



Utility Exploration Center Unit Plan



Decomposition Detectives

Does Nature Recycle?

Grade

5th

NGSS standards

[5-LS2-1](#)

Time

4 - 5.5 hours,
about 7 instruction days
plus observations

See [Example Timeline](#).
(Each component has
suggested timing which can
be stretched or condensed.)

Let's take a look at how the decomposition of organic materials can contribute to waste reduction.

Description

Students will perform hands-on exploration of the cycle of matter. This includes how plants (producers) use resources to create matter, how matter is broken down by decomposers and how producers again access decomposed matter to begin the process anew. Students will learn how our actions disrupt this cycle and how we can make a difference through simple steps like composting.

Learning Outcomes

- After discovering how organic waste becomes compost, students will be able to describe how and why matter breaks down and demonstrate the necessity of decomposition to life on Earth.

Materials List

- Whiteboard space or jumbo post-its
- 7 jars or clear containers (one with a lid)
- 3 biodegradable items (i.e. - apple, banana, leaf)
- 3 non-biodegradable items (i.e. - plastic bottle, straw, candy wrapper)
- Pencil
- 1 pair of scissors (per group)
- 3 2-liter (2L) bottles (per group)
- 1 bottle cap (from 2L, per group)
- 1 pushpin (per group)
- Hammer and nail
- Kitchen scraps (i.e. - coffee grounds, banana peels, apple cores)
- Dried leaves or shredded paper
- Soil from outdoors (not potting mix)
- Handheld magnifying glasses (optional)

Performance Expectation(s)

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



Phenomena / Essential Question(s)

Phenomena: Pumpkin growing and decomposing.

Essential Question(s): What happens to organic matter over time? How and why does it change and why is it important?

Science & Engineering Practices (SEPs)

Developing and Using Models

- Develop a model to describe phenomena.

Disciplinary Core Ideas (DCIs)

LS2.A: Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as decomposers.
- Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Matter cycles between the air and soil and among plants, animals and microbes as these organisms live and die. Organisms obtain gases and water from the environment, and release waste matter (gas, liquid or solid) back into the environment.

Crosscutting Concepts (CCCs)

Systems and System Models

- A system can be described in terms of its components and their interactions.



NARRATIVE / BACKGROUND INFORMATION

Prior Student Knowledge

- [K-LS1-1](#). Use observations to describe what plants and animals (including humans) need to survive.
- [2-PS1-1](#). Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- [2-LS2-1](#). Plan and conduct an investigation to determine if plants need sunlight and water to grow.
- [3-LS1-1](#). Develop models to describe that organisms have unique and diverse life cycles but all have birth, growth, reproduction and death in common.

Life Experience

- Students have most likely encountered decay in forms like a rotting strawberry or banana, a piece of moldy bread or decomposing leaves on the ground.
- Some students might have experience with home composting.

Teacher Background Information

[This document](#) provides background information about decomposers and the flow of matter pertaining to our waste/garbage. There are additional resources to investigate if you need even more information to help support your students on this journey.

Possible Preconceptions/Misconceptions

Misconception: Waste and matter just disappear.

Truth: Decomposers break down organic matter. Waste that is non-biodegradable, such as plastic, ends up in a landfill, where it does not decompose. Matter never disappears, it simply moves and changes form.

Misconception: Organic is fruits and vegetables grown without pesticides.

Truth: While the term organic is used in this way when referring to food and farming, organic also means something that came from or once was a living thing, is therefore carbon-based and will quickly decompose.

Distance Learning Variations

Check out [these ideas](#) for providing this lesson when in a distance learning situation.



LESSON PLAN – 5E MODEL



ENGAGE

Estimated time: 45 minutes (+ jar observations)

Watch time lapse video: [Pumpkin Growing](#) (3:01 min)

- Stoke curiosity about what plants need.
- Use [Guiding Questions](#) to solicit student questions and guide a discussion of the things a plant needs to survive.
- Transition: What happens to pumpkins after Halloween?

