Decomposers - Earthworms

Lesson Overview
Decomposers play an essential role in food chains and ecosystems. Decomposers break down the matter from dead plants and animals, as well as waste products, and recycle this matter into nutrients that are released back into the soil. In this lesson, students will learn about one important decomposer, the earthworm.

Objectives
- Collect information from multiple sources, including Cyber Science 3D, textbooks, and the Internet
- Conduct a short research project about earthworms to learn how they recycle matter back into the surrounding environment
- Carry out several experiments and formulate conclusions about the earthworm’s behavior, diet, and effects on the soil *(optional)*
- Give group presentations about earthworms using the data collected from research and experiments

Standards (NGSS and Common Core)
*For state specific standards visit edu.zspace.com/activities*

Next Generation Science Standards
- Life Science - subtopic
  - 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Common Core Connections
- Language Arts
  - 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.
  - W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
  - SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
  - 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.

Grade Level: 4th – 6th
Lesson Time: 120 Minutes
*(4 – 6 weeks for experiment)*

Key Terms:
- Anterior
- Compost
- Decomposer
- Dorsal
- Posterior
- Scavenger
- Ventral

Resources:
- Answer Key
- Earthworm Research worksheet
- Earthworm Experiments worksheet *(optional)*

Materials needed:
- Research center on earthworms
- Center with supplies for earthworm experiments *(optional)*
- Earthworm
- 10 small pots filled with soil
- egg shells
- fruit/vegetables
- coffee grounds
- grass/leaves
- seeds
- paper towels
- cotton balls
- nail polish remover
Differentiation

- Group students heterogeneously to allow students with a strong command of the English language to assist in reading or interpreting questions
- Provide paper copies of diagrams to students to use as a reference
- Provide a handout with a list of vocabulary terms and definitions that will appear in their activity

Introduction

The teacher will ask the students the following questions: What is a decomposer? Why are decomposers so important to food chains and ecosystems? The teacher will explain to the students that they will learn more about one very important decomposer, the earthworm.

Activity – Decomposers - Earthworms

CENTER 1
1. Open the “Earthworms” session in Cyber Science 3D.
2. Click on the “Presenter” mode at the top left corner of the screen. This will display a list of slides along the left side.
3. Follow the presentation: Click on the “Play Slides” button to pause the session at the first slide. When you are ready for the next slide, click the next slide on the list. Follow the directions on each slide and explore at your own pace.

CENTER 2
At a research center, read more about earthworms, their body parts and functions, and their role as a decomposer. Record your data on the "Earthworm Research" worksheet.

CENTER 3 (optional)
1. Conduct several experiments about earthworms. See the directions on the "Earthworm Experiments" worksheet.
2. After 4-6 weeks - Observe and record the results of your experiments. Split into four groups and work together to analyze the data for your group's specific topic: Earthworm's Structures and Functions, Behavior, Diet, or Effects on Soil.
3. Create posters, charts, or graphs that represent your research and data about earthworms.
4. Present your group findings to the class.

Closing

After the students complete their group presentations, they will discuss their results and any discrepancies in their data. They will share their conclusions about how earthworms play an essential role in food chains and ecosystems. Use the following questions for discussion.
Questions for Discussion

1. Based on your research and experiments, why are earthworms so important for food chains and ecosystems?
   
   Answers will vary. Sample Answer: Earthworms play a very important role in food chains and ecosystems. Earthworms are decomposers that act as scavengers. They break down dead plants and animals, as well as waste products, in a process called fragmentation and recycle these nutrients back into the soil. Plants use these nutrients to make food energy, which travels back up the food chain and repeats the cycle.

2. What are other decomposers?
   
   Answers will vary. Sample Answer: Fungi and Bacteria are also decomposers.

Investigate Further

Extension Activity: Decomposers - Fungi and Bacteria

Extension Activity: Students could dissect a real earthworm and analyze its structures.

Extension Activity: Students could create a compost pile for the school with earthworms from the garden. They could gather and add food waste daily. After several months of upkeep, students could use the nutrient-rich soil to plant seeds in the garden.

