Biology 20 – lesson 1

Composting Biology

Objective: To explore the conditions and ecology of composting

Introduction: While it may look like a pile of dirt and other organic materials, the compost pile is an area of considerable biological activity. This lesson will help students explore some of the cycles, organisms and interactions present in the compost pile.

Curriculum Connections:

Unit A: 1.1-1.4k, 1.2s, 1.3s, 2.1-2.2k, 2.1sts

Unit B: 1.1-1.4k, 1.1sts,

Unit C: 2.3k, 2.1-2.2sts

Supplies / Materials:

- Compost and soil samples
- Pictures of / words representing components and products of composting (resource 1)
- Microscopes
- Food web of compost pile (resource 2)
- Computers to look up other **resources** or print-outs from **resources** 3 and 4

Hook: Put out small dishes of soil and compost samples to be shared by small groups of students. Have them feel, smell and describe differences of the samples

Intro Activity: Ask the students which they thought was garden soil and which was compost. Fill out a KWL chart for composting (encourage them to think about the microbiology, heat and cycling)

SCIENCE FOCUS

Lesson Subject

Biology 20

Topic

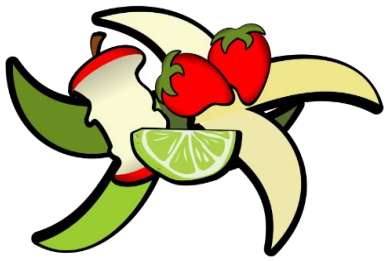
Compost Ecology and Energy

Location

Classroom

Length

60-80 mins



Main Activity:

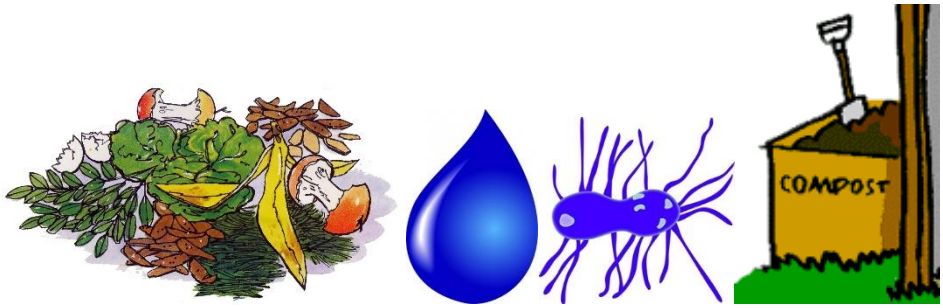
1) Have students create a flow chart of inputs/outputs for the compost process using the words/pictures.
2) Have them look at their samples under microscopes to compare microbiology, trying to find the organisms in the food web. Note this will not work if you have sterilized compost. See extension for creating your own compost
3) Divide students into groups: (Use **resources** 3-7)
    a) To research and discuss the roles of oxygen in composting. (Anaerobic vs aerobic processes)
    b) To research the role of water in composting. How does it promote anaerobic vs aerobic processes?
    c) To research the nutrient cycles in composting. Give some examples of carbon and nitrogen sources and discuss the ratios of these in effective composting.

Conclusion / Review: Review what was learned about compost ecosystems – what are the organisms, their niches, and abiotic and biotic factors? Review biogeochemical cycles.

Homework: Have students plan an experiment to explore compost variables (see extensions); investigate vermicomposting or determine the best composting for their home waste.

Resources:

1) Overview: http://home.howstuffworks.com/composting1.htm



2) Compost food web: http://www.cas.miamioh.edu/scienceforohio/Composting/images/CoFoodWb.pdf

3) Compost fundamentals: http://whatcom.wsu.edu/ag/compost/fundamentals/index.htm (includes information about aerobic vs. anaerobic, microbes, nutrients, moisture, T etc.).

4) The Science of Composting: http://web.extension.illinois.edu/homecompost/science.cfm

5) The decomposition process: http://aggie-horticulture.tamu.edu/earthkind/landscape/dont-bag-it/chapter-1-the-decomposition-process/

6) The N cycle: http://www.the-compost-gardener.com/nitrogen-cycle.html

7) The P cycle: http://www.gardenmyths.com/rock-phosphate-fertilizer/

Answer Guide to Question #3.

a) Role of oxygen:

- Allows respiration of aerobic decomposers, carbon oxidized for energy – no smell
- Lack of oxygen results in fermentation, aerobic organisms release of CH4 and H2S = smell

b) Role of water

- Survival of microorganisms
- Solvent for organic molecules
- Some microorganisms use water to move
- Too much displaces oxygen

c) Nutrients and nutrient cycles

C: becomes CO2 as respired; CO2 will be taken up in photosynthesis

N: combined with C in living cells, used for cell protoplasm and amino acids, produce ammonium

P: important for cellular growth – builds cell protoplasm

- When these microorganisms die, other organisms can take up the nitrogen and phosphorus and respire the carbon