Edible Campus Coalition

Three Part Garden Education Lesson Plan

Inside, Outside, Beyond—Classroom, School Garden, Farm

Garden Curriculum for Pre-K Students of Orfalea Family Children's Center

Preschool Learning Foundations fulfilled:

SOCIAL-EMOTIONAL DEVELOPMENT:

Self

- 2.0: Self-Regulation
    - 2.1: Regulate their attention, thoughts, feelings, and impulses more consistently, although adult guidance is sometimes necessary
        - Children anticipate routines, cooperate with fewer reminders, can focus attention on the task at hand
- 5.0 Initiative in Learning
    - 5.1: Take greater initiative in making new discoveries, identifying new solutions, and persisting in trying to figure things out

Social Interaction

- 2.0: Interaction with Peers
    - 2.1: More actively and intentionally cooperate with each other
        - ...may involve working together in groups to achieve a shared goal or communicating about how to share materials so all can use them
- 3.0: Group Participation
    - 3.1: Participate positively and cooperatively as group members

LANGUAGE AND LITERACY:

Listening and Speaking

- 2.0: Vocabulary Children develop age-appropriate vocabulary
    - 2.1: Understand and use an increasing variety and specificity of accepted words for objects, actions, and attributes encountered in both real and symbolic texts

Reading

- 5.0: Literacy Interest and Response: Children demonstrate motivation for a broad range of literacy activities
    - 5.1: Demonstrate, with increasing independence, enjoyment of literacy and literacy-related activities

MATHEMATICS:

Number Sense

- 1.0: Children expand their understanding of numbers and quantities in their everyday environment
    - 1.1: Recite numbers in order to twenty with increasing accuracy

Measurement

- 1.0: Children expand their understanding of comparing, ordering, and measuring objects
    - 1.1: Compare two objects by length, weight, or capacity directly or indirectly

ENGLISH-LANGUAGE DEVELOPMENT:

Listening

- 1.0: Children listen with understanding (focus: requests and directions)
    - 1.2: Respond appropriately to requests involving one step when personally directed by others, which may occur with or without contextual cues
    - 1.3: Follow directions that involve one- or two-step sequence, relying less on contextual cues

Reading

- 1.0: Children demonstrate an appreciation and enjoyment of reading and literature (focus: participate in read-aloud activity)
    - 1.1: Attend to an adult reading a short storybook written in the home language or a storybook written in English if the story has been read in the home language

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Lesson 1 — Inside

Settling Soil

Grade: Pre-K

Time: 90 minutes
Season: Any
Where: Inside

Learning Objectives: Students learn about soil and what it is composed of as an initial step in understanding the garden's composting system.

Introduction: In most cultures, young children have already experienced soil and have a general idea what it is. Many have dug in the dirt, made mud pies and planted gardens, but what do they really know about soil? This lesson will help children discover the science of soil in a discovery and play-based format. Soil is all around us. We wipe it off of our shoes before we enter the house and wash it from our hands before eating, but there's more to it than that. Help pre-K students understand the importance of soil with this lesson plan.

Key terms:
rock: a big pebble—you might be able to only fit one in your hand at a time.
gravel: smaller rocks—not as tiny as sand, but not as big as rocks. You could fit a few bits of gravel in your hand.
sand: the tiniest rocks—what you find on the beach. Sand doesn't hold water; the water just falls right through it.
silt: soil finer than sand but not quite as fine as clay.
clay: a much finer soil that holds water. You can squish it and shape it in your hand. It will clump together and you can roll it into a ball.

Supplies:
- 16 oz. Mason Jars with lids, one for every group of three or four children
- Soil dug out of the ground with debris such as leaves, rocks, sticks, insects, etc. (not bagged potting soil)
- Pitcher of water
- Pencils, crayons, markers
- Plastic Spoons
- Hand lenses
- Large sheets of white paper to cover tables
- Paper for drawing

Instructions:
1. Before the lesson fill each jar about halfway with soil. Make sure soil is not just sand but includes debris. (Option: take kids outside to fill their jars, making sure they collect different types of soil that includes debris such as leaves, sticks, rocks, etc.)
2. Divide the children into small groups of three or four.
3. Give each group a jar with soil in it.

