

Lesson 5

The Breakdown on Decomposition

v. 1.0.0



Topic(s)

Biodegradation
Compost
Decomposition
Rot/Compost

Duration

Lesson Steps—45-60 minutes
Service Project—ongoing
Extension Ideas—varies

21st Century Learning Skills

- Collaboration
- Communication
- Creativity
- Critical Thinking

Grade Level(s)

Fourth and Fifth

Materials and Supplies

Students

1. *The Breakdown on Decomposition* rubric (one per student)
Page 5
2. *Compost Buddies* video notes (one per student) **Pages 6-7**
3. *Finding the Main Idea* worksheet (one per student)
Pages 8-9
4. Paper bags (one per group)
5. Informational Text: [Composting at Home](#), from the U.S. Environmental Protection Agency (one per student)
goo.gl/qTySfN

Teachers

1. Interactive whiteboard, document camera, or overhead projector (photocopy transparencies of visuals if needed)
2. Examples of biodegradable and non-biodegradable materials—leaves and a plastic bag, for example.
3. Sample of compost
4. *Compost Buddies* video
goo.gl/CkH5sX

SUMMARY

In this lesson, students will collect and classify examples of biodegradable and non-biodegradable items, and watch a video that introduces the process of decomposition in a compost bin or pile. Then, students will read and synthesize fourth and fifth grade-appropriate informational text about composting. Finally, students will choose an important detail from the text around which to design a composting service project or activity.

CORRELATION WITH STANDARDS

NEXT GENERATION SCIENCE STANDARDS

Fourth Grade

Fifth Grade

Standard and Performance Expectation

4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

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

Disciplinary Core Ideas

ESS3.A Natural Resources: Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

ESS3.C Human Impacts on Earth Systems: Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

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 plants 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. (5-LS2-1)

Vocabulary

Anaerobic: Pertaining to or caused by the absence of oxygen.

Biodegradable: Organic materials that can decompose or decay, such as wood, food scraps, paper and grass clippings.

Compost: The process or the end result of living organisms digesting and reducing organic material into a dark, rich, soil amendment.

Decay: The gradual breakdown of dead organic material.

Decomposition: The process of materials being digested and broken down into simpler substances, making nutrients more available to plants. Decomposition happens all the time in nature and in human managed systems such as compost bins.

Inorganic: Any material that is not composed of matter that was once living or produced by a living organism.

Non-biodegradable: Inorganic materials that do not decompose, for example, glass, metal, and plastic.

Organic: Materials derived from or produced by a living organism, such as food, leaves, plant trimmings, hair, paper, clothing fibers from plant or animal sources such as cotton or wool, etc. Organic may also be used to describe food grown using sustainable agricultural methods.

Additional Resources

<http://www.newsela.com> A website containing current news articles at upper elementary and middle school reading levels. Sign-up required.

<http://www.rewordify.com> A website for translating difficult text into easier reading levels.

<http://www.cde.ca.gov/be/st/ss/index.asp> California Department of Education, Content Standards Page

COMMON CORE STATE STANDARDS

Fourth Grade

Fifth Grade

Lesson Focus Standards

Reading: Informational Text

RI.4.2: Determine the main idea of a text and explain how it is supported by key details; summarize the text.

RI.5.2: Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

Supporting Standards

Reading: Informational Text
RI.4.1, RI.4.8

Reading: Informational Text
RI.5.1, RI.5.8

Writing
W.4.4, W.4.8, W.4.9

Writing
W.5.4, W.5.8, W.5.9

Speaking and Listening
SL.4.2, SL.4.6

Speaking and Listening
SL.5.2, SL.5.6

LEARNING OBJECTIVES

1. Students will...
2. Classify things that are biodegradable and non-biodegradable
3. Define the characteristics of inorganic and organic matter
4. Analyze grade-appropriate text and design a service project or activity

TEACHER BACKGROUND

Items that we use every day are made from materials that can be classified as biodegradable or non-biodegradable.

Most organic material will decompose over time if exposed to ideal conditions of moisture, temperature, light and air. (In this context, the word “organic” refers to any material derived from or produced by a living organism.) These materials are biodegradable. Trees and leaves fall to the forest floor and break down, or decay. Grass clippings left on the lawn disappear. Animals die, and in time, little is left of their bodies. On the other hand, inorganic matter—such as plastics or metals—is non-biodegradable and won’t decompose or biodegrade over a short period of time, if at all.