Watch time lapse video: [Pumpkin in Worm Compost](#) (1:37 min)

- Evoke questions about what happens to living things over time.
- Use Guiding Questions to solicit student questions and guide a discussion of what happened to the pumpkin.

Discuss items students think will act like or unlike the pumpkin.

- Brainstorm and create lists of items that will act like or unlike the pumpkin.

Test student theories by observing items in jars.

- Pick three items from each list (like or unlike a pumpkin).
- Place each item in a jar without a lid and observe for a week. Repeat one of the items and place in a jar with a lid to use in Elaborate phase. (Total of 7 jars)
- After items are chosen and experiment is set up, ask students to predict what will happen to the items. Write questions and predictions in [Observation Journals](#).
- Observe twice during one week. Write observations in Observation Journals. Direct students' attention to observable differences between the two jars containing the same item.
- Prompt students to write all questions they have in their Observation Journals.

Homework opportunity

- Students write two questions in their Observation Journals that they'd like to answer based on observations.



EXPLORE

Estimated time: 45 minutes

Discuss jar observations and create a master list of students questions.

- Were your predictions correct?
- Refer to Guiding Questions.

Have students research compost and create an idea web.

- Students read and watch their choice of readings and videos from [Student Research Resources](#), observe items in jars and create a composting idea web to help determine how they would best construct their own compost.
- Goal: self-directed learning for students to obtain information about how and why certain items break down and develop a list of requirements for decomposition to occur.



EXPLAIN

Estimated time: 45 minutes

Create master list of terms students are curious about.

- With student input, create a list of words that they encountered while doing the idea web creation in the Explore section. Students then research terms to explore the definitions or terms they didn't fully understand from the research.

Watch animated decomposers in [Compost Pile](#) video. (6:30 min)

- Refer to Guiding Questions.
- Consider assigning these [Extension Activities](#).

Connect vocabulary to previously researched concepts and use discoveries students made to develop a list of requirements needed to create compost.

- Refer to Guiding Questions and the [Vocabulary](#) list.



EXPLORE

Estimated time: 45-60 minutes (+ compost bin activities)

Complete compost bin building activity.

- Students build **mini compost bins** in groups and observe. Students write down observations in their Observation Journal, twice a week for two weeks to allow enough time for organic material to change.
- Goal: apply concepts students explored while researching and creating idea webs and observed in the jars (Explain section) to real world situations (their own compost bin).
- Refer to Guiding Questions.
- Consider assigning Extension Activities.



EXPLAIN

Estimated time: 30-45 minutes

Discuss compost bin observations to connect student observations with research and bring their explorations into their own lives.

- Students now rewrite previous observations in Observation Journals using new vocabulary terms and answer their own questions using vocabulary terms.
- Refer to Guiding Questions.

Homework opportunity: Trash Tracker

- Ask students to keep track of their garbage for one day in two columns: biodegradable and non-biodegradable. (Activity found in Observation Journal.)



ELABORATE

Estimated time: 45 minutes (Part 1) + 30 minutes (Part 2)

Part 1: Connecting the Cycle of Matter to Waste Reduction

- Students create and present models of a cycle of matter.
 - Connect decomposers to plants: One provides what the other needs.
- Revisit biodegradable versus non-biodegradable (Explain section, documented in journals and included in Trash Tracker Homework). Lead discussion to a conclusion that items we throw away don't decompose, even if they are biodegradable. Watch [Landfill](#) video (2:23 minutes).
- Connect cycle of matter to waste/landfill.
 - Together, create a model of our waste ending in a landfill, which is a straight line rather than a circle. Discuss ways to complete the cycle by doing things like recycling and composting, rather than "losing" it in the landfill.
- More resources and help found in the Guiding Questions and Extension Activities.



Part 2: The Bigger Picture

- Use the [Compost Story](#) video (6:46 minutes) to expand the idea that how we handle our garbage is connected to our soil and the cycle of matter on Earth.
- Discuss the actions students can take to make a difference, like choosing reusable products and composting at home.
- To spark ideas of positive student actions: How can you help make sure resources and nutrients aren't being wasted?
 - *Composting.* As you all have experienced, composting is actually a lot easier than most people think. You can do it even if you don't have a lot of space.
 - If you don't have the ability or space to compost at home, the app/website [ShareWaste](#) lets you share your food and yard scraps with people nearby who have compost piles.
 - *Use fewer single use items.* If you use a paper cup once then toss it in the trash, all the matter that was used to create that cup is only used for a few minutes before being stuck in the landfill.
 - Use reusable items instead like a reusable water bottle or cup. Bring your own!
- Students share their new conservation actions with others (posters hung at school, present ideas for waste reduction in their school to the school board/administration, classroom presentation of ideas that prompt challenges or actions for the whole class to try, etc.).



EVALUATE

Estimated time: 20-30 minutes

Formative Monitoring:

- Check Observation Journal entries, review and discuss homework assignments, observe idea web creation and mini conferences with groups during idea web creation.

Summative Assessment (Quiz / Project / Report):

- Presentation of model of their cycle of matter (Elaborate Part 1). Expectations for model:
 - Should include decomposers, plants (producers) and organic matter.
 - Student should represent flow of matter as a circle connecting above three components using arrows.
- Presentation of conservation actions (Elaborate Part 2): posters, slides, presentations, class challenges, etc.
- **Kahoot Quiz:** Decomposition and Matter Cycling
 - Log in and share this quiz with your class to see how much they've learned. Kahoot is a great platform to receive feedback from every student and will provide engaging results!

STANDARDIZED TESTING (CAST) CONNECTION

- Standardized testing is likely to test on the role of decomposers (which is heavily covered in this lesson), as well as the role of plants as producers (which is also covered as a basis for the cycle of matter).

COMMON CORE STATE STANDARDS CONNECTIONS - ELA

- RI.5.7 - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1)
- SL.5.5 - Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1)

COMMON CORE STATE STANDARDS CONNECTIONS - MATHEMATICS

- 5.MD.A1 (Covered in math extension activity within 1st Explain section) - Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use these conversions in solving multi-step, real world problems.



Resource Links:

In case hyperlinks above get broken, here is a detailed list of links.

5-LS2-1: www.nextgenscience.org/pe/5-ls2-1-ecosystems-interactions-energy-and-dynamics

Example Timeline: www.roseville.ca.us/grade5

K-LS1-1: www.nextgenscience.org/pe/k-ls1-1-molecules-organisms-structures-and-processes

2-PS1-1: www.nextgenscience.org/pe/2-ps1-1-matter-and-its-interactions

2-LS2-1: www.nextgenscience.org/pe/2-ls2-1-ecosystems-interactions-energy-and-dynamics

3-LS1-1: www.nextgenscience.org/pe/3-ls1-1-molecules-organisms-structures-and-processes

Distance Learning Variations: www.roseville.ca.us/grade5

Teacher Background Information: www.roseville.ca.us/grade5

Pumpkins Growing Time Lapse Video: www.youtube.com/watch?v=xuUm6ygAhPI

Guiding Questions: www.roseville.ca.us/grade5

Pumpkin in Worm Compost Time Lapse Video: www.youtube.com/watch?v=3NY-DTD7obE

Observation Journal: www.roseville.ca.us/grade5

Idea Web Template: www.scholastic.com/teachers/lesson-plans/teaching-content/graphic-organizer-idea-web/

Student Research Resources (Readings and Videos): www.roseville.ca.us/grade5

Animated Decomposers Video: www.youtube.com/watch?v=cBkBwVFFEWw

Extension Activities: www.roseville.ca.us/grade5

Vocabulary List: www.roseville.ca.us/grade5

Compost Building Explore It: www.roseville.ca.us/grade5

Landfill Video: www.youtube.com/watch?v=mRGNoKxT82A

Compost Story Video: www.youtube.com/watch?v=bqDQD8cvO5Y

ShareWaste: sharewaste.com/

Kahoot Quiz: create.kahoot.it/share/flow-of-matter-5th-grade/af5e8bcb-00cc-43af-9ffa-ab9fb325b49a