4. Go around to each group and add water to the jars until it is almost to the top. Put the lids on the jars and tighten them.
5. When all of the jars have water in them, tell the children to take turns shaking up their jars. Then put the jars back on the table and let the soil settle. The longer the soil sits the better.
6. Introduce the key terms.
7. While the soil continues to settle, read your favorite gardening book to the kids (see further reading for book suggestions).

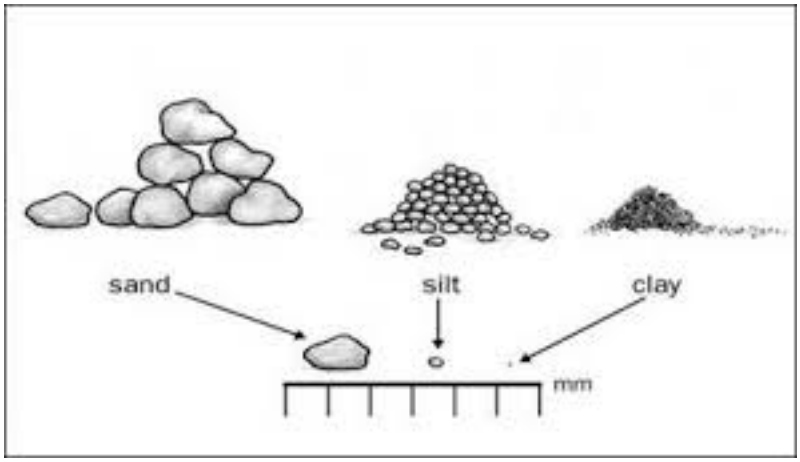
Once the soil in the Jars have settled…

1. When the soil has settled, tell the children to look at what has happened. Ask them what they notice about the soil. It will have settled into layers. They may notice small rocks and gravel on the top of the soil and finer silt and clay near the bottom. Any extra debris, like leaves and small twigs, will float to the top of the water. Talk to the students about what they see.
2. Cover the work surfaces with large sheets of white paper. This will make clean up easier and give the children a clear surface to work on.
3. Give the children paper to draw what they see and label any items they can in their soil.
4. Teachers carefully empty the water from the soil.
5. Give each of the groups a jar of soil, a few plastic spoons and hand lenses. Show them how to carefully scoop out their soil onto the white paper. Then have them use the spoon to separate the things they find in the soil and the hand lenses to take a closer look at the sediments in the soil.

6. Once again talk about what they notice:
   What kinds of things can they see in their soil? Are there different types or colors of soil? When they use the hand lenses, can they see different-sized particles?
   Did they find sand, rocks, gravel, or clay? Instruct students to rub the soil—note that if it leaves a mark on the paper it is more of a clay based soil.

Soil FAQ's:

What do different colors mean in the soil?
Soil will usually be a variety of hues in the brown/neutral colors. If it is lighter in color, it might be more sandy or even salty since Santa Barbara is in a coastal area. Salty soil is white to light beige in color. If it is solid brown, it probably has more clay in it. It might be chunky or dusty, but a cork colored soil probably has less sand in it, and not a lot of the organic plant material. Silt is a dusty type of a clay soil that we might also find around here too. Silt is really dark brown, and even almost black, it is likely good soil with lots of decomposed plants from the bacteria and fungi. This soil will probably have more bits of old plants too.



Do types of soil depend on location?
Depending on the geology of a region, soil might be more pink or more grey. For instance, some of the soil in Santa Barbara is really dark and clay like because of the high iron content from when our local mountains were formed by volcanic activity. Similarly, if it is orange or reddish in color, it might also have high iron content.

What might one find in soil with hand lenses besides decomposers?
One might find seeds, insect eggs, newly sprouted seeds, different sized rocks/gravel, leaves, roots, and unfortunately sometimes trash.

Suggested Reading:

"Up in the Garden Down in the Dirt" by Kate Messner
"In the Garden, Who's Been Here?" by Lindsay Barrett George
"The Curious Garden" by Peter Brown

LESSON 2—Outside

Digging for Decomposers:

Grade: Pre-K
Time: 1 hour
Season: Any

Where: Outside

Learning Objectives: In this lesson students learn about decomposition and the importance of life in the soil. They will learn the names of common decomposers and how to use hand lenses to investigate like scientists.

