



NUMi[®]
FOUNDATION
Celebrating People, Planet & Possibility

Fourth Grade

John Muir wrote, “When we try to pick out anything by itself, we find it hitched to everything else in the Universe.” Fourth grade gardening is designed to show students that everything in nature – and in our community – is connected in an intricate web of life.

The main themes of fourth grade gardening are community, plant adaptations, and soil health and production. Students will plant greens, potatoes, and cover crops to reinforce these themes.

In the garden, fourth grade students will be responsible for building and maintaining the compost pile. This work affords real responsibility, promotes learning, and can have a meaningful impact on the garden. Additionally, students will enjoy field trips to Muir Woods and to the Presidio in San Francisco. The Numi Foundation would like to thank all the writers of open-source material for contributions and inspiration to this curriculum.

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Welcome Back!

Week 1.1

STANDARDS

4.SL.1

OBJECTIVES

- Students make observations after an extended break from the garden
- Students review and practice garden rules
- Students make class agreements

MATERIALS

- Poster board and pens
- Garden tools

Preparation:

Be clear about the difference between garden rules and classroom agreements. Perhaps your garden has rules posted that are school-wide, otherwise know beforehand what the rules are. (For example: Always walk, Ask before harvesting, etc). It is more effective to have fewer rules, but be sure that they are clear. This lesson assumes that students are familiar with the garden rules.

Procedure:

- Students enter the garden and gather in opening circle.
- Welcome students back to their outdoor classroom.
- “We need to review the rules of the garden and decide on some classroom agreements.”
- Call on students to name garden rules, and have students act them out.
- “We have garden rules to make sure that the animals, people and plants in our garden stay safe. We also need to decide on our class agreements for this year. These are so that everyone feels safe and welcome here, and that all of our voices are heard. How do we want to agree to treat each other in this space? What do we want to bring into the garden? What do we want to leave out?” Draw a large circle in the center of the poster.
- Record student responses on the poster board: inside the circle write what students want to bring into the garden, and outside the circle write what they want to leave out. Discuss and clarify where needed. Have students sign the back. Keep this in your indoor classroom and review as necessary.
- Give students an extended explore time. Practice garden rules and class agreements. Decide on a gathering signal first. Guide students in looking for different things: Colors, something taller than you, a plant that looks healthy, a weed, a plant at the end of its lifecycle, a seed pod, something you don’t recognize, evidence of an insect.
- Practice your gathering signal. Gather students in the classroom.
- Share out observations from the garden explore time.
- “You are fourth graders now, and already have several years of experience in the garden. Fourth grade gardeners have more responsibilities and more jobs than kids in lower grades. As you learn to work together, you will be given more jobs. What are ways you can show that you’re ready for more responsibility in the garden?” Discuss.
- “Fourth grade is also a special year in the garden because we start to talk much more about the environment and about the world around us. Our knowledge from lower grades starts to lead us to talk about the natural world outside of the garden. We are going to be talking a lot about soil health, soil creation, the nutrient cycle and decomposition. We are also going to start talking about what our role in the community is. I am looking forward to a fun, enjoyable year of learning. What are you excited about doing this year?”
- Review names of tools, tool safety, and their proper use.

Wrap up:

Return all materials.

Notes/Feedback:



Scavenger Hunt

Week 1.2

STANDARDS

4.SL.1

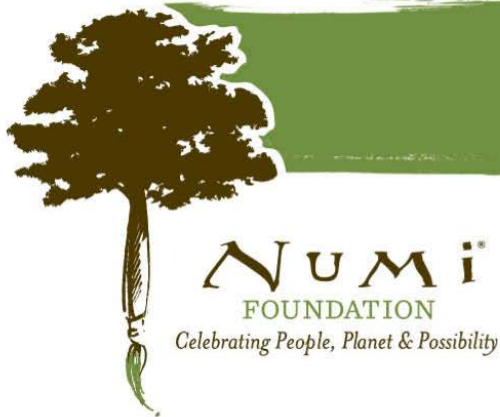
Preparation:

Know what you are going to ask students to find. For example: a healthy plant, a plant that you don't recognize, evidence of a bird, three insects, a seed pod, something soft, something you do not recognize, a plant that is taller than you, a plant that you have tasted, etc.

Procedure:

- Students enter the garden and explore.
- Gather students. "I am going to send you on a scavenger hunt. I want to see that you are able to explore the garden while practicing our garden rules."
- Begin the scavenger hunt; have students find each item, and then come back to you before you say the next item to find.
- If there is time, let students help suggest items to find in the garden.

Notes/Feedback:



Teamwork makes the Dream Work

Week 2.1

STANDARDS

4.SL.1

OBJECTIVES

- Students learn the meaning of teamwork, and practice teambuilding.
- Students understand that teamwork is required for success in the garden.
- Students find an example of nature working together in the garden.

MATERIALS

- 4 bandanas
- Materials for practicing cooperative garden work

Preparation:

The first few gardening classes really set the tone for the year. A lack of cooperation amongst students can be very destructive. Take time with team building exercises, and practice them as necessary. Be sure to debrief thoroughly at the end.

Also, have some tasks set up at the end for students to practice cooperatively.

Procedure:

- Students enter the garden and explore.

- Gather students; check in about season and weather.
- Review your class agreements. Ask a student to read the garden rules.
- “Today we are going to work on team building. Why do you think we start the year with team building? What are some jobs in the garden that we need to do cooperatively?” (All of them!)
- “I am going to give you a task. The job is to line up by birthday, January 1 is here, and December 31 is there. You may not touch another person, and you may not talk! If someone talks, the class has to sit down and start over.”
- Be clear with where the class should line up, and have them begin.
- After your students are lined up, have them say their birthday to check if they are in the correct order. Have students return to sitting.
- Debrief with questions like “Was that difficult? What was difficult? Was it frustrating when one person talked and you had to start over? What ways did you figure out to communicate without your voices?”
- “We are going to another task. You need to line up height. You may not talk. Shortest is here, and tallest over there. This will be harder, because four students will be blindfolded.”
- Choose four students to blindfold, and be sure that you are in a place without obstacles. “If you can see, you may gently help those who are blindfolded, but otherwise, you should not be touching anyone else.”
- After students are in height order, remove blindfolds, and have them seated.
- Ask the students who had been blindfolded, “How did it feel that you didn’t know what was happening? How did it feel to be helped? When in the garden may you need help? How do you want to be helped?”
- To the students who could see, “How did it feel to help someone else?”
- Have the students line up one more time, by number of siblings. Tell them they can talk.
- After students have lined up, and have been seated again, ask “How was it to be able to talk? What was easier? What was difficult? What was it like when everyone spoke at once? How did you take turns?” Also ask questions based on your own observations.
- “When we are having a class discussion and everyone is talking at once, what happens? If one student keeps talking out, and I keep asking them to stop talking, how does it feel for the rest of the class? If three students are supposed to water the garden with one watering can, how can they cooperate?”
- Have students act out scenarios for the class, for example: 3 students are to share one watering can, 5 students are trying to look at the same insect and there is not enough space, or someone needs helping pulling out a weed.
- Put students in groups, give students each group a task, and have them practice working together cooperatively.

Wrap up:

Have students look for examples of animals and plants working together in the garden.

Notes/Feedback:



Pumpkin Soup

Week 2.2

STANDARDS

4.SL.1

MATERIALS

- “Pumpkin Soup” by Helen Cooper (or another book about teamwork)

Preparation:

Think of some scenarios that might happen in your garden that would require teamwork, and communication.

Procedure:

- Students enter the garden and explore.
- Gather students, read “Pumpkin Soup”.
- Discuss. What does sharing responsibilities mean? Why do we help another? How can we use our words? What does this have to do with the garden?
- Continue to have students act out different scenarios that require teamwork in the garden.
- If there is time, continue to explore.

Notes/Feedback:



Community

Week 3.1

STANDARDS

4.SL.1

OBJECTIVES

- Students discuss the concept of community
- Students discuss their role in a community

MATERIALS

- 6 pack cells
- Potting soil in a large tub
- A full watering can
- Craft sticks
- Permanent marker
- Seeds—Collard greens, mustard greens, kale
- Poster board and markers

Preparation:

Collect all the materials in the place where you will be sowing seeds. Know how many cells you want to plant. You may choose to grow an abundance of seedlings to give away, or just enough for your garden.

Many types of greens grow well in the fall, choose any combination of seeds, just be sure to label them.

Find an organization nearby that you could donate produce to. Examples could be a senior center, a women's center, a homeless shelter, or a food kitchen.

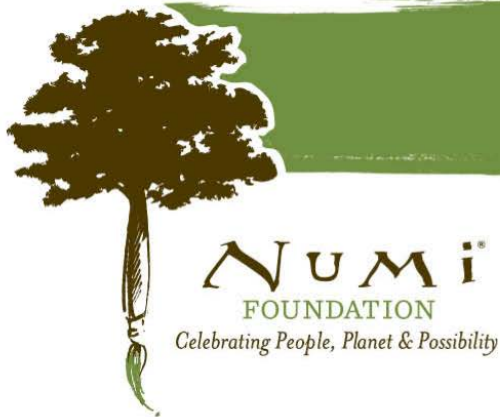
Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “We have lots of beautiful plants growing in our garden. Though we plant many of them, and take care of our garden, other factors are responsible for maintaining our garden. Who can think of some of these parts of nature that help our garden work?” (Insects, birds, wind, soil, sun, water).
- “If we take care of the earth, the earth takes care of us. Yes, we are working in our garden, but really we would have nothing if it were not for the sun, soil and water. When we are given so much, it is also important to share.”
- Discuss, solicit thoughts from the students. How do we share? With whom do we share? Why should we share?
- Write “Community” in the middle of the poster board.
- “What is our community? Who is in our community?” Write responses on one side of the poster.
- “How do we take care of our community? How does it take care of us?” Write responses on the other side of the poster.
- Review responses, and discuss. “We can talk about the world community, or even our classroom community. Let’s focus on the community in our neighborhood.”
- “Some people in our community may not have enough to eat. Should we care about that? Are we obligated to address the needs in our community?”
- “We are going to be planting greens today. Greens are eaten by many people in our community. We are going to take care of the plants, but the earth is going to most of the work. We are going to be given so much food from the earth, how can we share it?”
- Discuss, leading students to grow greens for giving away.
- Bring students to the area where you are sowing seeds.
- “We are going to be planting greens today. We are going to plant them in pots, and later transplant them to the garden. Most greens prefer the cool weather, and can grow through a cold winter. We are starting them in pots to protect them from pests. We are sowing seeds for other people. We are planting food to make our community stronger. Let’s think about this as we work quietly.”
- Pour water into the tub with the potting soil. The soil should be wet but not sopping. If you squeeze the soil and water pours out, there is too much water.
- Students fill cells with potting soil; do not compact soil.
- Plant two seeds in each cell. Label each pot with the type of seeds being grown.
- Place all pots in a sunny place. Water them gently every couple of days—do not let the soil dry out.

Wrap up:

Wash hands, return materials.

Notes/Feedback:



Garden Journals

Week 3.2

STANDARDS

4.SL.1

MATERIALS

- Journals, pencils

Preparation:

Think about the procedures you wish to share with your students for journal-writing days. Will you share the prompt beforehand? Will it be written on a board somewhere? What are the parameters of where students can sit?

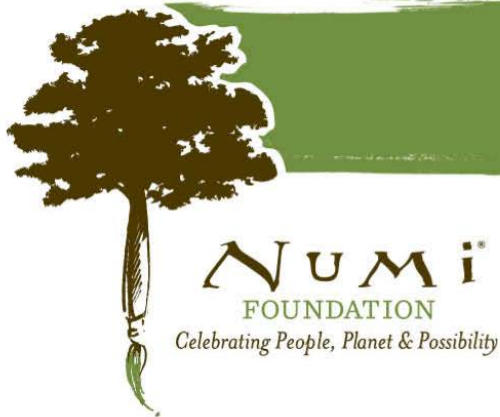
Procedure:

- Students enter the garden and explore.
- Have students find, again, examples of plants and animals working together in the garden.
- Distribute journals. “These will be your garden journals for the year. We will be writing and drawing in here this school year.”
- “Today we are going to do our first journal prompt to practice how we use our journals, and how we sit in the garden to write. Often in our journals, we will think and talk about nature. Today we are going to write about our discussion about community.”
- Go over procedures for journal-writing days.
- Students sit somewhere they enjoy and write in their journals, “Who is in your family community? How do take care of them? How do they take care of you?”

Wrap up:

Share, in partners.

Notes/Feedback:



Decomposition

Week 4.1

STANDARDS

4.ESS1.1, 4.PS3.4

OBJECTIVES

- Students review the word decomposition
- Students understand that compost is the result of decomposition
- Students understand that decomposition happens in nature, and in controlled settings (compost bins)
- Students know that some items decompose, and others do not

MATERIALS

- 10-15 items: some compostable, some not
- Watering can

Preparation:

Gather all materials in the outdoor classroom.

