

FACILITATOR GUIDE: Microbes & Composting GRADE: 6th - 8th

CONCEPTS & SKILLS:

Mathematics

Statistics and Probability

Develop understanding of statistical variability-

- **6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape.

Science

Science as Inquiry

S.6-8.SI.2 Identify and generate questions that can be answered through scientific investigations-

- Students should develop the ability to refine and refocus broad and ill-defined questions. An important aspect of this ability consists of clarifying questions and inquiries and directing them toward objects and phenomena that can be described, explained, or predicted by scientific investigations.
- Students should develop the ability to connect their questions with scientific ideas, concepts, and quantitative relationships that guide investigations.
- Students recognize that different questions lead to different types of investigations.

21st Century Skills

Technology Literacy

- **21.6-8.TL.4** Use technology to gather, analyze, and assess data and its effectiveness to design, develop and test possible solutions that assist students in making decisions. (21st Century Skills Technology Literacy)

MATERIALS & RESOURCES:

- A variety of compost/soil examples (resources: leaf litter, soil from different locations, home compost piles, etc. Be sure to include a sample of a commercial compost found at most hardware or home & garden stores)
- One gallon-sized plastic milk container for each student
- Empty pint jars with tight lids
- Ruler or stick about 10-12 inches long
- 1/4" mesh hardware cloth or aluminum window screen
- Scissors
- Masking or duct tape
- Rubbing alcohol
- Lamp
- Access to internet site: The Ground Crew-
<http://www.cals.ncsu.edu/course/ent591k/soil.html>

PRESENTATION:

This is an opportunity to learn about compost and soil through the study of organisms. organisms break down organic matter into soil. Do you know the difference between organic and inorganic matter?

Now we are going to experiment with the many organisms that do the work, how they do it and different materials that challenge them to do it! Did you know this about soil organisms?

By creating a Berlese funnel, students will separate the organisms from the soil, then count and identify the organisms for each sample of compost. Students will make predictions and then find if the data supports these predictions. Bigger Picture Concepts: Are organisms important to soil? How important is soil to human life? What are the things humans can do to be better protectors of the soil?

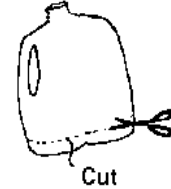
DIRECTIONS:

These directions are found at the Ground Crew page, Procedure for building and using a Berlese Funnel

<http://www.cals.ncsu.edu/course/ent591k/berlese.html>

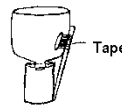
1. Cut the bottom out of the milk jug (Fig. 1) and turn it upside down over the Mason jar to make a funnel.
2. Tape the stick to the handle of the milk jug (Fig. 2) so it is just long enough to reach the outside bottom of the Mason jar.
3. Bend down the corners of the hardware cloth so it fits snugly inside the wide end of the funnel. If using window screen, cut and pinch numerous slits so larger animals can crawl through.
4. Place a few handfuls of compost sample in screen.
5. Pour alcohol into the Mason jar to a depth of 1-2 cm.
6. Carefully set the funnel on top of the jar and tape the stick to the jar so it won't tip over.

Figure 1



Cut

Figure 2



Tape

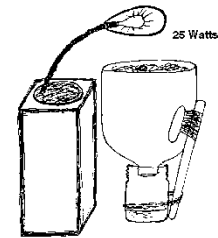


Figure 3 -- Completely Set Up

- Leave the funnel in a warm, quiet place where it won't be disturbed.
7. Set a lamp over the funnel to speed drying (see Fig. 3). Keep the light bulb at least 10 cm away from the funnel.
As the sample dries out, the animals will move down and fall into the alcohol. After 4 or 5 days (maybe longer if the sample was quite wet), you can CAREFULLY remove the jar and screw on its lid. The alcohol will preserve the sample indefinitely.
 8. Using an identification key such as found at website: [Ground Crew website](http://www.cals.ncsu.edu/course/ent591k/ident.html) <http://www.cals.ncsu.edu/course/ent591k/ident.html> or a Soil Organism Identification book, identify the living organisms found in the jar.
 9. Create a chart that contains the total number of organisms per sample, the number of different organisms, and the names of the organisms for each compost sample. As the students observe this process, have them discuss and/or journal about their original predictions, what they learned, and the "Bigger Picture Concepts" (see presentation section).

TIME:**1 week**

Surprising Facts about Soil Organisms:

- **More than half of the trash a family throws away every year, about **1,200 pounds**, is organic matter that could be composted into fertile soil.**
<http://earth911.com/recycling/garden/dirt/facts-about-dirt/>
- **In one gram of soil, **5,000 to 7,000 different species** of bacteria can be found.** <http://earth911.com/recycling/garden/dirt/facts-about-dirt/>
- **The American Midwest has the largest area of prime farmland soils in the world. Other large areas are in South America and Eastern Europe and Russia.**
<http://www.highlandsswcd.org/everything/News%20from%20the%20Watershed/2009%20articles/Some%20interesting%20facts%20about%20soil.pdf>
- **It takes 100 to 600 years to form an inch of topsoil.**
<http://www.rienvirothon.org/soil-fun-facts.htm>