

## Turning Food Scraps into Black Gold

### *Secondary*

#### Key Inquiry Questions

1. What can we do with food waste that cannot be recycled or reused?
2. What is composting and why is it important?
3. How does composting actually work?

#### Learning Outcomes

1. Students will be able to define biodegradable and nonbiodegradable materials, and compost by the end of the lesson.
2. Students will learn the importance of composting by the end of the lesson.
3. Students will be able to understand how composting works by the end of the lesson.

#### Sustainability Curriculum Goals

##### **Systems Thinking:**

1. All forms of life, including humans, are connected to each other through man-made and natural ecosystems on which their well-being depends on.

##### **Sustainable Futures:**

1. Actions associated with a sustainable future reflect values of care, respect, responsibility, empathy, and compassion for all living and nonliving things.

##### **Activities/Goals:**

1. Students will engage with sustainable agriculture, water and land conservation, and proper waste disposal practices.
2. Students will have a greater awareness of climate change and adaptation/mitigation strategies.

#### Overview:

The lesson will begin with students learning the difference between biodegradable and nonbiodegradable materials. They will learn that biodegradable materials, such as food waste and leaves, can be broken down by microorganisms, such as worms, and used to create a soil amendment (i.e. compost!). Next, students (as a class or in groups) will create their own compost soda bottle followed by a large scale compost pile for the school. At the conclusion of the lesson, students will understand the importance of composting and how to do it on a small scale and be able to share what they learned with the community by creating posters/pamphlets.

## Materials

### **SolarSPELL Resource:**

1. For teachers: “Composting Brochure” (Local Topics > Comoros > Agriculture for Islands > Garden and soil > “Composting Brochure”)

### **Other:**

1. Science journals
2. Pencils
3. Food scraps from breakfast/lunch
4. 2 x Liter Soda Bottles (or one Soda Bottle per group)
5. Soil
6. Paper
7. Tape (if available)
8. Scissors
9. Spray bottles or cups of water (one per soda bottle)
10. Poster paper
11. Colored pencils (if available)

## Suggested Procedure

*It is recommended you complete the lesson plan on Rubbish and Recycling prior to this lesson.*

### *Before Lesson:*

- Students will begin defining what it means for a material to be biodegradable by discussing different examples of what is biodegradable.
  - Tell students that, as they have learned, we use resources from the earth daily for everything that we do.
    - For example: We eat food, drink from aluminum cans, glass bottles, or plastic bottles, live in houses made from wood, and wear clothing made from cotton.
  - Materials like metal, glass, and plastic cannot be broken down by microorganisms living in the soil (they are non-biodegradable).
  - Alternatively, materials like wood, food scraps, and paper can be broken down by microorganisms, such as bacteria and worms, in the soil (they are biodegradable). These items return nutrients to the soil for more resources to be grown!
- On the board or on individual sheets of paper, give students 3 minutes to list as many items that can be broken down as possible.
  - Bring a ball outside with you and the students and have them stand in a circle.
  - Begin by calling out a student's name and ask them to shout out something that can be broken down.
  - Toss the ball to the students and then have the students sit down.

- Students continue shouting out a peer's name for them to share something that can be broken down and passing the ball until all students are sitting.
- For round 2, have students stand up again and you [the teacher] start standing in the middle.
  - The person in the middle has the goal of tagging the student who has the ball before the ball is tossed to the next student.
  - Like before, the student with the ball names something that can be broken down and throws the ball to one of their peers before the person in the center can tag them.
  - If the student with the ball does not name something before they throw the ball and is tagged, that student switches spots with the student in the center.
- Ask students if they think the items that can be broken down can be recycled?
  - Answer: Yes!!
- Tell students (and have them write this in their journals) that materials that can be broken down can be recycled through composting.
- Explain that composting is nature's natural process of recycling!!

*During Lesson:*

- Give students 10 minutes to read the document titled “Creative Composting” in order to get an idea of the basics behind composting and the potential uses for it.
- After the reading, ask students what composting is. Call on three students to share.
  - Explain to students that composting models nature's process of decomposition and decay. By adding compost to plants, the soil receives nutrients to soil in place of using pesticides/chemicals/or fertilizers from cows. It makes for healthy plants that humans and animals need for survival.
- At this time, students may wonder what the difference is between a landfill/throwing food away that can be broken down and composting?
  - Explain to students that in landfills or dumps, food waste breaks down and produces methane gas. This gas is even more harmful to the environment than CO<sub>2</sub> and results in increasing the rate of climate change.
- Students will now have the opportunity to see how composting works.
- Give students the following instructions and materials to create their own compost system as a group:
  - Note: this activity will take at least 4 weeks to complete.
  - 1. Have students collect their food scraps during breakfast and/or lunch.
    - Scraps can include all vegetable/fruit waste, and coffee grounds. Bones or meat should not be collected.
  - 2. Rinse out the soda bottles and cut the top off (the top is the side with the cap).
  - 3. Put one handful of soil into the bottom of the bottle, then a handful of the food scraps. Repeat this layering process twice, then add a third layer of soil, and on top of that add a layer of paper. Then put another layer of soil, followed by another layer of food scraps, and top it off with a layer of soil.