Background Information:

Decomposition is essentially rotting. Organic materials and their by-products (paper, cotton clothes, food scraps) eventually break down into smaller parts, becoming part of the soil. The agents that are responsible for decomposing will be explored in the following lessons.

Compost bins mimic the nutrient cycle in nature.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season, the weather
- “Let’s say I wanted to plant a bed of lettuce. What are the basic steps? How would I prepare the bed before planting?” Discuss.
- “Many of you mentioned that it is important to add compost to the soil before planting. You are very correct, but can you explain why it is important?”
- “Compost adds nutrients back into the soil, and plants need nutrients to grow. My questions for you is, ‘What is compost, and what is it made from?’”
- Discuss.
- Write DECOMPOSITION on the board. Underline the middle letters, from C until T. “Does anyone see a familiar word in here?”
- “Compost is the result of decomposition. What is decomposition?” If kids are stuck, hold up different items (some organic matter and some non-organic matter) and ask if they can decompose/be put in the compost/become part of the soil.
- “Decomposition, simply, is the process where organic matter (things that come from nature—plants and animals) breaks down into smaller pieces, eventually becoming part of the soil again. For example, in a forest, leaves fall off trees, and trees fall down, and eventually decompose and become part of the forest floor, providing nutrients for new plants to grow. This is called the nutrient cycle. Similarly, in our homes and gardens, we collect old plant and animal products (food scraps, paper, coffee grounds) and maintain compost bins so that we can ‘make compost’ to feed our plants with. Can anyone think of a garden animal that helps eat dead plants?”
- Check for understanding: “What does decomposition mean? (Rotting, breaking down). What is compost? What can go into a compost bin? What can’t? How are worms involved? Do living things (like apples growing on a tree) decompose while growing? What about when the apples fall off the tree?”
- Hold up each of the items, one by one. Ask students if they will decompose. Discuss.
- “In the coming weeks, we are going to talk about how this actually happens. And then we are going to set up a compost bin for the school.”
- In the garden, have students find 10 items that can decompose, and 5 items that cannot.
- Water the greens, if necessary.

Wrap up:

Return materials.

Notes/Feedback:



Journal Prompt: What is Nature?

Week 4.2

STANDARDS

4.SL.1

MATERIALS

- Journals, pencils
- Watering cans

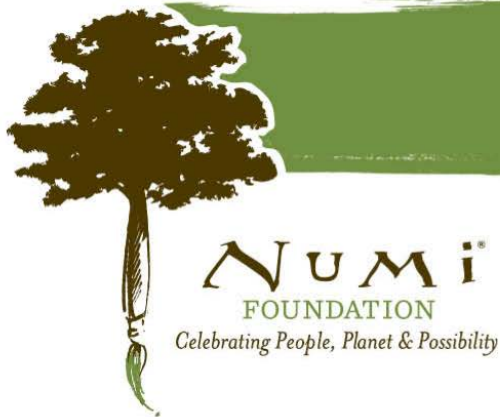
Procedure:

- Students enter the garden and explore.
- Check on the greens—are they sprouting?
- Gather students. “What is nature? Where do you find nature? Is there nature in the city? In this garden?”
- In their journals, “What does nature mean to you? How do you feel in nature? Write and draw a picture.”

Wrap up:

Share, in small groups.

Notes/Feedback:



Soil is Alive!

Week 5.1

STANDARDS

4.SL.1, 4.ESS2.1

OBJECTIVES

- Students feel and smell different types of soil
- Students list what they find in soil
- Students recognize that soil is formed by natural processes

MATERIALS

- Different soil samples: From the garden, potting soil, rocky soil, poor soil
- Clipboards with paper and pencil; one per group of 4 students
- Rocks, sticks, apple (or another food item)
- Watering can

Preparation:

Explore your campus, you will likely find different types of soils to pull from. Set up the soil samples in different stations in your outdoor classroom. Students will rotate through the stations touching, feeling and smelling the different types.

Background Information:

Soil is essentially made of organic (living) and inorganic (nonliving) matter. The living includes decomposed organic matter: plants, animals, woodchips, etc. The nonliving is silt, clay, and sand. Water is an essential part of soil, as well as billions of microorganisms. It takes hundreds of years for an inch of topsoil to be formed.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- “There is something in this garden that we do not talk about all that much...but without it, we would not have food to eat. It is found all over the world, it can be different colors and textures. It doesn’t move on its own, but it is alive. Any guesses?”
- “Soil! Soil is alive. (Show a handful of soil). In this handful, there are more living things than people on the planet!”
- “What is this stuff anyway? What do you know about soil?”
- Discuss.
- Rotate students through the soil samples in your outdoor seating area. Encourage students to hold the soil, smell it, squish it.
- Gather students, share out observations.
- Compare and contrast the “nice” garden soil and the poor soil. What do students notice in the texture and color?
- “I want you to pretend that I am from another planet and have never heard of this ‘soil’ stuff before. I’m going to put you into groups of four. You are going to go into the garden, and collect a soil sample. You are going to look through it, and write down all the things you see in the soil. You’ll need to become familiar with this ‘soil’ stuff, because I’ll want you to explain it to me.”
- Send groups into the garden with a clipboard, paper and pencil to record everything they find in a handful of soil.
- Gather students and share out lists. Write responses on the board, separating items into living and nonliving. If students say “dirt” or “brown stuff” ask them to better define what they see. Ask, “Can anyone tell why I listed your responses into two columns?”
- If anything is missing from their list, add them to the board (water, microorganisms, decomposed matter may be missing).
- “Soil is made of living and nonliving. You listed things like rocks, woodchips, sand.” Hand someone sticks, rocks, and the apple. “Can you make me soil from these things?”
- Discuss.
- “It takes hundreds of years for the earth to form an inch of topsoil. Topsoil contains many nutrients and is vital for plants to grow. We will discuss this more later in the year, but it is very important to take care of soil. Soil is alive!”
- “Soil is formed by two main processes: weathering and decomposition. We will discuss weathering more later in the year, and next week we will begin talking more about decomposition. All the ‘brown stuff’ you see in the soil is dead plants and

animals, broken down into tiny pieces. That's decomposition. But how does it get so small? We will be exploring that next week."

- Water the collards, if necessary.

Wrap up:

Return materials.

Notes/Feedback:



Journal Prompt: The Smell of Soil

Week 5.2

STANDARDS

4.SL.1

MATERIALS

- Journals, pencils
- Watering cans

Procedure:

- Students enter the garden and explore.
- Students look for insects and bugs living in the soil.
- Water the collards, if necessary.
- In their journals, "Find a handful of soil. Smell it. What does it smell like to you? What does it remind you of?"

Wrap up:

Share, in small groups.

Notes/Feedback:



The Garden FBI

Week 6.1

STANDARDS

4.SL.1, 4.ESS2.1

OBJECTIVES

- Students learn about the garden FBI
- Students can name an example of Fungus, Bacteria and Invertebrates
- Students understand the importance of decomposition

MATERIALS

- Hand lenses, class set
- Watering can

Background Information:

The FBI (Fungus, Bacteria, Invertebrates) are decomposers; they are responsible for breaking down organic matter. Fungus includes mold and mushrooms. Bacteria already lives on organic matter, but does not start to break down organic matter right away. Invertebrates that decompose include worms, roly polys (pill bugs) and slugs.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- “What is decomposition? Name 5 things that can decompose. Why is decomposition important?” Discuss.
- “Close your eyes. Imagine a forest. Leaves fall, trees fall, and animals die. Imagine that none of these things decomposed. Imagine, after 100 years, how messy the forest would be! Imagine after thousands of years...”
- “Now imagine that trees and plants are pulling nutrients out of the soil, but that no nutrients are going back to the soil. Eventually there will be no nutrients left for the roots to find. Then what?”
- “Again, why is decomposition important?”
- “Decomposition is the basis for the nutrient cycle –that is the recycling of nutrients back into the earth. Plants pull nutrients from the earth and contain these nutrients (which animals eat!). When plants die, they decompose and the nutrients go back into the soil for the next plants to use. It’s a cycle that has always existed. The nutrients that exist now are the same nutrients that have always been on the planet, just in different forms!”
- “But the question remains—what turns dead plants into soil? What breaks it down?”
- “There are three main categories, and we lovingly call them the garden FBI.” On your board, write Fungus, Bacteria, Invertebrates.
- “Before we start. Have you ever left food out too long in your house? What does it start to look like as it gets older and older?” (Mushy, moldy, slimy.)
- “Many of you mentioned mold! Mold is a type of fungus. Mushrooms are also fungus. If you have ever seen a tree that has fallen down, you probably have seen mushrooms growing on it. The mushrooms are decomposing the tree.” (Write mushrooms and mold under Fungus).
- “B stands for Bacteria. What do you know about bacteria?” Discuss.
- “Bacteria cannot be seen without a microscope. Bacteria are all over our bodies, and inside our bodies. Most bacteria help our bodies, only some kinds make us sick. Bacteria is in the soil, and on our plants. When a plant dies, only then do bacteria start to decompose.”
- “I stands for invertebrate. Vertebrate means with a spine. Invertebrate means without. Are you a vertebrate or invertebrate? Can you think of which invertebrates in the garden eat dead plants?” (Slugs, worms, roly polys).
- “When a plant dies, the garden FBI shows up and takes care of business. Are they interested in an apple growing on a tree? What about when the apple falls?”
- Distribute hand lenses; students explore the garden, looking for the FBI, or evidence of the FBI. Look under trees, in woodchips, under logs, and for fallen fruit. Remind students that if they find mushrooms, be sure to not touch them!
- Water greens, if necessary.

Wrap up:

Return materials.

Notes/Feedback:



Reading: The Rot Squad

Week 6.2

STANDARDS

4.SL.1, 4.ESS2.1

MATERIALS

- “The Magic School Bus Meets the Rot Squad: A Book About Decomposition” by Joanna Cole
- One banana
- Watering can

Preparation:

This book is very detailed. Perhaps choose sections to read.

Procedure:

- Students enter the garden and explore.
- Gather students, and read “The Magic School Bus Meets the Rot Squad”.
- Make note of the FBI.
- Discuss the book, and discuss the differences between decomposition in nature, and controlling decomposition into a compost bin, or a worm bin.
- Have students choose a place to put the banana. “We are going to watch this banana decompose. How do you think it will change over time, based on what you may have seen with old produce in your house?”

- Water the greens, if necessary.
- With extra time, continue exploring.

Wrap up:

Return materials.

Notes/Feedback:



ASSESSMENT: Building a Compost Pile

Week 7.1

STANDARDS

4.ESS2.1

OBJECTIVES

- Students learn about different types of compost piles
- Students learn about components of a compost pile
- Students build a compost pile

MATERIALS

- Brown, carbonaceous materials
- Green, nitrogenous materials
- Hose, or full watering cans
- Compost bin, if using one

Preparation:

Do your research about building compost piles.

Gather all materials needed at the compost building site. This is an assessment in that you are encouraging your students to use their knowledge of decomposition to help build the pile.

Background Information:

Refer to Teacher Supplement for additional information.

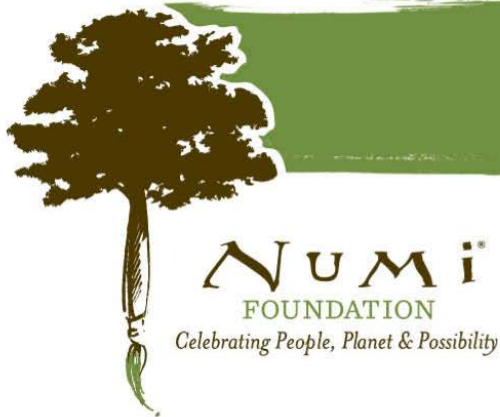
Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “Today we are going to build a compost pile! Before we get started, can someone remind us what soil is made of?” Discuss.
- “Yes, part of soil is made from decomposed plants. What does decomposition mean? Whose job is it to break down all the dead organic matter on earth? Why is this important?”
- “When farmers and gardeners build compost piles, we are copying nature. We are looking at how she recycles her nutrients. In nature, nothing is wasted. Did you know that in the United States, landfills are full of food scraps and food waste? All of that food can be recycled back into the earth if given the chance to decompose. Let’s recycle our plant waste into something we can use to feed the new plants we grow: compost.”
- Build the compost pile, teaching students as you go. You may want to have a student or two just in charge of keeping the pile wet.
- Stand back and admire your work. Ask, “Who do you think is going to show up to take care of this pile? How do you think the pile will change over time?”
- Water the greens, if necessary.

Wrap up:

Return materials, wash hands.

Notes/Feedback:



Weeds

Week 7.2

STANDARDS

4.ESS2.1

MATERIALS

- Tools for garden work
- Journals, pencils, colored pencils/crayons

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Do garden work. If you are pulling weeds, ask “How did these weeds get here?”
- Return materials, wash hands.
- In their journals, “A sunflower plant can become a peach tree. What does that mean? Draw a picture.”

Wrap up:

Share, in partners.