Introduction: Who lives in the soil below our feet? An entire community of living things hidden from our view lives in the soil beneath us. Many of these creatures are decomposers. What is a decomposer's job? To turn lifeless dirt into fertile soil. What does fertile soil do? It grows the veggies and fruits we eat! Let's explore the underground world and see if we can find these very helpful decomposers!

Key terms:
Decompose: When food or plants break down into tinier and tinier pieces. This is how old trees and plants disappear back into the ground.
Decomposer: The tiny animals that eat old food and plants to turn them back into soil. Bacteria are too small to see, but sometimes special decomposers like mushrooms or mold might appear, which we are able to see. Worms are some of the fastest decomposers - because they're larger, they eat more and faster.
Fertile Soil: The good dirt that has all the vitamins that plants need to grow big, strong, and green.

Supplies:
- trowels (1 for every 3 students)
- newspaper
- hand lenses (for each student)
- empty egg cartons
- child size garden gloves

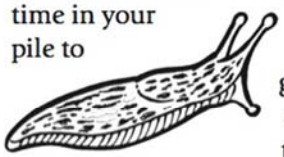
Instructions:
1. Collect a trowel full of rich fertile soil from the worm bin.
2. Pour the soil onto your newspaper and spread it out.
3. Use your hand lenses to see if there are any creatures lying in there. Look carefully. How do the bugs move? Where are they found?
4. Place any creatures you see in the egg carton, each covered in a bit of soil to protect them.
5. Collect another trowel full of soil from the bottom of the hole/container/etc.
6. Examine this soil for more creatures. Are there more living creatures down there, or fewer? Are they the same types of creatures or different ones?
7. Keep digging and investigating through the fertile soil until you have an egg carton full of creatures.
8. Return the creatures to the same places where you found them. Make sure you bury them very gently in the soil.

Extensions:
Write a story together, draw a picture including all of your creatures. Imagine what they might do under the soil, what they might eat, how they might communicate, how it might feel to move the way they do through the soil, what the earth looks like through their eyes…

Compost Critters Information Sheet

Slug

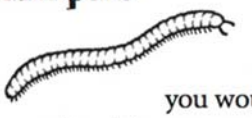
I have muscular discs on my underside that are adapted for creeping and crawling. I lay egg masses that look like jello. I eat living material but will make an appearance from time to time in your compost pile to eat fresh garbage and garden trimmings.



Mite

I am tiny. It would take 25 of us to cover an inch-long line. My body is round and fat so it's hard to see my 8 legs. I eat plant materials such as mold and soft tissues of leaves. Some of us eat the manure of other organisms. I am usually white or brown.

Millipede



I have so many legs you would have a hard time counting them. My name means "thousand legs," but I don't have that many. I am very shy and I roll up into a ball to avoid danger. I am a vegetarian and eat soft, moist, decaying plants. I am dark-red in color and am 1 to 3 inches long.

Springtail

I am a tiny insect less than 1/16 inch long. I eat molds and decaying materials. I have a little spring that helps me jump high into the air. I am white in color.

Collembola

I am a close relative of the springtail but I can't jump. I am tiny, and less than 1/16 of an inch long. I eat molds and decaying matter. I am white in color.

Beetle

I am an insect with shiny, black, tough wings and am about ½ inch long. I am a predator and eat slugs, snails, and soft insects such as caterpillars. I live beneath stones, boards, and other moist places.

Snail

Like my friend, the slug, I am a mollusk and creep around on my muscular belly. I carry on my back a spirally curved shell. I also have a broad retractable foot and a distinctive head. Like slugs, I prefer to eat living material, but I will also show up in your compost pile or worm box from time to time for lunch.

Spider

I am related to mites and have 8 nifty legs. I am one of the least appreciated animals in the garden and compost. I feed on other insects and work hard to help control pests that will hurt a garden.

Worm Cocoon

You can find me in a worm bin or compost pile. Before I have hatched, I am clear and yellowish and the shape of a lemon, and 1/8 inch long. After I have hatched I turn pea green. Two or more baby worms are hatched at once.

