an air tight container and chill in the fridge for two hours (or if you're impatient like me then stick it in the freezer for 20 minutes).

Have the toppings in different bowls and let the participants put their soil layer cups together.