Decomposition is a natural process, which means that nature does the work. Normally, billions of living organisms in the soil use organic matter that falls to the ground as a source of food. The end result of this decomposition is a rich, dark brown, earthy-smelling material called “compost” or “humus.” When returned back to the soil, compost improves soil texture and provides nutrients necessary for the next generation of plant life.

Decomposition will also occur in a human-made compost bin or pile. Composting is a great way to turn biodegradable materials into compost—a rich soil amendment for plants. Air, moisture, and microbial activity in a compost bin are essential to the process of decomposition. When biodegradable materials end up in a landfill, they will remain there for many years because of a lack of air, moisture, and microbial activity. If they do degrade they often do so anaerobically, or in the absence of oxygen. Anaerobic decomposition produces methane. Because methane is a greenhouse gas with more than twenty times the heat-trapping potential of carbon dioxide, food and other organics placed in landfills contribute significantly to climate change. And, like all other materials placed in a landfill, the opportunity to use these resources is lost. According to current estimates, nearly 50% of landfilled materials are organics.¹

One easy way to reduce waste is to compost biodegradable materials at home or school. Napa and many other cities are collecting food scraps and other organic materials in curbside bins, usually with plant debris and other yardwaste. These materials will be composted in a municipal composting facility, which operates on a much larger scale than a home composting bin. Materials are ground up, formed into piles, watered, turned regularly, and monitored closely for temperature.

LESSON STEPS

Activating Prior Knowledge

1. Ask students to name items that get thrown away at school and at home. Chart their suggestions. Explain that some of the items listed on the board are “organic” (circle these items). Some students will have prior knowledge that organic can refer to food that is grown without synthetic fertilizers or pesticides. Explain that while this is true, the word “organic” has another meaning in science. Organic matter is anything that is or was once living, or was produced by a living thing.
2. Students will choose one of the circled items to discuss with a partner using a sentence frame, e.g., “_____ (a banana peel) is organic matter because _____ (it was part of the fruit produced by a banana tree, which is a living thing.)”
3. Ask the students what they think “inorganic” means in science. Explain that inorganic matter comes from nonliving material or minerals in the earth like sodium, calcium, and sand rather than from plants or animals. Have students point out inorganic items on the chart and underline them.
4. Students will choose one of the underlined items to discuss with a partner using a sentence frame. For example, “_____ (a plastic water bottle) is inorganic matter because _____ (it was made from oil, which is nonliving).”

Building Background

5. Ask students to consider which items would be more likely to decompose, or break down, over time: organic or inorganic matter? If students are struggling to decide, provide them with a more concrete scenario: there is a pile of leaves and an aluminum soda can on the grass at the neighborhood park. Assuming no one touches either, and the wind doesn't blow them away, which item is likely to break down and become part of the earth again, and which item will still be sitting there a year later?

6. Once students have determined that organic matter, such as leaves, will decompose, show students several leaves in various stages of decomposition. How will these leaves change over time once they fall off the tree?
7. Introduce students to the term “biodegradable.” Students can repeat the word several times in various ways (slowly, quickly, to a partner, to their elbow, like a monster, like they're underwater, 3 times fast, etc.) and clap out the syllables. Tell students that biodegradable refers to organic matter that will decompose or decay over time (bio = life, degrade = break down, able = able to). Pass around some examples of biodegradable items.
8. Ask students what they think “non-biodegradable” means, and whether they can share some examples of non-biodegradable items. Point out that these examples (aluminum cans, plastic bottles, etc.) are inorganic matter. Pass around some examples of non-biodegradable items.