Compost Critters Information Sheet

Pill Bug or Roly Poly

I am an isopod, which means I have ten pairs of legs that look very similar to each other. I eat old leaves and veggie scraps. I am about ½ inch long and I roll up in a ball if I am disturbed. Some people think that I look like a little armadillo. I am a grayish, dark color.

Centipede

I move quickly on my many legs. I have 15-137 segments with a pair of legs on each. I am a fierce hunter. I love to eat earthworms. I use my pair of poison claws to help keep my prey from getting away. I am about 1 to 2 inches long. I am usually reddish brown.

Ant

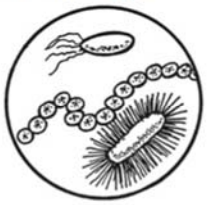
I am an insect with 6 legs. I help to decompose by breaking materials into smaller particles. I create tunnels, and move soil into clumps. Some people would rather not have me around their homes. I am black, brown, or red.

White Worm

I look like a frayed piece of thread. I am a skinny, white worm. I am ½ to 1 inch long. I am related to an earthworm. I like to eat rotting food after the other bugs get to it. You might think of me as one who likes to finish off the job.

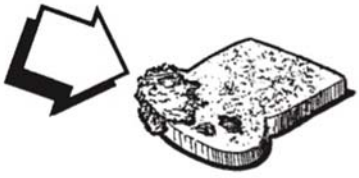
Bacteria

We are so tiny that you can't even see us. We are everywhere. I am colorless. I can eat almost anything. Some of us live together in groups and others don't.



Mold

I am a fungus. I am related to mushrooms. Most of us live on old food. You might see me on old food in your home or your worm bin.

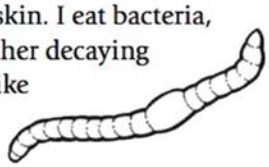


Sow Bug

I have 10 pairs of legs. That makes me an isopod like my cousin the Roly Poly. I eat vegetation and old leaves. My ½-inch-long body is oval and flat with flattened plates, but I can't roll up into a ball like Roly Poly. I am related to crayfish and lobsters. I breathe with gills so I must live in a damp, moist place. I am a dark, grayish color.

Earthworm

I am a long, thin, soft-bodied animal. My body is made up of little segments. I do not have legs or eyes. I sense light and I breathe through my skin. I eat bacteria, fungi, and other decaying materials. I like dark, moist places.



Fruit Fly

I am a very small fly. People don't like me, but I don't bite, sting, or make buzzing sounds. I don't harm earthworms either. Sometimes you will see me around a worm bin if a person forgot to bury their food. I like to lay my eggs where it's moist and warm.

Decomposer FAQ's:

What are typical behaviors of some of the decomposers found in compost? Worms, for instance, what do they do under the soil? What do they eat?
Decomposers pretty much just eat, all day, all the time. Worms, in particular burrow, or tunnel in soil and food. This creates space for air to flow through, keeping it from anaerobic decomposition, or from creating any greenhouse gasses. As they eat and move, they create the tunnels from the wriggling of their bodies. Worms feed on the microbes (bacteria, fungi, etc.) that grow on foods, and this is one reason they really like fruits such as melons. In this way, worms are very small carnivores! Although, worms don't feed on decaying meats, but they will eat through other dead bugs and worms.

How do worms communicate?
A combination of chemical sensing in their environments and physical contact. Worms aren't necessarily social animals, though they will congregate to reproduce. Since worms secrete fluids through their skin (equivalent to us breathing out CO_2, and urinating [nitrogen compounds, which is partly why there is so much nitrogen in worm castings]), they also communicate with a combination of hormones and other chemicals they excrete. Their skin also has little bristles all over it, hundreds per segment, so while they don't see with eyes like us, they can sense all of their bodies. Their heads can also detect light, which can be deadly if they are exposed too long. In other words, worms can feel each other and their skin has liquids that can let other worms know how they are doing.