- If the soil is dry, spray each layer of soil with water until it is as damp as a sponge.
  - Explain to students that compost needs an equal amount of green material (the food scraps) and brown material (soil, sawdust, paper without ink on it, sticks, leaves) to work.
  - Explain to students that the smaller the pieces of food waste are in the compost, the quicker it will decompose.
- 4. Spray the top layer of soil until it is as damp as a sponge.
  - Explain to students that water and air are important to making sure the bacteria can breakdown the waste.
- 5. Tap the lid back on (if tape is not available, the composter will still work without the lid taped back on)
  - See example of final product at the end of the lesson.
- 6. Place the soda bottle composter in the sun.
  - Note: if it is raining, place the soda bottle in the shade or in a window that receives sunlight so it does not wash away.
- 7. Have students check on their bottle every day to make sure the top layer of soil is not getting too dry.
  - Students should use a long stick to mix the compost daily as well.
- 8. Continue checking on the soda bottle daily for 4 weeks. All though it will take time, students should go out once a week to write down their observations of what is happening.
- 9. After 4 weeks, students can take their compost in use it to grow plants!!
  - The compost is ready when it is brown, crumbly, and feels like normal soil. If there are still lots of chunks, students should wait another week.

*After Lesson:*

- Now that students have an idea of what compost is, ask students why they think composting could be important and useful for their community?
  - Possible answers: composting leads to less food being sent to the landfill, composting returns nutrients to the soil we took them from by growing our crops, using compost reduces the need for pesticides/chemicals.
- Have students brainstorm with the class how they could work together to create a large compost pile at the school.
  - Note: Finished compost could be shared among the community or the school for growing pesticide/chemical-free crops that also protect the soil's nutrients.
- Instructions for a compost pile (See example of final product at the end of the lesson):
  - Ask students what are the key components to a successful compost:
    - Answer: Air, chopped food waste, 50:50 ratio of brown to green material, and maintain moisture in the pile.
  - Optional: Students can create a wire or wooden fence around a small plot of land to contain their compost.
    - Note: this will help protect it from animals.

- After green and brown material is collected, students should layer the compost pile in the same way they layered the soda bottle one.
- As the pile grows, it should be mixed-used a rake, stick, or strong tool of some kind.
- Create a sign-up sheet for students to take turns turning the pile every 3 days.
- Remember, always finish the pile with a layer of brown material to prevent flies from building their nests there.
- Tips:
  - If pile becomes too wet due to a storm, add more brown material.
  - If pile has what seems like an excess of insects (there will be flies, and other small insects), add more brown material and give the pile a good stir.
  - If pile is not moist, add water.
- Have students create a poster for what can and cannot be added to the pile. This poster should be placed near the pile or in a space where all people adding to the pile can see it.
  - Yes (Green): Fruit and vegetable scraps, eggshells, coffee grounds, feathers, tea leaves, nut shells, grass/plant trimmings
  - Yes (Brown): wood chips, paper plates/napkins, dry leaves, cotton, broken sticks, cardboard, soil, already completed compost.
  - No: animal products (meat, dairy, bones, fish), oil, grease, ashes, diseased or mildewed plants, charcoal, plastic, metal, glass.
- Have students create a poster for the steps and processes needed to take care of the pile.
  - It should include: how often to mix the pile, how moist the pile should be, and important information about a layer of brown material always being on top.
- Lastly, once the pile is 2 meters high, more waste should not be added to the top and a new pile can be created.
- After 6 weeks, the compost should crumble, smell earthy (like soil), and be black.

*Assessment:*

- In groups, have students create a compost pamphlet or poster describing what compost is and/or the steps to creating a pile in their own words.
- Pamphlets/ posters should have drawings and words.
- Pamphlets/posters should be hung and/or presented around the school/community to teach others about composting!
- See example below:



# COMPOSTING

Reduce your environmental impact today

## Compost vs. Landfill

The decomposition process in landfills produces methane gas, which is more harmful to the environment than the product of composting, carbon dioxide.

### Key Steps:

1. CHOP all green materials
2. Mix compost often
3. Compost should be as moist as a damp sponge
4. Be patient!



## WHY COMPOST?



Reduces need for chemical fertilizers



Decreases food sent to landfills that produces methane emissions

Promotes healthier plants



Example of Soda Bottle Composting System:



Example of Compost Pile:

