Seeds to Schools: Garden Compost Curriculum Guide

An integrated hands-on teaching curriculum for kindergarten through eighth grade, incorporating outdoor art and science education into the garden environment while exploring children's senses and wonder of nature.

Curriculum Developed by Classroom in Bloom, April 2025

Okanogan Conservation District

foundry10

Classroom in Bloom

Seeds to Schools, Compost Curriculum is a subset to the larger Seeds to School Curriculum Guide v2 2022; this subset version printed April 2025. These curriculum guides have coincided with Professional Teachers Trainings accredited through North Central Educational Services District (NCESD) and hosted at the Classroom in Bloom garden in Winthrop, WA.

Thank you to the Seeds to School curriculum development and teaching team.
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Overview

This Teachers Guidebook is an introduction to hands-on activities and learning for Garden Compost projects for your school garden. To teach in this environment, your garden may be flowers along the side of the schoolyard, veggies growing in garden boxes, or a community farm near-to or on school campus. The goal of these 20-min to one hour-long lessons is to provide hands-on experiential learning in your outdoor classroom.

Next Generation Science Standards and S.T.E.A.M. Connections: Each lesson within this curriculum guide engages students' senses and awareness of the natural world through Science, Technology, Engineering, Art and/or Math (S.T.E.A.M.). In development of each lesson, Classroom in Bloom educators align inquiry-based lessons, activities and questions with the Washington Visual Arts K–12 Learning Standards (WALS 2017), and Washington State's Next Generation Science Standards (WSSLS/NGSS 2013). Activities have been peer reviewed and taught with children.

About our Okanogan County School Garden Programs:
Classroom in Bloom is a non-profit 501c3 farm to school program in existence for 20 years. The 2-acre garden is on the Methow Valley School District campus. Classroom in Bloom staff teach K-12 garden education through exploration and science, art, food activities at the Methow Valley and seven (7) other Okanogan County school gardens. Children participate in weekly learning and garden work activities, and each class is completed with a garden snack. Classroom in Bloom's student-led garden produces thousands of pounds of organic produce each year which is donated to the Methow Valley School District for school meals, used as garden snacks during classes, and donated to the community through social services and events. Classroom in Bloom developed their own art and science curriculum in conjunction with school teachers, coaches, and mentors based on NGSS and WALS integrated with classroom learning. For more information, go to www.classroominbloom.org

Okanogan Conservation District (OkanoganCD) works collaboratively with individuals and organizations to conserve natural resources in Okanogan County. They provide resource stewardship planning, conservation incentives, and adult and youth education. OkanoganCD provides quality standard-based education for students K-12 in all of Okanogan County. Through this work, District employees form and strengthen relationships with teachers at each school and have built a diversified network of educators. OkanoganCD also leads the Okanogan School Garden Network, to share information and support school gardens and educators throughout the county. For more info about OkanoganCD education programs visit https://www.okanogancd.org/education.

Garden Compost
Curriculum Teachers Guide
April 2025

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Curriculum and How to Use This Resource

The Garden Art and Science Curriculum throughout this guidebook provides thematic lessons, activities and instruction which include:

- **Learning Objectives:** An overview learning question to help guide teachers in their focus for the lessons and activities for the garden. Introducing each lesson to students will help structure and focus the students' awareness on the natural world around them.

- **Next Generation Science Standards (NGSS):** Science Standards are listed for each grade, and specific to each lesson. These notations should help educators that are looking for creative and engaging ways to teach interdisciplinary lessons to meet state standards in the classroom.

- **Question of the Day**: Asking questions and using small group discussions sets the expectation of active participation in the garden. These questions teachers can pose to children to help build inquiry and wonder about their learning. Use what questions resonate with you as a teacher where appropriate.

- **Materials Needed:** Worksheets are tools for students who learn best as visual learners. Hands-on activities provide learning through movement and engaging activities. These are important materials needed for each lesson:

    - White board and markers
    - Garden Journals/notebooks and pencils (optional)
    - Worksheets and materials described in each specific lesson

- **Activities:** These step by step instructions are for one to multiple activities per lesson, and include some background information for teacher learning and for teachers to share with students. We suggest different activities in each lesson in which teachers can adjust for different age levels, or different energy groups.

  Instruction is given through direct teaching, group discussion, hands-on experience, and garden projects. These outdoor lessons work best when students are split into groups of up to eight (8) students with adequate adult supervision. Small group sizes allow every student to actively participate in art projects, activities and garden work groups. These smaller groups facilitated by a parent or community volunteer are dramatically more manageable in an outdoor setting.

- **Sharing:** Sharing gives students a chance to reflect and admire their work and that of others, and provides active listening for a group of students. It allows children to reflect on the craft they have learned or the work they have created. Sharing and reflection allows students to express themselves through the work they accomplish, and is a powerful learning tool for student to student learning.

- **Reflection:** Reflection time is critical for retention of new information. Include open-ended questions that challenge students to make connections between the garden activities and life concepts. Reflections through sharing or writing allow teachers to understand students' interests, encourage curiosity, and supply questions for future exploration in your classroom.

- **Harvest:** Children love to eat the food they grow and it is fun to incorporate garden lessons into a harvest snack. Garden education inspires children to try new foods, and possibly take home the love of fresh garden produce. At Classroom in Bloom, we gather in a Harvest Circle at the end of each lesson and give students the chance to taste the food they planted, harvested, or studied. Ideas for snacks include: allow students to pick peas, strawberries, or sorrel leaves for their end of garden snack. Or have a chaperone slice a variety of veggies to create a sampling platter so students can taste the results of their work. With more time, incorporate a cooking project into your lessons.