How do worms move through the soil?
Mainly, worms tunnel. They create little underground pathways with their body movements. Since they don't have arms or legs, they can't actually dig, but they use their wiggling to push their body through dirt and food scraps. They will also tunnel into food they really like, and sometimes they get in really big groups to make new baby worms. Worms can make themselves longer and shorter, and skinnier or wider too, which helps them shape out a little tunnel.

What might the earth look like through worm eyes?
They would see dirt and other bugs beneath them, and more plant material above them in the ground. In a worm bin, the bottom would be almost purely worm castings, maybe with some worm eggs, and above them would be food scraps and newspaper remnants. They might also see some seeds (which they don't usually eat because the outside is too hard), or other tough plant bits.

Why do pill bugs curl up?
This is because their outer-parts (i.e. exoskeleton) are thicker and tougher than their underside, and by rolling up, they are more protected. It's their shield against predators.

How do decomposers contribute to a closed-loop system?

Decomposers, either as bacteria, fungi, worms, or insects are critical to the closed loop system because they are recyclers—they turn the parts of food that we don't or can't eat, and make it into new soil/dirt/plant food. The closed loop system inherently tries to bring in as few new materials as possible, and tries to keep everything in the cycle: that means not sending it to the trash. Without decomposers, food piles would get raided by bigger animals like raccoons or mice, and as gardeners, we wouldn't have those leftover materials to enrich the soil to grow more food next time around. Bigger plant material like stems or leaves would stay in really big, chunky pieces, and the new plants we want to grow wouldn't be able to absorb nutrients that are still locked up in those big pieces. The bacteria, worms and fungi all work together to get the big pieces into smaller pieces that new plants can use.

Lesson 3 — Beyond

Compost Castle at Farm:

Grade: Pre-K
Time: 90 minutes
Season: Any
Where: Outside

Learning Objectives: Students learn what a compost pile is and how it is used.

Introduction: Compost is the garden's recycling station. Food scraps and garden trimmings go in, and healthy compost comes out. When you add this compost to your garden beds, you'll nourish the plants, which will give you more crops, food scraps, and trimmings. And so the cycle continues. This is what we call a "closed-loop". Not surprisingly, starting a compost pile can be a big job. Nonetheless, you will see that the reward of healthy garden soil is tremendous. So grab a pair of gloves and dig in!

Key terms:
browns: the dead leaves or straw. This is the compost's source of carbon.
greens: the fruit or vegetable scraps, crop leftovers, or fresh grass clippings. This is the compost's source of nitrogen.
closed-loop composting: When we eat fruits and veggies and use the scraps from those fruits and veggies for more compost. That compost helps grow more yummy fruits and veggies. It is the garden's way of recycling our food in order to give us the nutrients we need to thrive!

Supplies:
- trowels (1 per group)
- a ruler (one for every group of 3 students)
- a wheelbarrow full of "greens", such as fruit and vegetable scraps, crop leftovers, or fresh grass clippings
- children's garden gloves
- a wheelbarrow full of "browns", such as dried leaves or straw
- clear bucket (one for every group of 3 students)
- large watering can filled with water (one for every group)
- colorful markers
- a pound of red worms

Instructions:
1. Make your way to UCSB's Green House and Garden Project.
2. Hand out clear buckets, rulers, gloves, and watering cans to each student group. (Assign an adult for every group of students)
3. Ask students to decorate their bucket so that they know whose is whose.
4. Introduce the materials and vocabulary—"browns", "greens".
5. Instruct students to first put a layer of browns in the bucket. Then measure how many inches of browns were added. Then add about the same amount of greens to the pile. Sprinkle with water.
6. Repeat the layering, adding browns, water, greens, and a last layer of water until almost all of your materials are used and your "compost castle" is about as moist as a wrung-out sponge. Save a small amount of browns for the last step.
7. Remind students of the decomposers from the last lesson and give each group red worms to add to their compost castle.
8. Add the final layer of browns. Cover compost castle with lid.
9. Students take their compost with them back to the school's greenhouse. For 6-8 weeks turn and water the compost twice a week.
10. Once Compost Castles are ready, begin adding the compost to the classroom's garden plots.

Suggested Reading:
"Compost Stew: An A to Z Recipe for the Earth" by Mary McKenna Siddals

References:

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