Notes/Feedback:



Building a Compost Pile

TEACHER SUPPLEMENT

ADDITIONAL INFORMATION

Building a compost pile will require substantial research on your part. There are so many types of ways to build a compost pile, you will need to do some reconnaissance of what is available in your garden and school to see which type suits your program best. There is an abundance of information about compost piles available online, in books, and from local master gardeners. Take advantage of these resources!

Location

Find a place for the pile, not too close to a building. Piles need to be at least 3'x3'x3', or else they will not heat up properly.

Container

You can build a pile on the ground, or buy a bin to contain everything.

Ingredients

Building a compost pile is an excellent example of bio-mimicry. To build a pile, you need to add alternate layers of "greens" and "browns". Greens are the nitrogen rich materials, that include grass clippings, food scraps (avoid foods that attract animals, such as meat, dairy, and oily foods), weeds, and plant waste. Browns are the carbon rich materials: soil, dry leaves, pine needles, straw, wood chips. These two elements work together to maintain the bacteria population that breaks down the compost pile.

Building

You will need to spend time collecting all these materials so that you can build the pile all at once. Start by watering the area that you will pile the materials on. Add a layer of browns,

then greens, then soil. Water the pile as you go, but do not let the pile get soggy. If your pile is not three feet high, repeat this pattern. Within a few days, the pile should heat up! A compost thermometer is a great tool to have.

Maintenance

Turn the pile every few days. Water it, so it's damp but not soaking.



Moving Day!

Week 8.1

STANDARDS

4.LS1.1

OBJECTIVES

- Students learn about the difference between cotyledons and first true leaves
- Students transplant their greens

MATERIALS

- Seedlings
- Watering cans
- Hand trowels
- Compost

Preparation:

Bring the “greens” seedlings to your gather space. Have the trowels, compost, and watering cans ready at your planting area.

On the seedlings you should see at least one set of “true leaves”, not just the initial leaves (cotyledons) from inside the seed. If not, postpone the transplanting.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- Ask students to name the different parts of the plant.
- “You all know about leaves, and that they make food from the sun. You also know that inside a seed is a tiny plant with either one or two leaves, and a little root. When a seed wakes up (what makes a seed wake up?) it pushes its root down and unfurls its leaves up. If the roots find nutrients, and the leaves find the sun, the little plant has energy to grow bigger and bigger. (Pass out the seedlings, ask students to be careful.) The first two leaves to poke out are the called ‘cotyledons’, they were inside the seed, but the first ‘true’ leaves are those that they plant makes after growing. Can you tell the difference?”
- Bring students and seedlings to the planting area. Pull weeds, pick stones. Add compost (Ask, “Why are we adding compost to the soil?”) and dig it in. Smooth the soil. You, or a student helper, can dig the holes for the seedlings—spacing them properly. If you have a variety of greens, grow the same ones in the same area.
- Distribute seedlings being extraordinary careful with them. Do not hold the plants by the roots; it can damage the fine root hairs. Hold them from the stem. Give students a moment to look at their plants.
- Plant the seedlings gently, bury the first leaves. Make a little moat around each plant and water gently.
- If there is extra time, continue to explore.

Wrap up:

Wash hands, and return materials.

Notes/Feedback:



Journaling Prompt: Transplanting

Week 8.2

STANDARDS

4.SL.1

MATERIALS

- Journals, pencils
- Full watering cans

Procedure:

- Students enter the garden and explore.
- Water the greens if the soil is dry.
- In their journals, "This week we moved the seedlings from their small pots to the big garden. Have you every moved? What do you think the seedlings are feeling? Write a fictional story, draw a picture."

Wrap up:

Share, in partners.

Notes/Feedback:



Mulching for Warmth

Week 9.1

STANDARDS

4.ESS2.1

OBJECTIVES

- Students learn several reasons why mulching is important
- Students understand that mulching is a form of bio-mimicry
- Students mulch the greens

MATERIALS

- Bags to collect leaves
- Full watering cans

Preparation:

Are there many fallen leaves in the garden? If so, great! If not, find a place on campus where you and your students can collect fallen leaves.

Background Information:

Mulching is simply putting something under a plant, covering the soil under the leaves and above the roots. Common mulches are woodchips, leaves, straw or even compost. Mulching is done for a variety of reasons: to slow evaporation and thereby save water, to prevent weed growth, and to keep a plant warm. Mulching can often prevent soil from freezing. Most greens are frost tolerant, but still appreciate the extra warmth.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “What do animals do to prepare for the winter? What do plants do?” Discuss.
- “Many trees do drop their leaves to prepare for the winter. With less sun, the trees essentially ‘hibernate’ and focus what little energy they have on their roots underground. The fallen leaves help the tree in several ways. Can anyone think of how?”
- “For one, the leaves keep the soil under the tree warm. It is like a little blanket at the base of the tree. Secondly, the leaves eventually decompose, and all those nutrients from the leaves end up back in the soil for the tree to use in the spring. What will change the leaves into soil?” (The FBI!).
- “Gardeners and farmers have been copying nature for a long time. Just like we copy the forest when we make a compost bin, we copy the leaves that fall when we mulch. This is called bio-mimicry—copying the earth.”
- Discuss mulching—materials you can use and benefits of each.
- Either in the garden or out, collect leaves. Be sure to leave some leaves for the tree!
- Back in the garden, bring students and leaves to the greens.
- Show students how to mulch. Crush up some leaves and cover the area under the plants. Make a thick layer.
- Water the greens.

Wrap up:

Wash hands, return materials.

Notes/Feedback:



Journal Prompt: Winter is Coming

Week 9.2

STANDARDS

4.SL.1

MATERIALS

- Journals, pencils
- Tools for garden work

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Look for signs of the FBI.
- Do garden work, return materials.
- In their journals, "Winter is coming. Winter is a time of rest, and of slowing down. How do you feel as winter approaches?"

Wrap up:

Share, in partners.



Field Trip: Muir Woods

Week 10.1

STANDARDS

4.LS1.1, 4.ESS2.1

OBJECTIVES

- Students explore a redwood forest
- Students find different decomposers
- Students enjoy the beauty and wonders of nature

MATERIALS

- Anything you need for a field trip.

Preparation:

This trip will need to be planned weeks in advance. There are wonderful educational programs available. You will also want to plan on having “explore” time for your students.

Procedure:

- Enjoy Muir Woods! Discover tall redwoods, rows of mushrooms, and more in this majestic forest!

Notes/Feedback:



Journal Prompt: Redwoods

Week 10.2

STANDARDS

4.SL.1

MATERIALS

- Tools for garden work
- Journals, pencils

Preparation:

Prepare garden work.

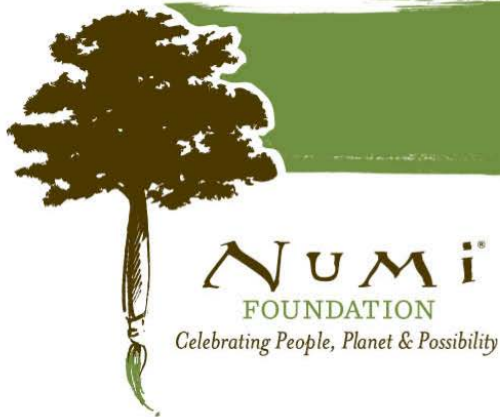
Procedure:

- Students enter the garden and explore.
- Do garden work.
- As a class, debrief the field trip.
- In their journals, “How did you feel in the redwood forest? Draw a picture.”

Wrap up:

Take volunteers to share with the class.

Notes/Feedback:



Plant Part Review

Week 11.1

STANDARDS

4.SL.1, 4.LS1.1

OBJECTIVES

- Students recall plant parts and their functions
- Students can identify different plant parts in the garden
- Students build their own plant

MATERIALS

- Tools for garden work
- A carrot, with stems and leaves attached

Preparation:

Know which plants you will bring students to as you discuss each plant part and their function.

This week is about basic plant parts, next week is about specialized plant parts.

Background Information:

Plant Parts and Their Jobs

Roots—Keep plants stable (rooted!) in the ground and absorb water and nutrients from the soil.

Stem—To hold the plant upright, and to bring water and nutrients from the roots up to the rest of the plant. The stem also brings sugars down from the leaves to the roots.

Leaves—Make food from the sun.

Flowers—Reproduction; to make new seeds.

Fruit—To protect seeds, to attract animals who spread the seeds

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “It is winter! What changes do you notice in the garden? Outside the garden?”
- “This week we are reviewing the 6 main plant parts and their functions. Each plant part has a specific job that helps the plant grow and reproduce. The same way you have many body parts, and those parts work together to make your body function.”
- “What are the six main plant parts?”
- As students answer, list on the board: Roots, Stems, Leaves, Flowers, Seed, Fruit.
- If students name other plant parts, list them, but mention that you will discuss those next week.
- Return to the original six plant parts. “We are going to find all of the plant parts in the garden and review their jobs.”
- Bring students to a tree. Ask one student, or maybe two to try to push it over. “Why can’t they push it over? What part of the plant is keeping the plant strong and stable in the ground?”
- “Right, the roots. What other job do the roots have?” (To absorb/drink water and nutrients from the soil.)
- “If I water a plant and pour the water on its leaves, it’s kind of like sticking an apple in my ear...I can’t eat through my ear, and a plant can’t drink through its leaves! It’s important to always remember that the roots drink, and to water the soil when watering.”
- Continue looking for plant parts in the garden, and discussing each purpose.
- When looking for stems: tear some stems apart so students can see the tubes inside that transport materials up and down.
- When looking for flowers: ask “How are flowers attracting insects?” (Smell, bright colors, etc)
- Once you have finished your tour, test students: “Go find three stems. Find two flowers. Find evidence of roots. Find five different shaped leaves.”
- Gather students, and show a carrot. “This carrot is a great example of plant parts working together. The little roots absorb nutrients and water from the soil. The stem brings the water and nutrients to the leaves. The leaves make food, sugars, from the sun and the stem brings the sugars down to the root. The plant stores this sugar in this huge taproot until the plant is ready to grow (carrots can grow more than 3 feet!) tall and produce flowers and seeds. Have you tasted carrots? They are sweet, right? You can taste the sugars that the leaves made from the sun.”
- “Find pieces of plants on the ground and leaves that have fallen. ‘Build’ your own plant. You can use any material you find, but be sure to show roots, stems, leaves, and a flower.”
- When students have finished, let them show each other their “plants”.
- Do garden work.

Wrap up:

Return materials, wash hands.

Notes/Feedback:



Journal Prompt: Plant Parts

Week 11.2

STANDARDS

4.LS1.1, 4.SL.1

MATERIALS

- Journals, pencils
- Watering can

Preparation:

Write on the board:

Roots: Who or what keeps you grounded?

Trunk: Who or what keeps you standing tall?

Branches: What are you reaching for?

Leaves: What talents do you have?

Fruit: What are your big goals?

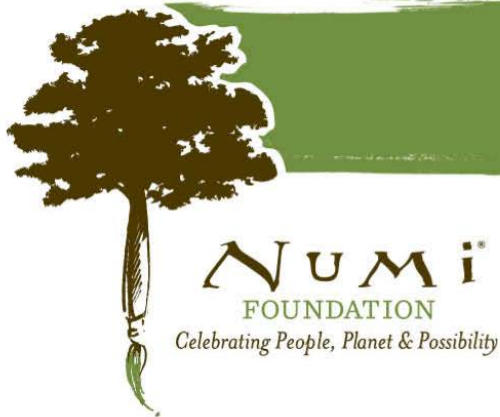
Procedure:

- Students enter the garden and explore.
- Water the greens.
- For this journal activity, students need to see the board. In their journals, “Draw a tree with roots, a trunk, branches, leaves and fruit. Pretend you are the tree. Label the different parts.”

Wrap up:

Take volunteers to share in front of the class.

Notes/Feedback:



Specialized Plant Parts

Week 12.1

STANDARDS

4.SL.1, 4.LS1.1

OBJECTIVES

- Students learn about examples of specialized plant parts
- Students discuss why plants have adapted specialized parts
- Students find examples of animals adapting to their surroundings

MATERIALS

- Tools for garden work
- “How to Hide a Butterfly and Other Insects” by Ruth Heller

Preparation:

Identify some of the following plant parts in or around the garden.

Background Information:

Thorns-Thorns are modified stems and are used to deter herbivores.

Tendrils-Tendrils are modified stems that are used by plants that climb. Tendrils attach to other plants (or in the garden, on trellises or fences) and support a plant by growing up.

Tubers-Can be specialized stems or roots. For our purposes, we will refer only to stem tubers. Tubers are enlarged stems that store nutrients for the plant during dry or winter

months. The stored energy is used by the plant in the next growing season. Potatoes are an example of stem tubers.