- **Appendixes**: Photos, worksheets or pictures at the end of each lesson help explain or see the work teachers will create with students.

We hope educators and students enjoy these S.T.E.A.M. activities/lessons. Please feel free to share any photographs, student quotes or additional ideas that come to light during your garden time. Classroom in Bloom also hosts educational student or staff field trips, and can assist in mentorship and facilitation/development of sustainable school garden programs.

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Compost 101

Grades K - 5

Learning Objectives: Students will learn what compost is, feed the compost pile, and compare the fresh and fully decomposed compost piles.

State Science Standards:

K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Questions of the Day: What is compost? What is a decomposer? How does compost help plants to grow?

Materials Needed:

- Copy of “Compost Stew” by Mary Mckenna Siddals
- Dead plants to compost
- Trowels
- Chart of Browns and Greens

Introduction: Ask students, “What is compost?”
Plants, like us, need nutrients in order to be healthy and grow. When we compost, we recruit the help of decomposers like worms, rolly-pollies and bacteria who eat dead plants and turn waste into rich soil that is full of nutrients. By adding compost to our garden beds, we can help our plants grow!

Read: “Compost Stew” by Mary Mckenna Siddals,

Activity: Help make Compost Stew!

Collect: Find a garden bed that needs clearing, help students pull plants and parade them to the compost pile.

Combine: A successful compost pile needs to have the correct combination of 4 things: nitrogen, carbon, water and air. With students, add in each ingredient to make the perfect stew!

1. Browns and Greens: The ratio is about 1 part greens to 2-4 parts browns. Greens are for nitrogen, having enough nitrogen in the compost pile will help the decomposers grow and reproduce, causing the pile to heat up. Browns are for carbon, which will feed the hard-working decomposers.
    - Add 1 bucket of greens such as food scraps, grass clippings, or coffee grounds.
    - Add 3 buckets of browns such as dried leaves, fine twigs, paper shreds, or straw.
2. Water: decomposers need water, too! If the materials you are adding are not already sufficiently moist, add enough water so the pile is like a wrung-out sponge.

3. Turn or Stir for Oxygen: decomposers need to breathe, too! If the compost starts to stink like rotten eggs, there is likely a lack of airflow and an overabundance of anaerobic bacteria. Airflow is achieved through layering and turning the pile. Turning a compost pile can be done with muscle and shovels, or tractors.
    - Pretend to stir the big, compost pot to make compost stew!

Compare: Compare the fresh and finished compost. Let students dig into the finished compost with trowels or their hands, then bring some of that compost back to the garden to “feed” next year’s plants.

Ways to start a new compost pile: Composting can happen on many scales, from a small cup, or a 5 gallon bucket, to a large city-wide facility. . For your school compost, you can use repurposed items like pallets, apple bins, or wire to cage in a compost pile and keep the critters out.

Worms!

Grades K - 2

Learning Objectives: Students will understand that decomposers, like worms, turn dead material into healthy soil. They will be able to connect healthy soil, with healthy plants and healthy humans. They will practice sensory awareness and fine motor skills by gently handling worms.

State Science Standards:

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-ESS-2. Construct and argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.

Questions of the Day: What is a decomposer? How do worms help the soil?

Activity 1: Story and Gusano Song

Tell the Worm Story:
“I was walking around the garden this morning. It was quiet and calm… I heard some wind in the leaves, and a song bird, but then I heard… a cry! I stopped and listened, and I heard the cry again! Walking through the garden I followed where the sound until I found where it was coming from. It was coming from a…. Worm!”.
I said, “Little worm, what’s wrong?”
He said, “Nooooo one likeeees meeee!”
I said, “Little worm, that’s not true! We like you! You create nutritious soil for all of the plants we are growing.”
He said, “Noooo, no one like meeee!”
So, I said, little worm what’s your name?”
And he said, “ Guuusanoooo”
And I said, “Well Gusano there is a group of kid’s coming to the garden today. And we’d love to sing a song to you. To cheer you up, and remind you why we all like you.”

So, can we sing this song for Gusano to help make him feel better?

Gusano Song:
I am a worm
The wondrous worm
It's down under
I love to squirm
To eat the dead
And the living's my toil
And what comes out makes magnificent soil

Chorus:
Gusano nonono nono nonono nono nononono si
Gusano nonono nono nonono nono nononono si
I aerate the earth as I tunnel and squirm
I'm proud to be called a worm

Our tunnels flood
It rains all night
Come up for air
We're killed by light
When people die worms attend
Though it's dull
But no one comes to a worms' funeral

Chorus

I'll eat your scraps
And dead leaves, too
And in return
You can use my poo!
Your garden's best
When the soil is alive
Give us the love that we need to survive

Chorus

Activity 2: Worm Anatomy and Observations

Materials Needed:

- Trays or cups
- Drawing paper
- Pencils
- Spray bottle with water
- We Dig Worms book

Introductions: Ask a worm if they would like to come out to meet the students. If the worm isn't sure, ask the students if they will be very kind and loving to the worms.