Answer Key – Decomposers - Earthworms

Activity Questions From “Earthworm Experiments” Worksheet (optional)

1. Based on your experiments, what did you learn about the earthworm's behavior?
   
   Answers will vary. Sample Answer: Earthworms prefer moist and dark environments. They react more to smells near their anterior region.

2. Based on your experiments, what did you learn about the earthworm's diet?
   
   Answers will vary. Sample Answer: The earthworms showed a preference for certain types of foods, and therefore grew larger in some pots than in others.

3. Based on your experiments, what did you learn about the earthworm's effect on the soil?
   
   Answers will vary. Sample Answer: The seeds grew better in the pots with earthworms. This is because earthworms recycle nutrients back into the soil, which help plants to grow.
Earthworm Research

Draw a cross section of an earthworm and label its body parts.

Research the functions of each body part and record the data below.

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Description and Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth</td>
<td></td>
</tr>
<tr>
<td>Pharynx</td>
<td></td>
</tr>
<tr>
<td>Esophagus</td>
<td></td>
</tr>
<tr>
<td>Crop</td>
<td></td>
</tr>
<tr>
<td>Gizzard</td>
<td></td>
</tr>
<tr>
<td>Intestine</td>
<td></td>
</tr>
<tr>
<td>Anus</td>
<td></td>
</tr>
<tr>
<td>Clittelum</td>
<td></td>
</tr>
<tr>
<td>Seminal Vessicles</td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td></td>
</tr>
<tr>
<td>Setae</td>
<td></td>
</tr>
</tbody>
</table>
Earthworm Experiments

Earthworm’s Behavior

Materials: Earthworms  
Paper towels  
Cotton balls  
Nail polish remover  
Flashlight

Directions:
1. Place a dry paper towel next to a moist paper towel on a flat surface.
2. Gently place several earthworms in the middle of both paper towels.
3. Watch the earthworms for 10 minutes. Make observations about the earthworm’s response to touch.
4. Now place one earthworm on a flat surface.
5. Soak a cotton ball with nail polish remover.
6. Bring the cotton ball close to the anterior end of its body (but don’t touch) and observe reactions.
7. Repeat step #6 with several different earthworms.
8. Make observations about the earthworm’s response to odors.
9. Using a flashlight, shine light close to the anterior end of the body. Repeat on posterior end.
10. Make observations about the earthworm’s response to light.

Earthworm’s Diet

Materials: Earthworms  
4 pots filled with soil  
Egg shells  
Fruits/vegetables  
Coffee grounds  
Grass/leaves  
Rulers/scale

Directions:
1. Mix egg shells into the soil of Pot #1 and label “Egg Shells.”
2. Mix fruits/vegetables into soil of Pot #2 and label “Fruits/Vegetables.”
3. Mix coffee grounds into the soil of Pot #3 and label “Coffee Grounds.”
4. Mix grass/leaves into the soil of Pot #4 and label “Grass/Leaves.”
5. Place one worm in each pot. But first, measure and record its starting length and weight.
6. After 4-6 weeks, remove each worm from its pot and record its ending length and weight.
Earthworm’s Effects on Soil

Material:  
- 6 Earthworms
- 6 Pots filled with soil
- 18 Seeds

Directions:
1. Plant 3 seeds in each of the 6 pots.
2. Water the seeds.
3. Add 2 earthworms to each of three different pots and label these “With Earthworms.”
4. Place all 6 pots in a location that gets sunlight.
5. Over the next 4-6 weeks, water all 6 pots equally.
6. After sufficient time has passed, observe and measure seed growth in all pots.
7. Record data in chart below.

<table>
<thead>
<tr>
<th>No Earthworms</th>
<th>With Earthworms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pot #1</td>
<td>Pot #2</td>
</tr>
<tr>
<td>Seed #1</td>
<td></td>
</tr>
<tr>
<td>Seed #2</td>
<td></td>
</tr>
<tr>
<td>Seed #3</td>
<td></td>
</tr>
</tbody>
</table>
Questions:

1. Based on your experiments, what did you learn about the earthworm’s behavior?
   ____________________________________________________________
   ____________________________________________________________

2. What did you learn about the earthworm’s diet?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. What did you learn about the earthworm’s effects on the soil?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. Why are earthworms so important for food chains and ecosystems?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________