Bulbs- A bulb is a modified stem that stores food during dormancy. Examples include onions, irises, and tulips.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- “Last week we reviewed the six main plant parts. Can someone name them?”
- “This week we are learning about some other special plant parts that some plants use to help them adapt to certain environments. For example, a cactus has adapted to not
- have leaves, but rather long spines. These spines are more water efficient for the plant, and also protect the cactus from being eaten. Can you think of any other specialized plant parts that you may have seen in the garden?”
- Discuss tendrils, thorns, bulbs, and tubers. “Why do some plants have these special adaptations? What kind of environment is a plant from if it needs to store food all winter?”
- Find examples in the garden.
- Gather students. Read “How to Hide a Butterfly” and discuss.
- “Some adaptations that plants have are to protect themselves from getting eaten. The same with animals—they try to avoid their predators as well. Can you find of camouflaged insects in the garden?”
- Search for insects.
- Do garden work.

Wrap up:

Return materials, wash hands.

Notes/Feedback:



Nature's Paintbrushes

Week 12.2

MATERIALS

- Cups of black paint; one cup per 3-4 students
- Clipboard and paper; one per student

Preparation:

Place cups of black paint in different spots in the garden. Students will be using something that they find in the garden to use as a paintbrush. You can allow them to harvest a whole plant, or a leaf, or a flower as a brush. You may choose to restrict them to only using plant material that has already fallen on the ground. Decide on your parameters before class.

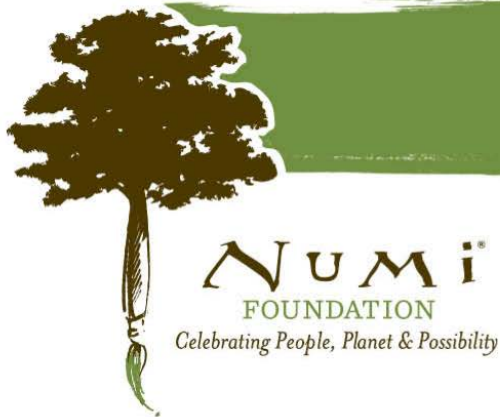
Procedure:

- Students enter the garden and explore.
- Distribute clipboards and paper to students.
- “You have a clipboard, a piece of paper, and in the garden there is paint. I want you to paint a picture. What is missing?”
- “Right! A paintbrush. Your paintbrush is in the garden!” Explain your parameters about what may or may not be used as a brush. Remind students that they can use their brush also as a stamp!
- Give students plenty of time on their artwork. When finished, collect paintings in the classroom and give students time to appreciate each others’ work.

Wrap up:

Collect all materials, wash hands.

Notes/Feedback:



Propagation

Week 13.1

STANDARDS

4.LS1.1

OBJECTIVES

- Students learn about propagation by stem cutting
- Students discuss advantages for a plant that can propagate vegetatively
- Students pot stem cuttings

MATERIALS

- A stem from a lettuce plant, or something similar
- A stem from a plant that can be propagated by cutting
- Shears
- A plant from which to take cuttings
- Pots and potting soil
- Craft sticks and permanent marker
- Watering can
- Rooting hormone (not completely necessary)

Preparation:

Arranging a guest lecturer from a local nursery would be ideal. Nurseries propagate many of their plants by cutting, and it is always fun to have an expert on hand.

If you do not have access to a guest lecturer, make sure you gather all your materials ahead of time. You'll need to water your cuttings frequently; make sure you have a system in place.

Do some extra cuttings, so that after 6-7 weeks, you can pull them out and check out the roots.

Background Information:

Plants that propagate easily from cutting: Fig, purple tree collards, rosemary, willow, any type of succulent.

Whichever you choose, do a little extra research for best results.

Nodes are the places on the branch where the leaves grow from. Underground, the roots will sprout from the nodes as well, so make sure you bury at least two nodes.

Procedure:

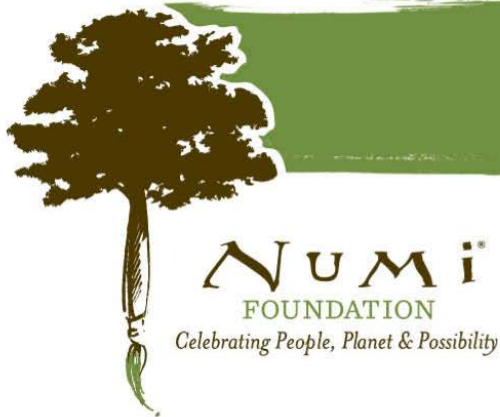
- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- “We have spent the past few weeks revisiting the different plant parts. Just when you thought it was all pretty clear: leaves make food from the sun, seeds make new plants, I am going to make it a little more complicated.”
- “First, I want to teach you the word propagation. It simply means the growth of a new plant. In nature, plants propagate themselves by spreading their seeds through animals, or by the wind. Gardeners propagate seeds by planting them. This is where this gets tricky, you don't always have to plant a seed to get a new plant. Can you think of any plants that we have grown in the garden, but not from seed?”
- Show the lettuce stem. “Some plants can only be propagated by seed. If I want a lettuce plant, I have to plant a lettuce seed. I ripped this lettuce stem from the plant, and this stem will now die. If I stick the stem back in the soil, it will decompose.”
- Show the stem that can be propagated. “This stem is another story. It can be propagated vegetatively, that is, by part of the plant. That's just a fancy way of saying that I can actually plant this stem and it will re-grow into a new plant. Does that seem crazy to you?”
- “This is almost like saying that I could cut off my toe, and my toe would grow a whole new body. We know that can't happen, yet that's basically what happens with certain plants. I can cut a stem from a certain plant, take off the leaves, and plant it. All of a sudden, the part of the stem that's underground starts acting like a root, and the part above ground starts growing new leaves. Can we think about this for a minute?”
- Discuss. “Why do you think some plants have adapted to be able to re-grow from stems?”

- Do your cutting project, following directions for your specific plant.
- Water the greens if necessary.

Wrap up:

Return materials.

Notes/Feedback:



Journal Prompt: Reproduction

Week 13.2

STANDARDS

4.SL.1, 4.LS1.1

MATERIALS

- Journals, pencils
- Watering cans

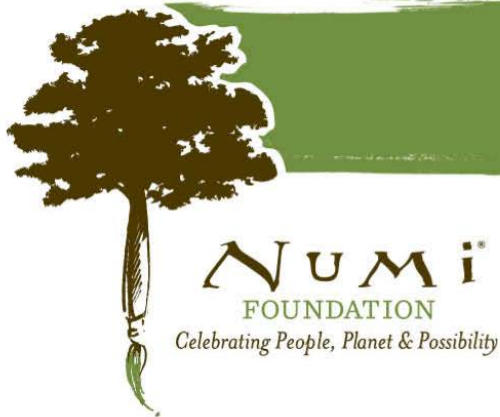
Procedure:

- Students enter the garden and explore.
- Water the greens, and cuttings, as necessary.
- In their journals, “Over the last few weeks, we have been learning about special ways that plants can grow and reproduce. If you could grow a special new limb, what would it be and why? Draw, and explain.”

Wrap up:

Share, in partners.

Notes/Feedback:



Ecosystems

Week 14.1

STANDARDS

4.LS1.1, 4.LS1.2, 4.ESS2.1, 4.SL.1

OBJECTIVES

- Students can define ecosystem to mean an environment composed of living and nonliving things
- Students know that ecosystems can vary greatly, but are consistent in being comprised of living/nonliving
- Students investigate the ecosystem within the compost pile

MATERIALS

- Materials for garden work

Preparation:

Identify the area in the garden that students will be weeding, thinning or watering after the lesson. If the weather has been dry and the garden needs water, you can ask students about the rainfall trend in your ecosystem. If you are going to be weeding, you can ask students about competition for resources in an ecosystem. Any garden project you do can be related back to this lesson, just be sure to identify some areas to work beforehand.

Also, write ECOSYSTEM on the top of your whiteboard.

Background Information:

An ecosystem is a community of living and non-living things that work together. Ecosystems have no particular size. An ecosystem can be as large as a forest or as

small as a tree. This lesson is meant as a review. In past grades, ecosystems are defined relatively simply. Here the idea is to reinforce that all elements in a system work together. This lesson will serve as a foundation for following lessons in attracting pollinators, discussing the roles pollinators have within a system, food webs, and even donating produce—what role do we have in our community?

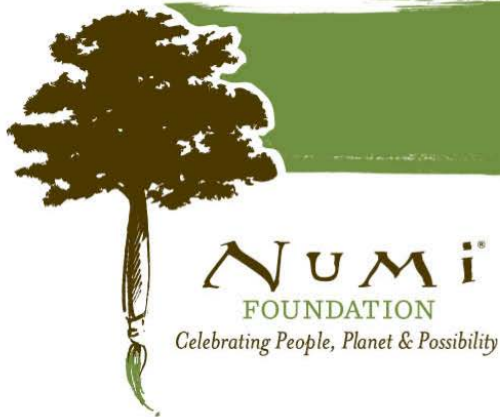
Procedure:

- Students enter the garden and explore
- Gather students, check in about the season and weather.
- “Let’s look around our garden. Can you name what you see?”
- Teacher lists student responses on whiteboard. Teacher should list responses into two columns, one with living organisms and one with nonliving, but should not tell students why he/she is organizing it that way. If students aren’t listing nonliving things, some prompting may be necessary. Nonliving things should include soil, water, air and heat/sunlight.
- After all responses have been taken... “I have listed your answers into two columns. Can anyone see the pattern? Why did I separate your responses? How are the things in column A different from column B?”
- Facilitate a class discussion.
- “You just described our garden ecosystem here in Oakland. You figured out that it is made from living and nonliving elements. The living things depend on the nonliving, and the nonliving can be affected by the living. They work together. The point here is consistent with what we have been discussing for the past weeks. Though each plant part has its job, its greater job is to work with the other parts to help the plant grow and reproduce. Same goes the compost pile, the FBI works together to decompose plant material.”
- “A forest ecosystem is also compromised of living and nonliving components. You can imagine that there are different living things in a forest, or in the desert. Again, everything in the system works together.”
- Teacher asks: “You listed soil as a nonliving element in an ecosystem. But soil is alive, and each handful contains billions of microorganisms. But it’s made up of nonliving things like rocks, and sand and decomposed plant matter. Would you consider soil living, or nonliving?”
- Discuss.
- Bring students to the compost pile. Pull out a chunk, and let students dig through it. “What are you finding? How are the FBI working together in here?” (One example is that the bugs generally break the bigger pieces apart, and the fungus and bacteria work on the smaller pieces. In general, the FBI works together, not one part can decompose by itself.)
- When all have finished, return the plant material back to the compost pile. Gather students and do the garden work that you have prepared.

Wrap up:

Return materials, wash hands.

Notes/Feedback:



Garden Drawings

Week 14.2
STANDARDS
4.LS1.1

MATERIALS

- Watering cans
- Journals, pencils

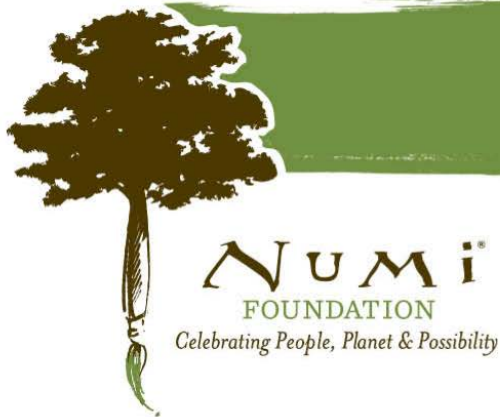
Procedure:

- Students enter the garden and explore.
- Allow time to water the cuttings, the greens, and to explore the compost pile.
- In their journals, "Find something beautiful. Look at it for a little while, and then draw it. Try to be so detailed, that someone could find what you were drawing."

Wrap up:

Trade journals, in partners, and have partners try to find each other's subjects within the garden.

Notes/Feedback:



The Bees and the Flowers

Week 15.1

STANDARDS

4.LS1.1, 4.LS1.2

OBJECTIVES

- Students learn that to attract pollinators, one must provide food
- Students discuss the importance of pollinators in a garden ecosystem
- Students learn that flowers have adapted to attract specific pollinators

MATERIALS

- Pictures of different types of flowers
- Materials for garden work

Preparation:

Print some examples of different types of native flowers available in your local nursery; print a variety of colors, shapes, and sizes.

Students will be choosing which types of pollinators they want to attract by choosing flowers to plant in the next lesson.

Prepare garden work.

Background Information:

One of the most interesting examples of co-evolution is the way that pollinators and flowers have adapted to each other; which is commonly seen in the ways flowers have adapted to attract specific pollinators.