Getting Started:

1. Provide students with a tray, cup, and piece of paper for drawing a worm, and a worm (leave the worm in the soil) for worm observations. Each table should have a spray bottle filled with water.
2. Present a drawing of worm anatomy to students: Anterior (head), Posterior (behind), Clitellum (central band).
3. If students are using paper they can draw and diagram their worm.
4. Let students know they'll be using the spray bottle to wet hands before handling a worm, or to spray the worm with water, otherwise the worm can dry out! Proper animal handling is important!

With one worm on the table or floor, notice some things together (you can use the We Dig Worms book as an extra visual)

1. A worm's body is wet and has rings around it
2. They have tiny hairs all over their body to help them move
3. Worms have no eyes or nose!
4. The pointy end is the head, can you see its mouth?
5. The round end is the tail, where the casting come out
6. Their intestine goes from their mouth to their tail
7. Blood vessels run the length of the body, too
8. Adult worms have a Clitellum: that's the thick, smooth segment where eggs develop into cocoons. One worm can have 100 babies!
9. Worms have 5 pairs of hearts!! That's 10 total and a lot of love!

Worm Investigations:

Present each child, or group of children with a worm at their table with the supplies listed above. Let them do their own observations, and draw and diagram their own worm!

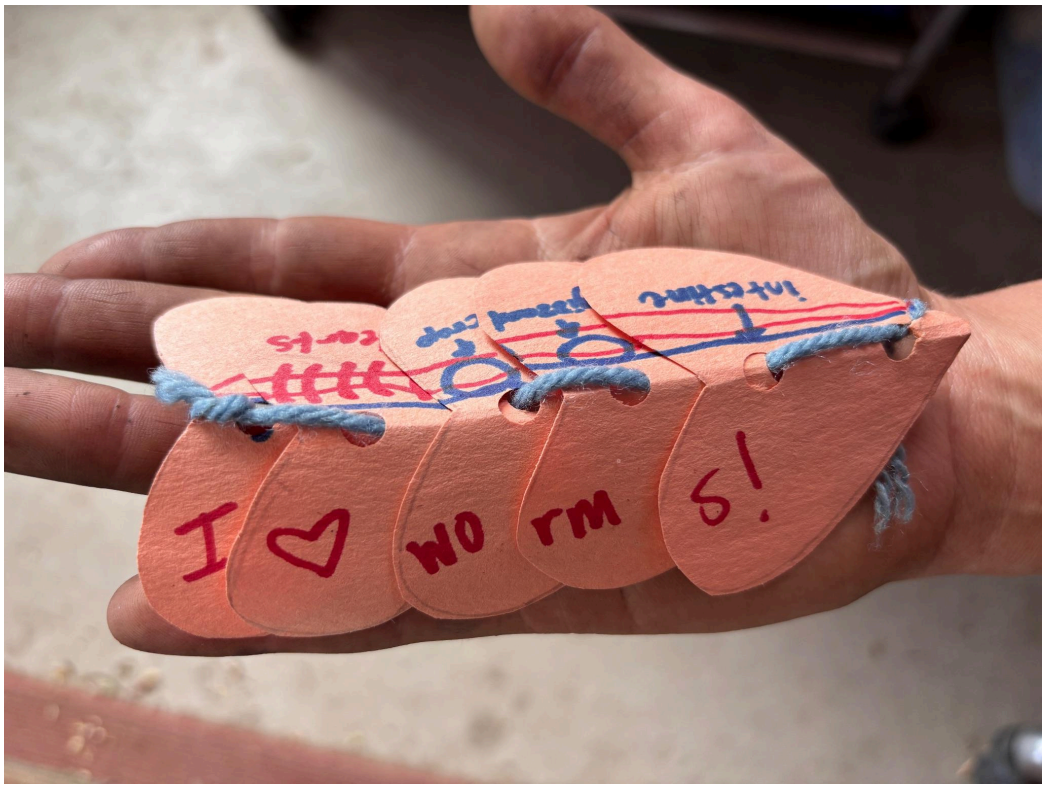
Activity 3: Worm Love Valentine

Materials Needed:

- Paper
- Markers
- Scissors
- Yarn
- Hole punch

Tell students you want to honor and remember this worm by making a worm valentine out of hearts. Worms have 5 pairs of hearts! Each student will use 5 paper hearts to make this worm valentine. Punch two holes in each heart, both lined up down the middle of the heart. Weave a piece of yarn through the holes to connect the 5 hearts, then fold down the midline. Add details like hearts, intestines, and blood vessels. Older students can write what they love about worms on their valentines.

Send students to their desk with valentine materials.Create and share!



Life in the Compost

Grades K - 8

Learning Objectives: Students will become familiar with decomposers, including who they are, where they tend to live, and how they interact within the garden ecosystem.

State Science Standards:

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Materials Needed:

- Decomposers Worksheet
- Bucket, cup, or container for collecting
- Shovel or spoon for digging
- Magnifying glass, hand lens, or binoculars (held backwards can be used as magnifying glass!)
- FBI data sheets

Question of the Day: What is a decomposer? What is life like in the soil? Who are the soil F-B-I's and what do they do?

Introduction: Step carefully, the soil is alive!! In one teaspoon of soil, there can be more living organisms than there are people on the Earth! What are all these living things in the soil?
Introduce the F-B-I acronym. Ask the class what they think each letter stands for. Give a hint: these are groups of friends that live in the soil!

- Fungi = mushrooms and mycelium
- Bacteria = tiny, microscopic organisms
- Insects/Invertebrates = beetles, flies, ants, worms, centipedes etc.