Check for Understanding

9. Organize students into small groups. Assign half of the groups to take bags outdoors and collect items that they think are biodegradable, e.g., leaves, twigs, food scraps, etc. The other half will collect items that they think are non-biodegradable, e.g., metals, plastics, rocks.
10. Once you have returned to the classroom, pair up small groups (one biodegradable and one non-biodegradable), and ask the groups to switch bags and examine the examples collected by the other group. For example, students in a group that collected non-biodegradable items will examine biodegradable items collected by another group.
11. In groups, students will verify that items are correctly classified as biodegradable (organic materials from once living organisms) or non-biodegradable (usually from nonliving origins, such as metals, rocks, etc.). Some items may be moved from one collection into another if there is a group consensus.
12. As a class, make a list of what the students found under the categories of biodegradable and non-biodegradable. Discuss examples in each group that were difficult to classify. Have students suggest other things that might decompose and other things that may not decompose over time and add to the lists. Have the students count how many of the items on the biodegradable list are organic. Next, count the number of inorganic items. Review and discuss the reason why all of the items on the biodegradable list are organic, and none of the items are inorganic.

Activities

13. Show the lesson rubric, and review the expectations for this lesson.
14. Ask students what they do with organic materials when they're done with them. Use the items on the chart as an example. Encourage students to think through the 4Rs hierarchy learned in previous lessons. For example, do you need to reduce the number of bananas you eat to reduce the number of peels you put in the trash can? Should you reuse the banana peel for something else? Do banana peels go in the recycling bin? After students have had time to discuss with a partner or small group, explain that these materials can be composted.
15. To learn more about composting, students will watch the *Compost Buddies* video. Distribute the *Compost Buddies Video Notes*. Read through the directions as a class. Make sure students understand that during the video, they should be looking for the differences between biodegradable and non-biodegradable materials, as well as evidence to support facts when possible. Review the example given on the video notes.
16. Show the video *Compost Buddies*. Pause after each section to allow students ample time to update their notes.
17. After the video, have students consider what might happen if things didn't decompose in nature. What would a forest look like if dead organic matter remained intact? Explain that nutrients return back into the soil through the process of decomposition. Show them a sample of compost, if available.
18. Assign students to read and take notes on the *Composting at Home* article. Model for students how to use the *Finding the Main Idea* worksheet to use while reading the articles.

19. Note: the *Finding the Main Idea* worksheet requires students to take notes on and look for evidence within expository text, and determine the main idea with supporting evidence within the text. You may choose to give the assignment in stages, stopping at various points to provide additional scaffolding and direct instruction on isolated skills.
20. Students will choose one detail from the *Composting at Home* article that they think is important enough to teach someone else about. For example, if a student chooses to focus on the detail about the percent of food waste in a lunchroom trash can, they might design an activity or project that encourages composting at school. Ideas and activities will vary greatly. Final products might include, but are not limited to a plan/proposal for a composting system, posters, Public Service Announcements, letters to government officials, brochure, videos, an activity designed for younger students, a piece of writing, or a presentation.

Wrap-Up

21. Have students share their chosen details and brainstorm service project or activity ideas with a partner. Make a class list of ideas. Students with similar interests might collaborate on a project. Discuss what additional time, materials, or information is needed to move forward.

Extension Ideas

- Have students compare and contrast the materials shown in the video to the materials collected outside. Discuss similarities and differences.
- Ask the students whether they think they can find materials that are biodegradable at home. Discuss ways to recycle these materials, such as starting a compost bin.

REFERENCES

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- California Department of Resources Recycling and Recovery (CalRecycle). (2009, August 1). California 2008 Statewide Waste Characterization Study. Retrieved December 9, 2014, from <http://www.calrecycle.ca.gov/WasteChar/PubExtracts/2009023/Summary.pdf>
- Alameda County Waste Management Authority and Recycling Board. *Doing the 4Rs – A Classroom Activity Guide to Teach Reduce, Reuse, Recycle and Rot*. 2010. Web. 18 November 2014. <<http://www.stopwaste.org/recycling/schools/curriculum-and-videos>>.
- United States Environmental Protection Agency. "Composting at Home." Web. Accessed 21 July 2014. <<http://www2.epa.gov/recycle/composting-home>>.
- City of Napa, County of Napa, and Napa Recycling & Waste Services. *Reduce, Reuse, Recycle Guide for Napa County*. 2016. Web. 19 July 2016. <<http://schools.naparecycles.org/wp-content/uploads/2016/09/Napa-Recycle-Guide-2016.pdf>>.