- Bees see blue/purple, yellow and UV light and are attracted to sweet smells. Bee-pollinated flowers usually fit this description, and often have “landing patterns” where the flower wants the bee to land.
- Butterflies see red, and do not smell very well. Butterfly-pollinated flowers are bright, often red, and grow in clusters to offer the butterfly a landing platform. The flowers are usually tubular and are the right shape for a butterfly tongue.
- Moths are usually night flying, and therefore moth-pollinated flowers are often open at night, and are white or pale, to be visible in the dark.
- Hummingbirds tend to be attracted to bright red flowers that do not smell. Hummingbirds feed while hovering, so petals are curved and out of the way.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- “Last week we talked about ecosystems, which are a community of living and nonliving things. Together, we are taking care of our garden ecosystem. We have also talked about the community in which we live, we have talked about the community of decomposers in the compost pile, and about the ways that plant parts work together in a system. What else works in community in the garden?”
- “One really interesting example is the way that flowers and pollinators work together. Why do pollinators visit flowers? Why do flowers need pollinators?” (Flowers provide food for pollinators, and many flowers depend on insects for pollination).
- Discuss.
- “Why is it so important to have pollinators in our garden?” Discuss.
- “Can you name 10 things that we eat that depend on insect pollination?” (Fruit, some nuts, “vegetables” that are really fruits like cucumbers, tomatoes, and pumpkins).
- Show the pictures you have, and explain how each pollinator is attracted to certain things (colors, smells, or no smells) and that flowers have adapted to attract certain pollinators.
- “If we want pollinators to visit our garden, we need to invite them! Which flowers do we want to plant? Which do you want to bring to our garden?”
- Class discussion; record choices because you will purchase these plants to plant in the following lesson.
- Explore the garden; see if students can find any examples of pollination. It is mid-winter, so it may be unlikely.
- Do garden work.

Wrap up:

Return materials.

Notes/Feedback:



Seedlings

Week 15.2

STANDARDS

4.LS1.1, 4.LS1.2

MATERIALS

- Seeds or seedlings of the chosen flowers
- Watering cans
- Mulch

Preparation:

One risk of sprinkling wildflower seeds throughout the garden is that they can be confused for weeds, and may be pulled. You can choose to designate a section solely for the pollinator garden, or you can disperse such a copious amount of seed that even if a few plants get pulled here and there, there will still be plenty of plants blooming in the spring.

Procedure:

- Students enter the garden and explore.
- Gather students. If planting seeds: “Normally we do not plant mid-winter, but we can plant wildflower seeds. In nature, flower seeds sit underground all winter and wait for the warmth of spring, when they sprout.” If planting seedlings: “Normally we do not plant mid-winter, but these native flowers should be fine. We need to be sure to water them deeply, and mulch them.”
- Gather students at the planting area. If seedlings: Plant the seedlings that your students have chosen.
- Water the plants and mulch.
- If seeds: Pass out a pinch of seeds to each student. Let them look at the different sizes, shapes and textures of the seeds. Have them cup their hand with the seeds in it, and add a small handful of soil. Have them mix the seeds and soil together. Show

them how to sprinkle this soil/seed mix into the garden. Great places are next to established plants, in corners, around the edge of the garden, near the garden entrance or whatever inspires your class. As students are planting, encourage them to take their time.

Wrap up:

Return materials.

Notes/Feedback:



Food Chain

Week 16.1

STANDARDS

4.LS1.1, 4.LS1.2, 4.SL.1

OBJECTIVES

- Students understand the concept of a food chain
- Students name food chains in nature
- Students identify food chains in the garden

MATERIALS

- Tools for garden work

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “Last week we planted flowers to attract pollinators. We know that if we provide food for bees and butterflies, they will come. Every living thing must have something

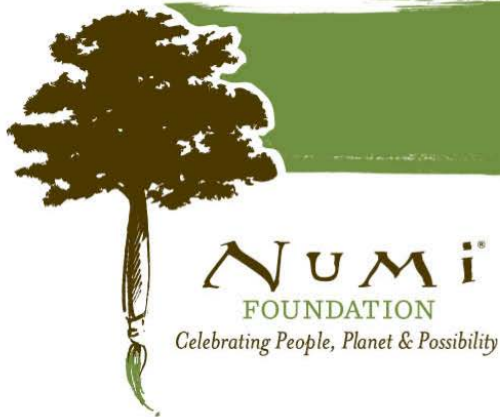
to eat in its habitat, otherwise it will starve. Can you name some animals and what they eat?"

- Discuss.
- "I heard some great examples. For example, in a forest, perhaps a fox will eat a rabbit. Let's take it one step further. (On the board write 'Fox' and draw an arrow towards 'rabbit'. What does the rabbit eat? (Once students say plants, draw an arrow from rabbit and write 'plants').
- The board should say Fox□Rabbit□Plants.
- "What do the plants eat? What eats a fox?" (Discuss until you have something like the following on the board: Cougar□fox□rabbit□plants□sun/soil).
- "This is called a food chain. It is actually a little more complicated than this, but we will stop here for today. I want you to find examples of the food chain in the garden."
- Students explore the garden for more examples of food chains. (Birds eat insects, insects eat other insects, insects eat plants, etc).
- Garden work.

Wrap up:

Return materials.

Notes/Feedback:



Journal Prompt: Food Chains

Week 16.2

STANDARDS

4.LS1.1, 4.LS1.2, 4.SL.1

MATERIALS

- Journals, pencils
- Tools for garden work

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Find 5 examples of plants or insects being eaten.
- In their journals, "Draw 3 food chains. One from the garden, one from the ocean, and one from an ecosystem of your choosing."

Wrap up:

Share, in partners.

Notes/Feedback:



Food Webs

Week 17.1

STANDARDS

4.LS1.1, 4.LS1.2, 4.SL.1

OBJECTIVES

- Students learn that the ecosystem is a web, not chain
- Students learn surprising connections among elements in a web
- Students discuss consequences of altering the web

MATERIALS

- Blank stickers (i.e. name tags)
- Permanent marker
- A ball of yarn or string

Preparation:

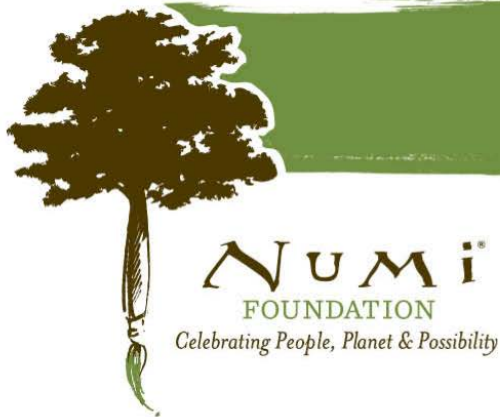
For this web to work properly, students must represent decomposers, plants, animals, as well as the sun, soil, and water.

Remember that decomposers can “eat” anything (and return it to the soil), plants can “eat” sun, soil, water and get eaten by animals. Animals eat plants or other animals, and get “eaten” by decomposers.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “Last week we talked about food chains, can somebody name one?”
- “Like we have been talking about all year, nature actually works in a system, in a community, where all parts work together. I will show you how. First, as a class, name everything you see in the garden.”
- If a student says “Greens”, give him/her a sticker that says “Greens” on it. Continue until all students are labeled. Push students towards naming the less obvious (sun, soil, water) and decomposers (fungus, bacteria, invertebrates). Once all students are labeled, gather everyone in a standing circle.
- Give one student the string to start. Instruct him/her to hold on to one end. “Pass the rest of the string to someone that you eat, or get eaten by.” The next person holds onto the string, and passes the ball of string to someone they eat or get eaten by. Continue until everyone is in the web.
- (This could look something like: Greens□soil□Lettuce□Caterpillar□Bird□Fig tree□Fungus□Ladybug□Aphids□Wheat...etc).
- “This is not a chain, this is a web! We are all connected to each other. This is a system, an ecosystem. When we looked at animals at the ‘top of the food chain’ last week, the animals that don’t get eaten, we can see now they do get eaten, by the decomposers. The decomposers return everything to the soil, where new plants grow from. It is all connected in an intricate web of life.”
- Ask the ‘fungus’ to pull on his/her part of the string. Ask “Who else feels the tug? Who is connected to the fungus?” Ask the ‘ladybug’ to pull the string. Continue, finding interesting connections between unexpected members of the ecosystem.
- “What would happen if I sprayed a chemical that killed all the ladybugs? Would that affect the rest of the ecosystem?” Discuss.
- I am going to ask the ‘ladybug’ to drop his/her part of the string. If you feel your string move when his/her drops, then you can drop yours as well, and so on. Ask the ‘ladybug’ to drop his/her part of the string.
- The whole web should collapse very quickly.
- Gather students. “What did you learn from that activity?”
- Discuss.
- Probe, “What connections surprised you? What did you learn from the part when the whole web collapsed? If someone came to you and said they wanted to kill all the aphids on their farm, what might you say to them?”
- “Some animals on our planet are going extinct. How does that affect the habitat in which it lives?”
- Continue exploring the garden.

Notes/Feedback:



Reading: Children of the Earth

Week 17.2

STANDARDS

4.SL.1

MATERIALS

- “Dear Children of the Earth” by Schim Schimmel
- Tools for garden work

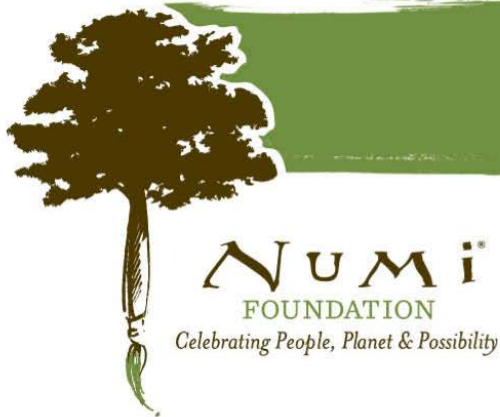
Preparation:

Prepare for garden work.

Procedure:

- Students enter the garden and explore.
- Do garden work, return materials when done.
- Gather students, read “Dear Children of the Earth” and discuss. Connect the story to food webs, and interconnectedness.

Notes/Feedback:



Harvest Day

Week 18.1
STANDARDS
4.SL.1

OBJECTIVES

- Students revisit their discussion about community
- Students learn to harvest greens

MATERIALS

- Container to collect harvested greens
- Container to collect damaged greens
- String/twine and scissors OR rubber bands
- Compost
- Full watering can

Preparation:

Before class, have students decide on who will receive the greens that you are harvesting.

As the plants re-grow, continue to harvest and donate.

Background Information:

It is important to harvest properly, otherwise the plant can get damaged. With greens, harvest the outside leaves. With your thumb, follow the stem of a leaf all the way to the main stalk where it is attached. Snap the stem off so there is a clean break on the main stalk.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather. Are there any signs of spring approaching?
- “As you well know by now, we have been discussing systems and communities over the year. In the beginning of fall, we talked about our community, and what role we want to play in our community. We decided as a class to grow greens for giving. Today we are doing our first harvest. How do you feel about giving these plants away?” Discuss.
- Bring students to the greens.
- Show students how to harvest. Show students examples of damaged leaves. “Collect the greens into this container, and the damaged greens in this container—which we can later compost.” Tell students how many leaves they should harvest and begin.
- Some students can make bundles of 8-10 leaves and tie them with twine/rubber bands.
- Put the greens in a safe place until they will be given away.
- “When we harvest, we need to give the plants a little extra food. Remember, their leaves make food from the sun, and we just took away many of their leaves. The compost will help.”
- Add compost to the plants, under the leaves/over the roots. Water the plants.
- Gather students in your outdoor seating. “What is the chain of giving here? Include the people we are sharing the greens with.”

Wrap up:

Return materials.

Notes/Feedback:



Journal Prompt: Children of the Earth

Week 18.2

STANDARDS

4.SL.1

MATERIALS

- Journals, pencils
- Tools for garden work

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Do garden work. Return materials.
- In their journals, “Last week we read a letter from the Earth to the children. Write a letter from you, to the Earth.”

Wrap up:

Take volunteers to share in front of the class.

Notes/Feedback:



Soil Jars

Week 19.1

STANDARDS

4.ESS2.1, 4.PS4.2, 4.SL.1

OBJECTIVES

- Students set-up soil jars
- Students learn about the types of nonliving matter in soil
- Students discuss weathering

MATERIALS

- 4-5 clean glass jars with lids—ideally the same size
- A full watering can
- Tools for garden work

Preparation:

Bring all materials to your gathering area.

Is there garden work?

Background Information:

Soil is essentially composed of decayed organic matter (plants, animals) as well as rocks,

sand, silt, and clay. Rocks are the largest particle, followed by sand, silt and lastly clay. When you make a soil jar, and let it sit, the sediments will settle in that order. Often, large pieces of organic matter will float, and the rest of the organic matter will settle with the clay. You will prepare the jars today, and observe them later this week.