What do the F-B-I's do? These are all *decomposers,* they are the mighty soil builders working hard to eat and transform waste into nutrients that plants need to thrive.

Imagine: what would happen to life on earth if there were no decomposers?

Activity 1: Compost Pile Exploration to Feed the Garden

1. Travel to the compost pile and tell students that this is a feast for our friends in the soil. If you do not have a compost pile, you can explore the soil in places where decomposition may be happening on its own, such as under a tree.
2. Allow time for compost pile discoveries. You may want to provide trowels, small dishes and magnifying glasses
3. Gather students and ask: What likes to eat the nutritious soil made by FBIs? Plants!
4. Hold up a teaspoon of soil. There could be billions of FBI's living in this one teaspoon of soil!!!!
5. Ask students if they want to help feed a plant? Hand out spoons and have students carefully carry the precious, living soil to a hungry plant in the garden. They may want to do it over and over and over again.
6. For older students, work to turn, shift or haul compost to plants or garden beds.

Activity 2: Searching for F-B-I's

1. Choose a place to start - compost pile, beneath trees or shrubs, or any spot outside with nice soil.For older students, explain the data they will collect using their field guides and data sheets.
2. Start digging! Using hands or a tool of choice, dig around and look for the critters as seen on your worksheet. Use magnifiers to get a closer look.
3. Try searching around different areas. Are there more F-B-I's in one area than another?
4. Keep track of what you find on your worksheet. Where did you find the most activity?
5. Which decomposers are we able to see with our eyes? **Macroinvertebrates** are the critters we can see with our naked eye. All the rest are **microorganisms**, they are there, but we can't see them! Imagine you could shrink to the size of bacteria and see the soil alive all around you!
6. Gather and Share back as a group. Make a running list on a DryErase board in the front of the class, of all the different FBIs that were found by students for the day.

Additional Activities - Digging Deeper:

1. Can you find any new insects to add to the list? If so, take your sample and gently place it in a jar. Observe closely and draw your specimen. Try looking it up and discovering more about it. Share what you've learned with someone! Make sure to put your insect back in its home when you are done.
2. Take note of the temperature, location, and materials where critters are most abundant. Why might this be? What do you notice about what different insects like to eat?

Life in the Soil Field Guide

Circle if You Can Find Me!

mite

springtail

slug

worm cocoon

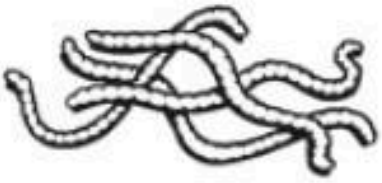
sow bug

fruit fly

beetle

millipede

spider



white worm

pill bug

snail

ant

mold

centipede

bacteria

Life in the Soil Data Sheet

Decomposer Name	Location where found	Number of individuals	Other observations

Musical Bonus: The F.B.I. (Fungus, Bacteria, Invertebrates), by The Banana Slug String Band

Song: youtube.com/watch?v=P8RcLX4hT8A
Video with motions: https://www.youtube.com/watch?v=VbCkRXBdQWA

Chorus:
The FBI…. whenever something dies
Oh, the FBI…. is there on the scene
The FBI…. is working overtime
Oh the FBI, to pick those bones clean
Fungus….Fungus,
Bacteria…. Bacteria,
Invertebrates…. Invertebrates,
The FBI

There's fungus among us and its breaking things down
Returning nutrients into the fertile ground
Millions of mycelium underground that's why
When you hold a handful of earth you hold the FBI

Chorus…..

There are millions of bacteria in that soil over there
Microscopic life is in all water, land and air
You should know that they are there though they are too small for your eye
These are secret agents of the FBI

Insects, bugs, slugs and worms are working night and day
The invertebrate crew are special agents of decay
To remove whatever's rotten, they will hop, crawl, hide or fly
Enforcing nature's laws, they are the FBI

Lay down very still in the duff and learn their ways
Lift up a rotten log and you will surely be amazed
Go creeping through the forest, learn to see and be a spy
In search of evidence of the FBI

Compost Temperature Tracking

Grades 4 - 8

Learning Objectives: Students will track decomposition in the compost heap by observing how the temperature changes during different phases of microbial activity.

State Science Standards:

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
MS- LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
MS- LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Materials Needed:

- Compost monitoring data sheet
- Compost thermometer
- Compost at various stages of decomposition - prep one week beforehand

Question of the Day: What factors influence how quickly decomposition takes place? Why does the temperature of the compost pile change?

Activity 1: Tracking Decomposition- Temperature

We can get a glimpse of the life and health of the compost pile by tracking its temperature. Decomposers generate heat as they break down organic matter. In the right conditions, a compost heap goes through three phases, each corresponding to a predominant community of microorganisms.

1. The **Mesophilic**, or moderate-temperature phase, lasts for a couple of days. During this phase temperatures are between 50-115°F. Mesophilic bacteria and fungi thrive in these conditions, reproducing, feeding and raising the temperature to get decomposition started.
2. The **Thermophilic**, or high-temperature phase, can last from a few days to several months. Mesophilic microorganisms are replaced by thermophiles (heat-loving bacteria and fungi!) when temperatures reach between 115 and 160°F. Thermophiles break down more complex carbon sources, such as

cellulose and lignin.