The Breakdown on Decomposition

Rubric

A rubric is a scoring tool that helps you understand how your work will be evaluated. This rubric is provided to show you the expectations for your performance and engagement during the lesson based on specific tasks.

Name _____ Date _____

| Task | 4 | 3 | 2 | 1 |
|---|--|---|---|--|
| Compost Buddies Video Notes (Individual) | Notes are detailed, complete, and neat. Responses to focus questions are thorough and correct. | Notes are mostly detailed, complete, and neat. Responses to focus questions are correct, though may lack some detail. | Notes lack detail or are difficult to read. Some responses to focus questions are incorrect. | Notes are incomplete. |
| Finding the Main Idea Worksheet (Individual) | Responses are thorough and accurate. Student finds the main idea(s) and supporting details of the text; summary contains only essential details. | Responses are mostly thorough and accurate. Student finds the main idea(s) and supporting details of the text; summary contains essential details. | Responses are short or contain some errors. Student can locate some details in the text, but does not accurately infer all main ideas ; summary is incomplete, or contains unnecessary details. | Responses are superficial and incomplete. |
| Service Project (Individual or group) | Student uses a detail from the article to inspire an engaging and interesting composting service project. Project is well planned and has the potential to help people learn about composting. | Student uses a detail from the article to inspire a composting service project. Project is planned and has the potential to help people learn about composting. | Though the idea is interesting, the project is not thoroughly planned and/or executed. | Student does not plan or execute a composting service project. |

The Breakdown on Decomposition

Compost Buddies — Notes During the Video

Videos and other multimedia can be an effective way to learn information on a topic. Before the video begins, read the entire notes page thoroughly. As a result, you'll know what information you should be watching and listening for. Then, pay close attention to the information presented in the video, and take notes on what you see and hear. These notes will be an important resource for you later in the lesson. There's a place at the bottom for questions you have during the video.

Name _____ Date _____

During the Video: Use the boxes below to write down important facts relevant to the topic.

| | | |
|--|----|----|
| <p>1. Example:</p> <p>Fact: Worms help break down materials, and their tunnels provide space for air to enter.</p> | 2. | 3. |
| 4. | 5. | 6. |
| 7. | 8. | 9. |

Questions?

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The Breakdown on Decomposition

Compost Buddies — After the Video

Name _____ Date _____

Video Topic _____

What was the main idea or central message of the video?

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Using your list of facts and details from the previous page, choose the 3 most important facts that you believe best support the main idea.

1).....
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2).....
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3).....
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Summarize the information presented in the video. If you need help, paraphrase your main idea and supporting details outline above.

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The Breakdown on Decomposition

Finding the Main Idea

Whether it's to inform, explain, argue, or entertain, authors always write text for a reason. As readers of expository text (real text that explains or informs), it is our job to determine the main idea or ideas of the text. To do so, we must first consider the author's purpose in writing the text.

Name _____ Date _____

Task Description:

- 1. Read the article "Composting at Home" from the United States Environmental Protection Agency. http://www2.epa.gov/recycle/composting-home
2. Answer the questions below in order to determine the main idea of the text.
3. Use one of the supporting details to inspire a service project in your school or community. Your teacher will provide you more information and specific expectations for the project.

Finding the Main Idea — Part One
Read the text 3 times

- ...individually and silently, one time through without stopping.
...by listening to your teacher read the text aloud, or with a partner.
...for detail, highlighting important ideas and jotting notes in the margins.

Finding the Main Idea — Part Two
The Author

- 4. Who wrote this text? (It can be an individual or an organization)
5. Why do you believe they wrote this text? (If you're not sure, discuss with a partner, or ask your teacher if you can find out more about the Environmental Protection Agency.)

The Breakdown on Decomposition

Finding the Main Idea — Part Three

The Main Idea(s)

1. What is the topic of the text? (1–3 words) _____
2. There are four aspects of composting about which the author gives more information. Write down the author's main idea, or main point, along with 3 supporting details the author provides for each category.

| Topic | Main Idea | Supporting Details |
|--|-----------|--------------------|
| The reasons why we should compost | | 1) 2) 3) |
| The ingredients of composting | | 1) 2) 3) |
| The benefits of composting | | 1) 2) 3) |
| How to compost | | 1) 2) 3) |