Weathering is the process by which soil, rocks and minerals are broken down into smaller pieces. This activity is meant to show the different sizes of materials found within soil, and therefore open a discussion about how rocks change sizes to begin with.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- “In the fall, we learned about the different components of soil. Can someone tell the class what is in soil?”
- “Soil is alive, and it is basically made of decomposed organic matter, and rocks of different sizes. We know that soil has air, water, and microorganisms in it as well. How do dead plants and animals become part of the soil?” (The FBI decomposes organic matter).
- “We also know that there is nonliving ‘stuff’ in the soil as well. We know there is sand, which are smaller rocks, but there are two other types of rock as well. We are going to discover what else is in our soil, and how it gets there.”
- Split the class into 4-5 groups, give each group a jar. Instruct students to fill their jar one third full with soil and then return to the classroom.
- Once all students have returned, fill each group’s jar with water. “What do you notice? Are there bubbles? What do bubbles mean?” (There is air in soil).
- “Cap your jars tightly, and shake them well. We are going to let the contents of the jar settle, and we will look at our jars later this week.” Students bring their jars to a place in the garden where they will not be disturbed until next garden class.
- Discuss, “What are ways that people use soil? What are ways that other animals use soil? What are ways that plants use soil?”
- Do garden work.

Wrap up:

Return materials.

Notes/Feedback:



Weathering

Week 19.2

STANDARDS

4.ESS2.1, 4.PS4.2, 4.SL.1

MATERIALS

- Soil Jars from earlier in the week
- A book about weathering (if necessary)
- Watering cans

Preparation:

This lesson assumes that students have a general background of weathering, erosion and deposition from science lessons. If not, it may be helpful to find a book on this topic.

Background Information:

Weathering should not be confused with erosion, which involves movement. Weathering happens without movement of particles.

Procedure:

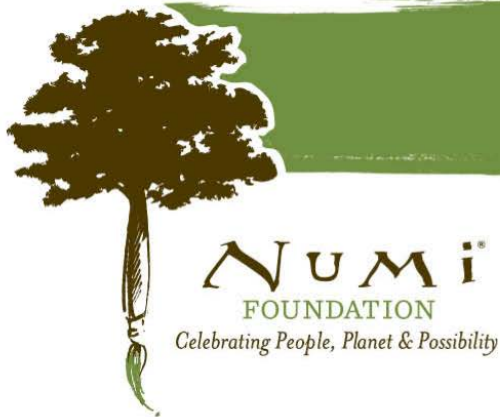
- Students enter the garden and explore.
- Groups from earlier in the week bring their soil jars, carefully, to the classroom.
- Give students time to observe the layers in their jars.
- “What do you see on the bottom?”
- “Sand is the bottom layer because it is the heaviest part of the soil. What is sand? What is it made from? (Rocks). How do rocks break into smaller pieces?” (Heat, water, ice and pressure).
- Discuss weathering, read a book if you have one.

- “The next layer is called silt. Silt is smaller than sand. Can you see the layer just above sand?”
- “The next layer is called clay. Have you heard of clay? What can you do with clay?”
- “Clay particles are tiny, much smaller than silt, and therefore they rest on top. There may not be very much clay in our soil, and mixed it in is all this brown stuff. What is the brown stuff?”
- Encourage students to make further observations. Did any organic material float to the top? Is your soil very sandy? Or is it heavy clay? What kind of soil would you expect to find near the ocean?
- “Although this may seem like a simple project, farmers and gardeners often do this test before planting a new area. Why do you think it would be helpful for a gardener to see the amounts of clay, silt, and sand in their soil?”
- “One benefit of sandy soil is that it is soft, and plants’ roots can easily grow and breathe. However, water and nutrients flow through sand quickly, sometimes before the plant has a chance to absorb it. What do you think a solution would be, if your soil is too sandy?” (Adding compost).
- “Very clay-ey soil keeps nutrients and water readily available in the soil, because it is so hard. This is a good thing, but on the flipside, the harder, heavy clay soils can sometimes be difficult for plants to grow and breathe in. What do you think a solution could be, if your soil is too clay-ey?” (Adding compost).
- “Look at your soil jars. Which layer is the thickest, sand, silt or clay?”
- Students can pour their soil jars back into the garden.
- Water the garden.

Wrap up:

Return materials.

Notes/Feedback:



Planting Day

Week 20.1

STANDARDS

4.LS1.1, 4.LS1.2, 4.SL.1

OBJECTIVES

- Students learn about the history of the potato
- Students recall the function of tubers
- Students discuss vegetative propagation

MATERIALS

- “Garden Wizardry for Kids” by L. Patricia Kite
- Seed potatoes or Organic potatoes from the store
- Full watering cans
- Compost
- Rulers
- Craft stick, permanent marker
- Hand trowels

Preparation:

Potatoes can be grown from “seed potatoes” (not actually seeds) bought from a nursery or from small, **organic** (very important!) potatoes from the store. Find potatoes with little sprouts. There are methods where you cut the potatoes into pieces and let them dry, but it’s not necessary to do it that way.

Find the area where you will be planting potatoes.

Be familiar with the section on potatoes from “Garden Wizardry for Kids”.

Background Information:

Plant potatoes in trenches 6-8 inches deep and at least one foot apart. As potatoes sprout and grow, you will need to “hill” the potatoes. You cover the green stems and leaves so that only the top few inches are showing.

Procedure:

- Students enter the garden and explore.
- Before gathering students, ask them to sink their hands into the soil. Warm? Cold? Cool?
- Gather students, check in about the season and weather, and soil temperature.
- “You know from your years of gardening that, as gardeners, we follow the cycles of nature. We learn how to take care of plants by observing how they grow naturally. We know that some plants grow in cooler weather, and some in warm weather. What do you know about potatoes?”
- “Potatoes grow in the spring and summer. The soil is warm enough for us to plant, as winter is ending and spring is approaching.”
- Read a little about potatoes from “Garden Wizardry for Kids”.
- “The part of the potato plant that we eat is the ‘tuber’. What do you remember learning about tubers earlier this year?”
- “Tubers are a specialized plant part. Potatoes store their nutrients in this tuber, underground, to have energy to use for later. Even though potatoes produce flowers, and their flowers make seeds, farmers and gardeners don’t plant potato seeds. We plant the tubers, and this is another example of propagating vegetatively. Instead of planting a seed, we are basically taking part of the potato’s stem and sticking it in the ground. This piece of stem can grow a whole new plant!”
- Bring students to the planting area.
- Pull weeds, pick stones. Dig in plenty of compost.
- Using rulers, have students dig trenches, 6-8” deep, one foot apart.
- Dig holes within the trenches, place the potatoes in the holes, one foot apart, and cover the potatoes. Water thoroughly.
- Label the area with the date and variety of potato.

Wrap up:

Return materials, wash hands.

Notes/Feedback:



Reading: Two Old Potatoes

Week 20.2
STANDARDS
4.SL.1

MATERIALS

- “Two Old Potatoes and Me” by John Coy
- Watering cans
- Journals, pencils

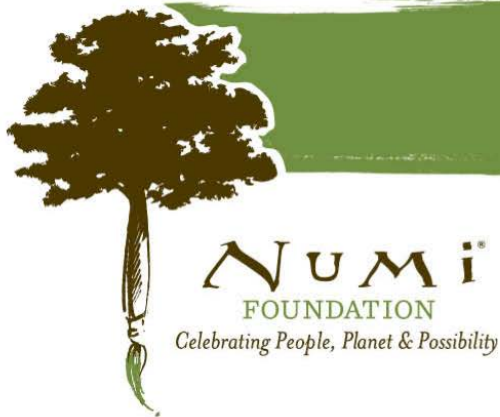
Procedure:

- Students enter the garden and explore.
- Water the potatoes, only if the soil is dry.
- Gather students. Read “Two Old Potatoes and Me”.
- Discuss the steps of growing potatoes. Note that you will be harvesting your potatoes as “new potatoes”, in the late spring, and not in the fall, as depicted in the story.
- In their journals, “What is a lesson that you learned from someone in your family?”

Wrap up:

Share, in small groups.

Notes/Feedback:



Spring Check In

Week 21.1

STANDARDS

4.LS1.1, 4.LS1.2, 4.SL.1

OBJECTIVES

- Students notice and discuss signs of spring
- Students investigate their plant cuttings
- Students do whatever garden work is necessary

MATERIALS

- “And Then It is Spring” by Julie Fogliano
- Any tools you may need for garden work

Preparation:

Choose a few of the plants you have propagated by cutting to pull apart.

This lesson is mostly about “checking in” with the garden. What needs watering? Have the potatoes sprouted? Are the flowers blooming? Do the greens need harvesting?

Procedure:

- Students enter the garden and explore.

- Gather students, check in about the season and weather.

- “What signs of spring have you noticed? What has changed? Are there pollinators in the garden?”
- Explore the garden again, looking for signs of spring.
- Gather students, read “And Then It is Spring” and discuss.
- Distribute the plant cuttings, one per group of students. Allow students pull the cuttings out, and spend time looking at the new roots and new leaves.
- Go to the compost pile. “How has this pile changed over the past few months? What do you notice right away? What are less obvious changes?”
- Allow students to pull apart the compost pile a little bit. Look for examples of the garden FBI.
- Distribute the rest of the cuttings. They can be taken home, or distributed as gifts. Some can stay and be transplanted into the garden.
- Harvest greens, if possible.

Wrap up:

Wash hands.

Notes/Feedback:



Soil Testing

Week 22.1

STANDARDS

4.LS1.1, 4.LS1.2, 4.SL.1, 4.ESS2.1

OBJECTIVES

- Students learn about the three main nutrients in the soil
- Students learn about the functions of nitrogen, phosphorous, and potassium
- Students complete a soil test procedure

MATERIALS

- Soil Test Kit
- Containers of different soil samples from the garden, and one sample from outside the garden
- Tools for garden work

Preparation:

Soil Test Kits are inexpensive and can be bought from a nursery. Become familiar with the instructions, and be sure to gather anything you may need before class.

Prepare garden work.

Background Information:

Basic functions of plant nutrients:

- Nitrogen helps plants with rapid growth, increases growth in seed and fruit production, improves the quality and growth of leaves. Aids in photosynthesis.
- Phosphorous encourages blooming and root growth. Also aids in photosynthesis.
- Potassium helps in the building of protein. Aids in photosynthesis, and improving fruit quality.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- “In our yearlong discuss of soil, we know the importance of having healthy soil for our plants. What are some signs of healthy soil? What does it look like, feel like, smell like? Turn to your partner and discuss.”
- “I heard some of you say that healthy soil is full of nutrients. Today we are going to learn the names of those main nutrients, and we are going to test for them. Many of the nutrients get into soil from decomposed plants, and some are minerals that come from weathered rocks. Today we are going to talk about the main three: Nitrogen, Phosphorous, Potassium.”
- Show students the soil test kit, and explain the procedure.
- Test the soil. Results take about 10-15 minutes, do garden work in the meantime.
- Gather students, and discuss results. Which areas of the garden are lacking nutrients? Which areas have plenty? “Any theories?”
- “Just like our bodies require different types of nutrients, so do plants. Next week we will talk more about adding nutrients back into the soil.”

Wrap up:

Return materials from garden work, clean up from soil testing.

Notes/Feedback:



Journal Prompt: Smell and Memory

Week 22.2
STANDARDS
4.SL.1

MATERIALS

- Journals, pencils
- Tools for garden work

Preparation:

Prepare garden work.

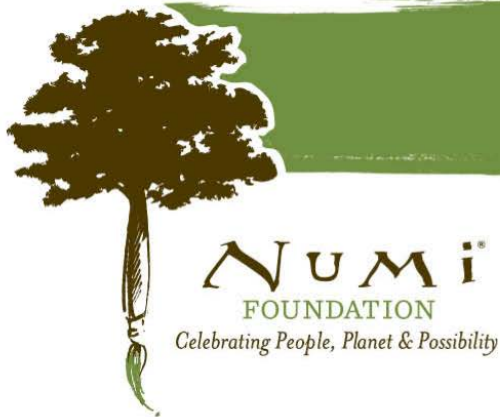
Procedure:

- Students enter the garden and explore.
- Do garden work.
- Return materials.
- Students spend time holding and smelling soil.
- In their journals, "What does the smell of soil remind you of? What memories does it bring back?"

Wrap up:

Share in small groups.

Notes/Feedback:



Plants Change the Land

Week 23.1

STANDARDS

4.ESS2.1

OBJECTIVES

- Students discuss the ways to add nutrients into soil
- Students learn that cover crops add nutrients to the cover, and protect soil from weathering
- Students plant cover crops

MATERIALS

- A shoebox, or smaller, full of soil
- 1 spray bottle, full of water
- Fava beans to plant
- Bucket to collect weeds, if necessary
- Watering cans
- Hand rakes
- Craft stick, permanent marker
- Row cloth and stakes to hold it down

Preparation:

Bring your shoebox of soil and spray bottles to the garden classroom.

Know where you are planting! Have all the materials you need (buckets to collect weeds, compost, hand rakes, full watering cans, etc) ready at the planting site. Fava beans

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should be planted about 1.5 inches deep, and 4 inches apart (or the width of a child's palm). Roughly estimate how many fava beans you'll need to plant your bed, divide that by the number of students, and then you'll know how many seeds to give each student. Row cloth can be bought from a garden store. It is a thin, light synthetic material that allows light and water in, but slow evaporation, and keeps bugs out. Water through row cloth, and remove it when plants are several inches tall.