Something important happens during this high-heat phase: weed seeds, fly larvae, and harmful bacteria such as Salmonella and E. Coli are killed off by the heat. This pasteurization is necessary in the making of a safe product that we can use to grow more food!

During this phase, the pile typically needs to be turned to introduce more oxygen and prevent an anaerobic environment from developing. An oxygen-starved pile is obvious to the nose, it smells like rotten eggs! Once a pile is turned, you will notice the temperature rise because the introduction of more oxygen leads to increased microbe activity.

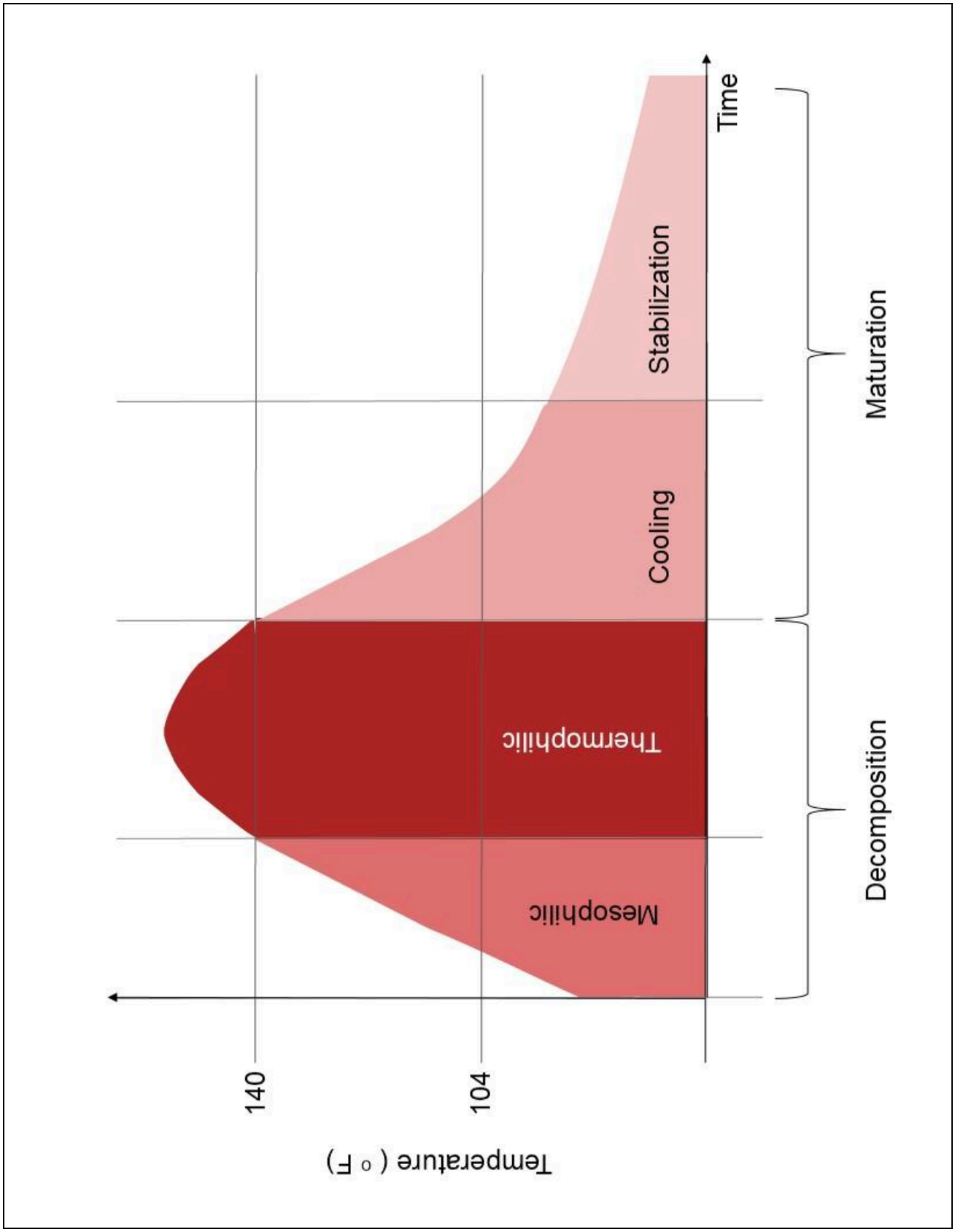
3. The **cooling** phase begins when the temperatures drop and mesophilic bacteria become active again. As microbial activity slows, the compost cools to air temperature.
4. The compost finishes with the **stabilization** phase. Microorganisms continue to break down organic matter, and the compost develops a dark, crumbly texture and an earthy smell. With the mild temperature, invertebrates like worms, rolly pollies, centipedes and beetles move in or awaken. During this phase, the compost can be tested for maturation and quality.

Students can use the Compost Temperature Tracking Worksheet to gather data over weeks and months, then use their data to make a line graph. Alternatively, students can use the Compost Temperature Graph to determine what phase of decomposition the compost pile is in on any given day.

Activity Extensions: PH Sampling and Maturation Tests:

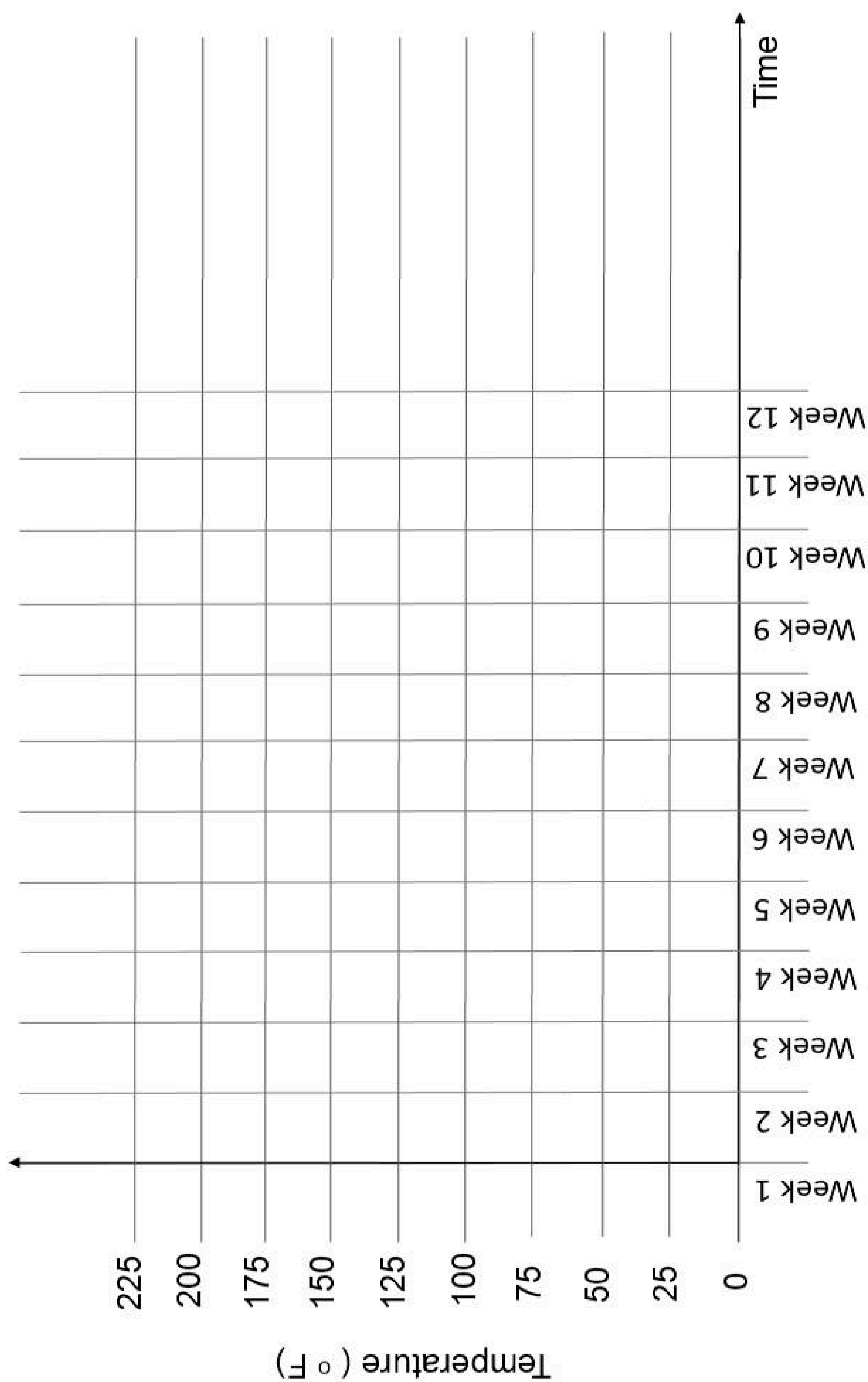
1. You can also choose to sample the pH of the compost pile during each phase of decomposition. How does it change from one phase to the next?
2. Follow-up by conducting maturation and growth tests to determine the quality of the compost. See lesson 5 in the compost curriculum for more details.

Graph: Compost Temperature vs Time



Compost Monitoring Log							
Pile Location:				Date Pile Built:			
Date:	Pile Temperature in 3 Locations-			Average Temp	Air Temp	Odor	Notes
	1	2	3				

Graphing Compost Maturation



Compost Maturity Investigation

Grades 4 - 8

Learning Objectives: Students will make observations to determine if the compost is ready for use. They will conduct a growth test to determine the quality of the compost. personal significance.

State Science Standards:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS- LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
MS- LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

Question of the Day: How can we tell when decomposition is finished, and the compost is ready to use? How can we test the quality of the compost before using it in the garden?

Materials Needed:

- Compost
- Sand
- Potting mix
- 3-4 packets of different vegetable seed
- Planting trays
- Compost Maturity Worksheet

Introduction: Review: Why do we compost? We will be doing scientific tests to see if the compost is finished and ready to feed to our garden plants!

Great information and demonstration from Sierra Harvest Farm Institute:
https://www.youtube.com/watch?v=w-OuMd6nm78

Activity 1: Visibility and Smell

We can tell a lot about the maturity of the compost just by using our eyes, hands and noses!

1. Visibility and Feel: grab a handful of compost in your hand.
    - Do the particles look and feel small and uniform?
      Small and uniform particles are a clue that the compost is mature.
    - What color is the compost?
      We're looking for a delicious, medium brown.
2. Smell- our noses are a great indicator of compost readiness, take a whiff!
    - Does the compost have a pleasant, earthy smell?
      Earthy smell indicates the compost is ready!

Activity 2: Growth Test

Let's see how plants respond to the compost! This experiment will tell us how much compost we should use in different parts of the garden.

Set-Up the Experiment:

1. Mix 9 parts compost with 1 part sand, spread into a planting tray
    - This is the test tray
2. Fill another planting tray with potting soil mix from the store
    - This is the control tray
3. Plant the seeds- plant 10 seeds of each type in both the compost mix and the potting soil.
    - Bean- beans are amazing nitrogen-fixers, they take nitrogen from the air and introduce it to the soil via root nodules. Because of this, they are very sensitive to excess, or high levels of nitrogen.
    - Tomato- Tomato plants are big feeders, they can show signs of too little of too much nitrogen.
    - Radish- Radish grow quickly, allowing a glimpse of how the compost will affect vegetable plants, especially root crops.
    - Corn- As a member of the grass family, corn or wheat can demonstrate the effect that your compost could have on other grass family plants.

Germination: Keep both trays equally moist and warm until germination is complete, about 10 days depending on the temperature.

Collect Data: Fill in the Growth Test Chart for the compost and control (potting soil). We will be examining the germination rates, plant health and root structure for each plant type. See descriptions below to help fill in the Compost Growth Test Charts.

> *Germination Rate*
> -what percent of the seeds grew? 1 out of 10 = 10%; 5 of 10 = 50%.
> Germination rates of seeds packaged for sale range from 88-100% germination.
> How did the germination of your seeds compare in the compost and potting soil?

Plant Health Score
1- unhealthy, 5- super healthy
Health of a seedling can be determined by the color, shape, size. Some seeds and seedlings can turn black or brown in color if they are not healthy. Some may look stunted in size and shape. Look for the overall vigor and describe in the next question.

Plant Health Described
3 words to describe the appearance of the seedlings

Root Structure Score
1- undeveloped, weak, 5- extensive, strong
Gently scoop your plants out of the soil, keeping the roots intact. Did the roots grow deep, wide, branched and look well developed (scored as a 5)? Or do they look small, compact, short, flimsy and undeveloped (this would be a 1). Compare several so you can see the differences between an undeveloped-weak and an extensive-strong root system.

Analysis:
How does the compost compare to the potting soil? Is your Compost Ready to Use? Has it reached maturation? How can the information we gathered inform us about how to use the compost in our garden, or when seeding different vegetable or flowering plants?

Compost Maturity Data Collection Worksheet

Compost Description

Date and Location:	
Compost temperature: -is it at ambient temperature?	
Visibility: -what size are the particles? -are the particles uniform? -what is the color?	
Feel: -what is the texture?	
Smell: -Stinky? Sour? Sweet? Earthy?	

Compost Growth Test

Compost and Sand- Test				
	Beans	Tomato	Radish	Corn
Germination Rate -what percent of the seeds grew?				
Plant Health Score 1- unhealthy 5- super healthy				
Plant Health Described 3 words to describe the appearance of the seedlings				
Root Structure Score 1- undeveloped, weak 5- extensive, strong				
Overall Health Description compare to potting soil seeds				

Potting Soil- Control				
	Beans	Tomato	Radish	Corn
Germination Rate -what percent of the seeds grew?				
Plant Health Score 1- unhealthy 5- super healthy				
Plant Health Described 3 words to describe the appearance of the seedlings				
Root Structure Score 1- undeveloped, weak 5- extensive, strong				
Overall Health Description compare to compost soil seeds				

Compost Art

Grades K - 5

Learning Objectives: Students will learn the importance of minimizing waste as they differentiate kitchen scraps from wasted food. They will celebrate the compost pile by creating a painting using the impressions of kitchen scraps.

State Art Standards:

K-ESS-2. Construct and argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Questions of the Day: What is the difference between food scraps (kitchen scraps) and food waste (wasted food)? How can we reduce food waste? How can we use kitchen scraps to make a work of art?

Introduction: What is something that we can compost? What things cannot go into the compost? Bonus; bring a jar of compost with worms inside, ask the children what the worms love to eat, and what they cannot eat (see the Worm Lesson for a list of worm foods). Now we know what we *can* compost, but what *should* we compost? Hold up an example of a kitchen scrap, like an apple core, is this appropriate for the compost? Now show an example of food waste, like an apple with one bite out of it, is this compost? Why not? How can we rescue this food?

Background: For the future of our planet, we need to reduce food waste

- https://kids.earth.org/climate-change/10-food-waste-facts-for-kids/
- We throw away almost one-third of the food we produce. That is more than 1 billion tons!
- So many people around the world do not have enough food to eat on a daily basis. In fact, almost 800 million people are undernourished.
- Just one-quarter of the food we currently waste could be enough to feed all undernourished people in the world.

Activity 1: Food Waste Relay
Students will play a relay game to sort kitchen scraps from food waste

Materials Needed:
- Food Waste Relay Cards, or examples of kitchen scraps and food waste
- Two buckets, one labeled Food Waste, and one labeled Kitchen Scraps

1. *Define*
   Kitchen Scraps: are parts of the plant that we do not typically eat, but that could be added to the compost, such as apple cores, banana peels, onion skin, or coffee grounds. Food Waste: is food that was intended for human consumption but is wasted and lost, and can occur anywhere throughout the entire supply chain from farm stage to grocery stores to households.
2. *Explain the Relay*
   Students will be in two teams, each team will receive a set of relay cards, they will have one minute to look through the cards and decide which cards are examples of kitchen scraps and which are examples of food waste. They will line up for the relay, then on "Go!" one student at a time will run to put their card into the correct bucket before returning to the back of the line.
3. *Play!*
4. *Discuss*
   Pull cards out of each bucket. For some items deemed Food Waste, ask, "How could this food be rescued?" or "When could this food have been rescued?" Bonus: How might even the kitchen scraps be used? (Feeding to animals, or pickled watermelon rinds!)