Background Information:

You will be cutting the fava bean plants down before they produce bean pods, but the leaves are edible (and delicious). There is a rare genetic condition, Favism, that causes certain people to get sick from eating fresh fava beans. It tends to affect people from the southern Mediterranean region.

Row cloth can be purchased from any gardening store. It is a thin cloth that slows evaporation while still letting light through. You can water right through it, and remove it once plants are a few inches high. It will need to be weighed down.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- Show students your little model garden. "This is my little garden. I don't have anything planted in here right now. Last year I planted corn in my little garden, and the corn grew for months and months and pulled nutrients out of the soil."
- Blow on the soil until some flies out. "Then a storm came and blew some of my soil away." Spray the soil. "Then a rainstorm came and pushed the soil down, making it hard."
- "My soil is now lacking nutrients, it is hard and compact, and much of it has been blown away. Am I taking good care of my soil? No? What can I do to take better care of it?"
- Discuss.
- "I'm hearing lots of good ideas, like cover the soil, or add compost back to it."
- "One way of doing both of these things at the same time is by planting cover crops. Cover crops are special plants that feed the soil; they add more nutrients to the soil than they take. The 'Legume' plant family is a group of plants that include beans, peas, and peanuts. These important plants put Nitrogen into the soil, one of the nutrients we discussed last week! Nitrogen is one of the most important nutrients a plant needs to grow. The legume we are going to plant this spring is called the Fava Bean."
- "The wind and rain can really hurt our soil if we do not protect it. Though weathering is natural, we want to protect the soil that we use to grow food. When scientists talk about erosion, they are usually talking about what happens in nature as the wind and rain move soil and rocks. Have you ever heard of a landslide or a mudslide? That is an example of how heavy rains can cause a lot of soil to move! Sometimes people

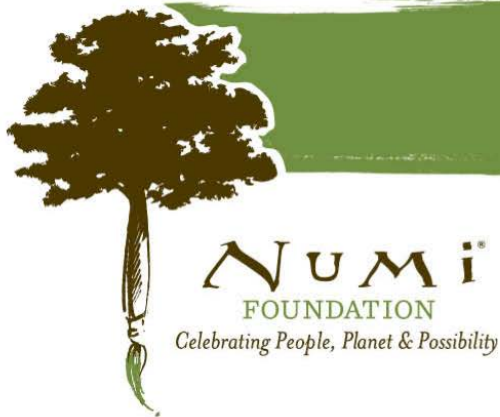
plant grass on hillsides, so the roots grab the soil and prevent it from moving. Can you think of any other examples?"

- "Farmers worry about erosion. Many farmers and gardeners take very good care of their soil, and do not want it to erode! They do not want their soil moving around in the rain and from the wind. Though this may happen slowly, over time they can lose a lot of soil."
- "Back to the fava beans. We are going to plant them now, and learn more how they add food to the soil next week."
- Bring students to area where you are planting.
- "We are going to take care of the favas until they are big and tall. Once they make flowers, we are actually going to cut the plants down and let the plants decompose. After the plants have decomposed, we will be able to plant new plants on top next year, and the soil will be rested, healthy and strong!"
- Pull weeds, if necessary. Make the area smooth with hand rakes. Students can crush big clumps of soil if there are any, and pull stones if there are big ones.
- Distribute seeds to your students. Allow them a minute to explore these big seeds.
- Show students how to lay one seed down at a time, placing a flat hand down as a spacer before laying down the next. There should be about one hand's width in between all seeds. Be careful not to compact the soil while putting hands on the bed. Instruct students that everyone should lay their seeds down first, otherwise students may accidentally plant on top of each other's seeds.
- Once all seeds have been laid down, ask "If we push small seeds in only a little bit, how far do we push big seeds?"
- "Fava beans need to be pushed down about an inch and a half, which is about the height of your thumb." Show students how to push seeds down with your thumb, pushing until your thumb is all the way in the soil.
- Students push the seeds down.
- Water thoroughly.
- If it is very sunny, or has been very sunny, cover the soil with row cloth to keep the soil moist. You can remove the row cloth when plants are 3-4 inches tall.

Wrap up:

Wash hands.

Notes/Feedback:



Meal Planning

Week 23.2
STANDARDS
4.SL.1

MATERIALS

- Full watering cans

Procedure:

- Students enter the garden and explore.
- Students find and identify 4-6 plants that are ready for harvest.
- In groups, plan “meals” that they could make from the produce in the garden.
- Gather class, have groups explain the meal that they would make from the garden.
- Water the fava beans, if necessary.

Wrap up:

Return materials.

Notes/Feedback:



Nitrogen Fixation

Week 24.1

STANDARDS

4.ESS2.1, 4.LS1.1

OBJECTIVES

- Students learn about nitrogen fixation
- Students understand the mutually beneficial relationship between a special bacterium and the fava bean
- Students understand that cover crops are planted to improve soil quality

MATERIALS

- Watering cans
- Tools for garden work
- Labeled index cards
- Masking tape

Preparation:

If there are already fava beans (or any other legumes—peas, or other beans) growing in the garden, try to pull one out before class. You should be able to see the nitrogen modules on the roots.

Label index cards. Label one 'fava bean', label one 'bacteria' and label five cards 'sugars', and another five 'nitrogen'. You should have 12 cards total.

Prepare garden work.

Background Information:

Nitrogen fixation, simply, is the process by which certain legumes “fix”, or put, atmospheric nitrogen into the soil. Nitrogen is an extremely important plant nutrient. Certain legumes, including fava beans, have a relationship with bacteria from the genus *Rhizobium*, which cause the formation of root nodules. The bacteria live in the nodules and create food (nitrogen) for the plant, and the plant supplies food in return.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- Take one volunteer; bring her to the front of the class. Tape the card that says ‘fava bean’ on her. Hand her the five cards that say ‘sugar’.
- “This is our fava bean, a full-grown plant. Last week we talked about how cover crops protect the soil from wind and rain, and how plants in the legume family add nitrogen to the soil. What do you remember about nitrogen from our soil testing day?”
- “I am going to show you how this plant brings nitrogen into the soil. It’s a special plant, it gives more to the soil than it takes.” Take a volunteer, and bring him up to the fava bean. Tape the card that says ‘bacteria’ to him, and have the bacteria sit next to the fava bean’s roots. Hand him the five cards that say ‘nitrogen’.
- “This is a special bacterium, called *Rhizobia*. You don’t need to remember his name, just know that he is a bacterium. The fava bean and the bacteria have a special deal.” (Have the fava bean and bacteria shake hands.)
- “The bacteria live on the bean’s roots. The plant is making sugar from the sun, and bringing it to its roots. The plant is letting the bacteria eat some of the sugar.” (Fava bean hands the bacteria a ‘sugar’ card.”
- “In exchange, the bacteria takes nitrogen out of the air in the soil, makes it solid, and puts it on the bean’s roots for the bean to use.” (The bacteria hands the bean a ‘nitrogen’ card.)
- “And so on and so forth, they get along quite nicely.” (Bacteria and bean continue exchanging cards.)
- “The bacteria gets sugar to eat, and the bean gets nitrogen to grow. This process is called ‘nitrogen fixation’.”
- If you have a sample fava bean or pea plant, pass it around, showing students the solid nitrogen nodules on the roots. They can break them apart and open them, they should be pink on the inside. Volunteers can sit down.
- “As gardeners, this is an amazing plant to put in your garden. We can cut the fava beans down before they use up all their nitrogen to make bean pods. The favas will decompose into the soil, adding nutrients. Also, the nitrogen on the roots will stay in the soil and be available for the next plant to use.”
- Discuss, take questions.
- Do garden work, including watering the fava beans.

Wrap up:

Return materials.

Notes/Feedback:



Journal Prompt: Nitrogen

Week 24.2

STANDARDS

4.SL.1, 4.LS1.1

MATERIALS

- Journals, pencils
- Tools for garden work

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Do garden work.
- In their journals, “Earlier this week we discussed nitrogen fixation—an absolutely amazing partnership between a plant and a certain bacterium. What else that you have learned in the garden has amazed you this year? Write, and draw.”

Wrap up:

Take volunteers to read in front of the class.

Notes/Feedback:



Assessment: Pygmy Forest

Week 25

STANDARDS

4.LS1.1, 4.ESS2.1

OBJECTIVES

- Students are assessed around what plants need from soil, and what happens in cases of extreme lack of nutrients
- Students learn about pygmy forests
- Students connect their learning to the soil health in the garden

MATERIALS

- Pictures of pygmy forests
- Journals, pencils

Preparation:

Print pictures from pygmy forests. Try to find photos that show the contrast between normal trees and pygmy trees.

Background Information:

Pygmy forests exist around the world, for different geologic reasons. They are formed when a certain area of forest has extremely poor soil, and perhaps a hardpan of soil (basically a big rock) only a few feet deep. This essentially has a natural bonsai effect on the trees, keeping them extremely small. Trees 80-100 years old can have a trunk only one inch thick!

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather.
- Distribute journals and pencils.
- “We have been learning about soil formation, the importance of decomposition in recycling nutrients, and which nutrients exist in soil. I want you to draw a picture of what you think a forest should look like with very healthy soil.”
- Give students several minutes to draw.
- Show pictures of pygmy forests. Show the tiny trees in relation to normal trees growing nearby.
- “What happened here? What is causing some of these trees to be tiny?”
- Class discussion. (This is a gentle assessment. You are looking for mention of lack of nutrients.)
- “Scientists have studied pygmy forests around the world. Imagine finding 100-year-old trees that are only a few feet tall, and a few steps away, the same tree growing fifty feet tall! Scientists have tested these soils, like we have in our garden, and have found areas that are simply missing nutrients. Without nutrients, plants can’t grow!”
- “Sometimes the soils have lots of natural metals in them as well. These minerals can join and essentially form a long, flat rock just under the soil surface. Imagine you are a tree, and your roots meet a huge rock just underground. Your roots would not be able to break through this rock to reach the water and nutrients it needs to grow. This is common in pygmy forests as well.”
- “What does this look like in our garden? We have no sheet rock in our soil, but what happens to plants when they lack nutrients?” (Lack of growth, poor development, insect infestations—insects attack weaker plants).
- In their journals, students should draw a pygmy forest, showing a huge rock under the surface of the soil.
- As students finish, explore the compost bin. Look for signs of the garden FBI.

Wrap up:

Wash hands.

Notes/Feedback:



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Approaching Summer

Week 25.2

MATERIALS

- Tools for garden work

Preparation:

What needs to be done in the garden? Harvest greens, compost maintenance, water favas?

Procedure:

- Students enter the garden and explore.
- Students look for signs of summer approaching.
- Garden work.

Wrap up:

Return tools, wash hands.

Notes/Feedback:



Field Trip: Presidio in San Francisco

Week 26.1

STANDARDS

4.SL.1, 4.ESS2.1

OBJECTIVES

- Students learn about the history of the Presidio in San Francisco
- Students explore the sandy soil by the coast
- Students enjoy their local National Park

Preparation:

Your class could go on a day trip to the Presidio, or on a one-night camping trip through the organization “Camping at the Presidio”. The trip requires planning, but is worth it. The Presidio offers fascinating social studies connections for fourth grade students. Try to contact a naturalist beforehand who may be able to take your students on a guided hike.

The Presidio has many nature walks—look at map beforehand. Students should explore the native plants in the area. Notice the sandy soil, and the windswept scenario. Notice the plants that have been modified by heavy winds, and plants that adapt that grow low to the ground. Can students find example of weathering?

Procedure:

- Students explore and enjoy the Presidio!

Notes/Feedback:



Journal Prompt: Field Trip Reflection

Week 26.2

STANDARDS

W.4.8, 4.SL.1

MATERIALS

- Journals, pencils
- Tools for garden work

Preparation:

Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- Do garden work.
- Gather class. “What did you enjoy about the field trip? What did you learn?”
- In their journals, “What was interesting to you about the Presidio, and the plants that you saw growing there? Write a letter to someone you know that has not been to the Presidio, and tell them what you saw, and what you did.”

Wrap up:

100

Take volunteers to read letters.

Notes/Feedback:



Build A Seed

Week 27.1

STANDARDS

4.SL.1, 4.LS1.1, 4.LS1.2

OBJECTIVES

- Students revisit the ways that seeds travel
- Students work cooperatively to build a seed
- Students test their seeds (next lesson as well)

MATERIALS

- A large boxful of “junk” materials: string, paper, cloth scraps, paper clips, tape, glue, cotton bolls, corks, pipe cleaners, ribbon...
- A shoebox sized box, one per group, in which to keep their materials
- A bucket of water for testing “floaters”
- “The Reason for a Flower” by Ruth Heller
- Watering cans

Preparation:

- You will need to collect all of the materials to make this project possible. It would be best to start ahead of time. Your front office may be a good place to collect “junk” materials.
- This lesson digresses somewhat from the themes of the year, but it is a very fun project that your students will enjoy.