Activity 2: Compost Art
Students will create a painting using the impressions of kitchen scraps.

Materials Needed:
- Kitchen Scraps- with containers for each table or group of students
- Construction paper
- Painters tape
- Acrylic or tempera paint
- Paint brushes

Steps:
1. Demonstrate. Gather where all students can see.
   a. Lightly paint a background
   b. Show an example of creating a negative image by placing a leaf or peel on the paper, painting over it, then gently lifting the item away.
   c. Show another example of using kitchen scraps to make a stamp by painting the item and pressing it to the paper.
2. Pass out materials.
3. Create!

4. Collaborate- provide a large piece of paper to every group of students, they can press their paint-covered kitchen scraps here and create a collaborate compost painting
5. Allow students the opportunity to share their work with the class.

Optional: Prepare a snack beforehand that will provide the kitchen scraps for use during painting. For example, prepare a fruit salad as a class and use the orange peels, apple cores and melon rinds for painting!

Food Waste Relay Cards

Apple Cores	Banana Peels
Egg Shells	Coffee Grounds
Avocado Pits	Oyster Shells
Tea Leaves	Watermelon Rinds
Cucumber Ends	Pumpkin Skin
Onion Skin	Pistachio shells
Corn Kernels that Didn’t Pop	Carrot Greens
Orange Peels	Cherry Pits

Expired Bacon	Apples that never got picked
Sour Milk	Leftovers from eating at a restaurant
Loaf of bread that got dry	Bananas that got squashed in transport
Carrots that rotted in the root cellar	Potatoes that got left in the ground
Popcorn that didn't sell at the movie theater	Moldy sour cream
Half a sandwich in the bottom of your backpack	Damaged cans of beans
Overripe avocados	Recalled chicken
Melted ice cream	Odd-looking fruit that no one buys at the store

Rot Museum

Grades K - 8

Learning Objectives: Students will conduct a rot experiment to compare the rate of decomposition of various items. Students will be able to differentiate between compostable waste and non-biodegradable waste.

State Science Standards:

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Questions of the Day: What is rot? How does nature recycle materials? Why is decomposition an important process for life on Earth?

Materials needed:

- 3-5 mason jars with lids
- Items to rot, including food item, paper item, and plastic item
- Soil
- Rot museum worksheet

Introduction: With a teammate, discuss the following questions. What is rot? What items rot or break down quickly? What items take a very long time to decompose?

Activity 1: Rot Museum Set Up

1. Choose items to watch break down in the Rot Museum. Include at least one food item, one paper product, and one plastic item. Place each item in its own jar.
2. Add the same amount of soil to each jar, enough to cover the items. You could also experiment by only adding soil to one jar as your controlled experiment.
3. Moisten lightly with a spray bottle, then seal.
4. Line your rot museum up on a windowsill, or experiment by placing some in the dark.
5. Fill in the prediction portion of the Rot Museum Worksheet.

Activity 2: Observe and Reflect

1. Once a week, for the next 3 weeks, make observations and record on the worksheet.
2. At the end of the experiment, discuss the findings and implications.
    a. Materials that don't break down naturally are **non-biodegradable.** They will not break down for thousands of years! What will happen to the materials that do not rot? What impact does this have on our environment? How can we solve this problem?
    b. Materials that rot quickly are **compostable,** but they don't always break down when we send them to a landfill. Studies have found readable newspapers from the 1950's in landfills, along with 25 year old grapes and banana peels! Why might decomposition halt in a landfill? How can we solve this problem?

Additional Resources

1. The Magic School Bus Meets the Rot Squad
    a. Meets the Rot Squad | Full Episode | The Magic School Bus | Schol…
2. Wonderopolis
    a. https://www.wonderopolis.org/wonder/why-does-food-rot

Rot Museum Worksheet

Predict: How decomposed will the items be in 3 weeks on a scale from 0 (no sign of decay) to 5 (fully decomposed)

Item 1:	Item 2:	Item 3:	Item 4:	Item 5:

Observations: Write a few words to describe each item. You can use your sense of sight and smell!

After 1 Week

Item 1:	Item 2:	Item 3:	Item 4:	Item 5:

After 2 Weeks

Item 1:	Item 2:	Item 3:	Item 4:	Item 5:

After 3 Weeks

Item 1:	Item 2:	Item 3:	Item 4:	Item 5:

References

Washington Arts K–12 Learning Standards (WALS), 2017. (http://www.k12.wa.us/arts/Standards) by the Office of Superintendent of Public Instruction (OSPI, http://k12.wa.us/) are licensed under a Creative Commons Attribution Non-Commercial 4.0 International License (https://creativecommons.org/licenses/by-nc/4.0/). OSPI Document Number: 17–0013

Washington State K-12 Science Learning Standards (WSSLS) – otherwise known as the Next Generation Science Standards (NGSS), 2013. https://ospi.k12.wa.us/student-success/resources-subject-area/science/science-k-12-learning-standards