Background Information:

The prior knowledge necessary are the methods by which seeds travel. The four main ways are by wind (fliers), passing through animals (poopers), sticking to animals (hitchers) and by water (floaters). Review this information with your students while reading “The Reason for a Flower”.

Procedure:

- Students enter the garden and explore.
- Gather students, check in about the season and weather.
- Read “The Reason for a Flower” and review the ways that seeds move.
- “How do plants depend on animals? How do animals depend on plants?”
- “Today, you are going to try to build a seed. You will be in a group, and I will give you plenty of different types of materials. As a team, the first thing you will do is try to decide if you’re going to make a flier, hitcher or floater. (No poopers!). You will have all of this class to work on your project. During our next garden lesson, later this week, you will have time to finish your project and then test it in front of the class. Also, you will need to come up with a name for your new plant, and tell us the life cycle.”
- Split class into groups, and distribute materials. Before students start, “Remember! First look through your materials, and decide on which seed you’ll make. You can test out your first drafts, but the final test will be at the end of the next class.”
- Allow students to work for at least 30 uninterrupted minutes. Have a tub of water available for students to test if certain materials float or sink.
- Have students collect their materials in their container and wash hands.
- Water potatoes and favas, if necessary.

Wrap up:

Return materials.

Notes/Feedback:



Seed Types

Week 27.2

STANDARDS

4.SL.1, 4.LS1.1, 4.LS1.2

MATERIALS

- Each group's shoebox of materials
- A bucket of water for testing "floaters"
- An electric fan for testing "fliers"

Preparation:

Is there an electrical outlet close enough to the garden that you can plug in a fan? If so, great! If not, you will test the "fliers" back inside your classroom.

It's possible that none of the students' seeds will "work". What a great segue into a conversation about the amazing power of nature!

This is a gentle assessment: how do students work together? How are ideas heard, and discussed?

Background Information:

A suggestion on "testing" seeds:

Floaters: Seeds should float for at least 5 minutes.

Fliers: When dropped in front of a blowing fan, seeds should fly two or three feet.

Hitchers: Stick hitchers onto a students' clothing and walk 20 feet without the seed falling.

Procedure:

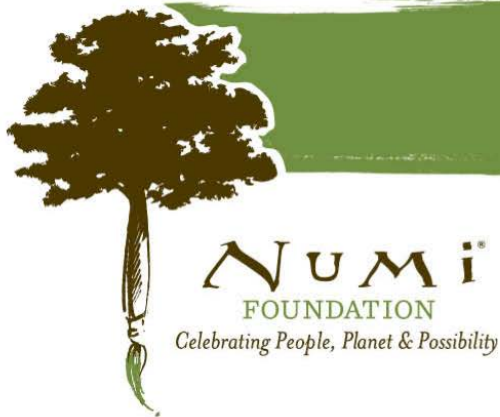
- Students enter the garden and explore.
- In their groups from early this week, distribute the boxes of materials.

- “You have thirty minutes (or however long) to finish your seeds. When we stop to clean up, you should be ready to test your seed in front of the class. Also remember to tell us the name of your seed, and a little about its lifecycle. For example: ‘Our group built a floater, and it’s called the Purple Waterberry. A purple waterberry seed falls off a purple waterberry tree, which usually grows by rivers, and the seed floats until it hit lands. There, if it finds enough soil, air, water and sunlight, the purple waterberry seed sprouts, and eventually grows into a huge tree. The tree blossoms in the spring and drops new seeds every fall.’”
- Students work on their projects, testing and modifying them, until clean up.
- Clean up, collect excess material.
- Have students ready in their groups.
- Each group presents their seed, tells its story, and tests their project in front of the class.
- After each group had a turn, debrief the experience.
- “Was this difficult? Was it easy? Which seed designs worked well? Which didn’t? What did you learn from this? Isn’t nature amazing?!”

Wrap up:

Make sure no junk is left in the garden.

Notes/Feedback:



Harvest Potatoes

Week 28.1

STANDARDS

4.LS1.1

OBJECTIVES

- Students learn about methods of potato harvesting
- Students harvest potatoes

MATERIALS

- Shovels
- Container to collect potatoes
- Tools for garden work

Preparation:

New potatoes are ready to harvest once the plants have already flowered, and begin to wilt a little bit. If potatoes have not flowered and been pollinated, postpone this lesson. Prepare garden work.

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and weather. What are signs of summer approaching?
- “We are going to harvest our potatoes today. There are two ways to harvest potatoes. You can harvest ‘new’ potatoes, which is what we are going to do. New

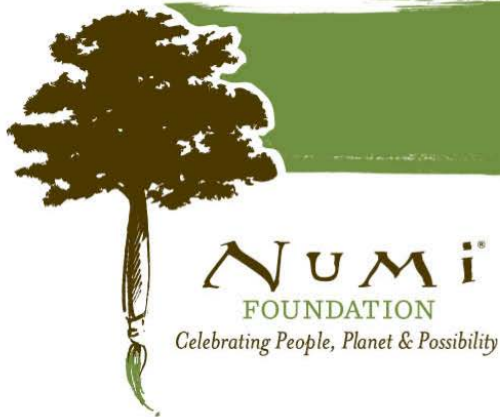
potatoes are small, and are the newly formed tubers of the plant. They are formed after the flowers are pollinated—that is, it is best to eat them fresh. They are harvested in the late spring or early summer, and do not last very long. The other way to harvest potatoes is to let the plant grow all through the summer, and harvest them in the early fall. In this method, the potatoes grow much bigger, and their skin grows hard and thick. These kinds of potatoes can be stored in cool places underground, or in the grocery store, for many months without going bad. People used to grow enough potatoes to last them all year!”

- Bring students to the area with the potatoes. One at a time, or however it works for you, have students dig and pull out potatoes. This is a fun activity, take your time.
- After pulling the plants out, dig through the bed one more time to avoid leaving potatoes underground.
- Gather potatoes in the container. You will be cooking them later this week.
- Count the potatoes. Look at all the shapes, sizes and colors.
- If there is time, do garden work.

Wrap up:

Return materials. Wash hands.

Notes/Feedback:



Eating Potatoes

Week 28.2

MATERIALS

- Tools for garden work
- Electric burner
- Pots and their tops
- Colander
- Serving materials, and plates
- Salt
- Soap for hand washing
- Journals, pencils

Preparation:

Is there place where the electric burner can be plugged in, inside the garden? If so, great! If not, do the cooking in your classroom. Wash the potatoes and put them in their pots. Fill the pots with water.

Procedure:

- Students enter the garden and explore.
- Turn on the stove. New potatoes should only take 20-30 minutes to cook.
- In the meantime, students write in their journals. "Planting one potato can produce 5 or more new potatoes. If you take care of the earth, she will take care of you. How else can you take care of the earth?"
- As potatoes are finishing, drain the hot water.
- Students wash hands.
- Distribute plates, hot potatoes. Sprinkle salt on top, if you choose.
- Once all students have their snack, "We are going to go in a circle, and each person says something they are thankful for."
- Eat, and enjoy!

Wrap up:

Compost serving materials, wash dishes.

Notes/Feedback:



Summer Shut Down

Week 29.1

STANDARDS

4.LS1.1

OBJECTIVES

- Students contribute to cleaning the garden for summer
- Students observe the nitrogen nodules on the fava bean's roots
- Students experience cutting cover crops

MATERIALS

- Scissors, one pair per student cutting down favas
- Full watering cans
- Tools needed for garden work

Preparation:

How are you shutting down the garden for summer? What work needs to be done? Perhaps you can have rotation stations. You can also add finished compost into the garden beds.

Background Information:

How to cut favas:

Today is the day you are cutting down the fava beans. Ideally the flowers are budding, and only beginning to bloom. If the favas have not flowered at all, postpone the cutting. If you do postpone, be sure to discuss (again) why you are cutting the fava beans, and why it is important to add nutrients to the soil. When you cut the cover crops, pull the plant completely out of the soil. Cut the plant into pieces, and push the roots back into the soil so that the nitrogen is released into the soil. (If you do not pull the roots out completely, the plant will re-sprout.) The plant body will decompose, also releasing nutrients into the soil.

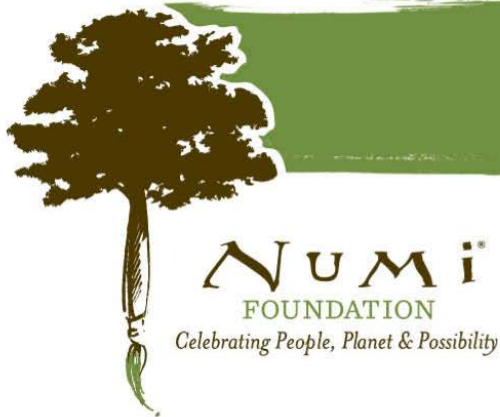
Procedure:

- Students enter the garden and explore.
- Gather students. Check in about the season and weather.
- Bring students to the fava bed. Pull out several plants from the roots, and pass them around, asking students if they see anything interesting on the roots.
- (If your students have not yet seen the nitrogen nodules:) “These balls, or nodules, on the roots are full of nitrogen. When we cut the favas down, the nitrogen will stay in the soil. The rest of the plant, the stem and the leaves, are going to decompose, just like compost, and add even more nutrients into the soil. Why is it important that the soil has nutrients in it?”
- Show students how to pull the favas, cut them into 5 inch sections, and push the roots back into the soil. This will probably take quite a while.
- Once the favas have been cut, dig the stems into the soil a little bit, and then water the bed gently. Plants decompose faster when wet, and when in smaller pieces.
- Have garden work rotation stations, if possible.

Wrap up:

Return materials.

Notes/Feedback:



Class Discussion

Week 29.2
STANDARDS
4.SL.1

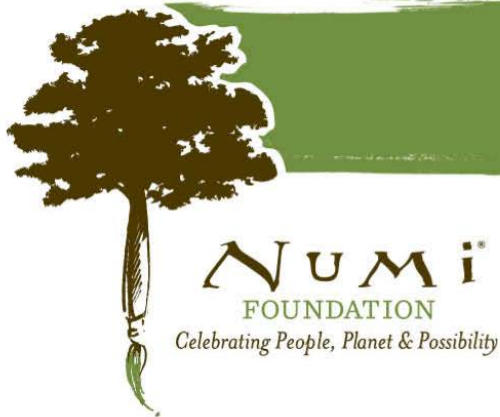
MATERIALS

- Journals, pencils
- Paper for you to record student responses

Procedure:

- Students enter the garden and explore.
- Class discussion: What have you learned this year? What surprised you? What do you want to know more about?
- In their journals, "Next year you are fifth grade gardeners. What do you want to plant in the garden? What activities do you want to do more of? What are you interested in?"
- Ask students to share out their responses, and record their responses. Keep this paper for next year, and try to incorporate their suggestions into their fifth grade year.
- With extra time, continue exploring.

Notes/Feedback:



Miss Rumphius

Week 30.1

STANDARDS

4.LS1.1

OBJECTIVES

- Students meditate on the power of a seed
- Students feel encouraged to play a role in taking care of the earth

MATERIALS

- “Miss Rumphius” by Barbara Cooney
- Sunflower seeds, at least one per student (or another summer-loving seed of your choice)

Procedure:

- Students enter the garden and explore.
- Gather students; check in about the season and the weather.
- “Over this year, we talked about how we are all connected on this earth, and in this community. Here is a story about the same idea.” Read “Miss Rumphius” and discuss the many lessons within the book.
-

- Hand each student a seed, and instruct them to hold it tight and close their eyes.
- “You may be thinking, ‘One seed?!’ but think about this. Inside your hand is one seed. It is a sunflower seed, and if you plant it and take care of it, it will grow in a tall, beautiful sunflower plant. The flowers are pollinated, and turn into seeds. One plant can produce 1000 seeds. So now you have 1000 seeds. Imagine you plant 1000 sunflower seeds, and then have 1000 sunflower plants. If each sunflower grows, and produces 1000 seeds, you will have one million seeds. Can you even imagine one million seeds? If you harvested the seeds from one million plants, you’d have one trillion seeds. Can you even imagine that? And this can go on forever, and in fact, it has been going on forever. Open your eyes, and look at your seed. Your one seed.”
- “One way you can help our community is by planting this seed, and taking good care of it. Think about how much beauty you can bring to the world with a single flower. Think about how much joy you can bring the world with one kind word.”
- Students put seeds in their pockets.
- Explore the garden, enjoying and noticing the flowers, plants, birds and bugs that make it all happen.

Notes/Feedback:



Thank You Letters

Week 30.2

MATERIALS

- Materials for garden work
- Journals, pencils

Preparation:

Is there more garden work to be done?

Procedure:

- Students enter the garden and explore.
- Gather students, reflect on the year.
- Continue cleaning the garden for the summer: pulling weeds, taking out the compost, whatever needs to be done.
- Distribute journals, give students time to look through their work from the year.
- In their journals, “Write a Thank You letter to something in the garden”. It can be to an insect, a plant, or even to the sun.

Wrap up:

Gather students; take volunteers to read the letter.

Notes/Feedback: