

ABSTRACT

People often think of insects as pests, but insects are valuable members of the natural world. In this lesson, students investigate the extraordinary manner in which insects live and interact. Student groups collect different types of insects and study their habits. Students identify different species and record observation data into laptop computers, then use mathematical formulas to analyze the data. Groups collect ants and create ant colonies. As a final activity, groups present their findings to the class, using their laptops.

TIES TO CURRICULUM

In keeping with the *National Science Education Standards*, this lesson integrates technology into the science curriculum and promotes flexibility in data collection. Students work cooperatively and share data and ideas on insect species. Groups present data to classmates and assess each other's presentations.

LEARNING OBJECTIVES

Students will

- ◆ learn about insect anatomy and behavior;
- ◆ describe several types of insects found in the region;
- ◆ classify insect species;
- ◆ determine the diet and habitat of local insects;
- ◆ learn the importance of insects in the environment;
- ◆ use computer technology to present their findings orally and visually.

NUMBER OF LAPTOPS AND GROUP SIZE

Assign one laptop to every group of four students.

TIME REQUIREMENT

Conducted *Ant Farm* over a period of several weeks for extended observations. Approximate time frames are as follows:

Task	Time	Location
Introduction	45 minutes	Classroom
Activity	3 hours	Field
Observation, data collection, and presentations	2 weeks	Classroom

LESSON DESCRIPTION

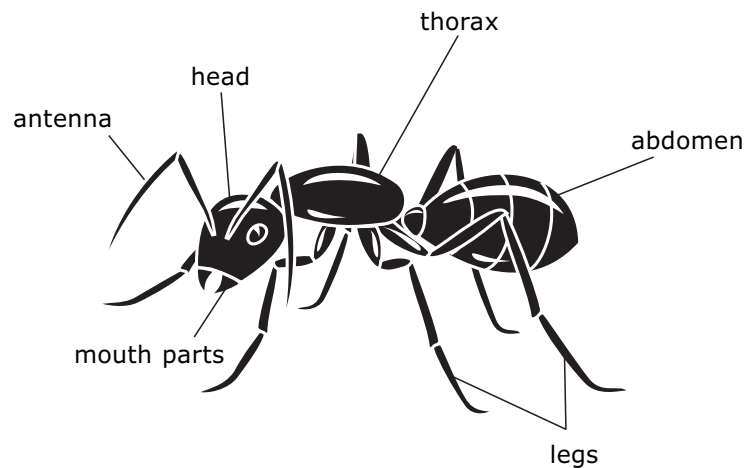
MATERIALS

- ◆ Laptop computers
- ◆ Word processing and spreadsheet software
- ◆ Digital camera
- ◆ Overhead projector
- ◆ Labels
- ◆ Tweezers or forceps
- ◆ Honey
- ◆ Cheese cloth
- ◆ Elastic bands
- ◆ Hand-held magnifying lens
- ◆ Metric rulers
- ◆ Glass jars (two sizes)
- ◆ Thermometers
- ◆ String
- ◆ Bottle caps or aluminum foil
- ◆ Black construction paper
- ◆ Soil
- ◆ Drinking straw
- ◆ Transparencies identifying insects in the region

Introduction

Introduce students to insects at stations around the classroom. Ask students to think about what life would be like without insects. Use an overhead projector to review generic insect anatomy (Figure 1) and to display drawings of different types of insects found in the region. Use field guides to identify insects and discuss characteristics of major insect orders.

Figure 1: Basic insect anatomy



Guide the class through preparing a spreadsheet for the field trip. Create a database in which students enter insect features such as size, color, nest location, description of the physical environment, weather conditions, and insect activity. The spreadsheet should have sections for three types of insects, and each section should have cells available for the number of insects at each nest. Create formulas in the spreadsheet to calculate the sum and average of appropriate fields.

Activity

Divide students into groups of four and take the class to the field site. The field site can be a schoolyard habitat, a park, or a nature reserve—anywhere you will find soil and insects. Carry a digital camera and help

students take pictures during group observation and collection. Take close-ups of insects whenever possible.

At the field site, each group should enter data about the site location, time, and weather conditions. Groups should first observe insect life at the field site, then choose three species from different classes to observe. Groups observe insect and record notes on the laptop spreadsheet and answer these and other questions: What is the location and size of the nest? How does the species feed? How does the insect interact with other individuals of the same species?

After making behavior observations, groups catch 10 individuals of each species. Each student examines the insects with a handheld lens and makes observations about each insect's appearance. Note all appearance observations in the laptop, and then use a field guide to classify the insect to its Order. Also, record the number of nests observed for each species, the number of individuals at each nest, and the number of individuals captured.

To catch an ant or other small insect, lick your finger, press the back of the ant lightly and pick the ant up. Carry the insect gently to the jar. To make an observation, gently pick the insect up by its hind legs using tweezers. Put insects from different nests into separate jars. Cover the jars with cheesecloth, and secure the cloth with elastic bands. Pieces of crumpled, honey-soaked paper in the jars will provide food and protection, calming frantic insects. Use one jar for each species. Don't put too many ants in a bottle, as ants produce formic acid, which may kill them if there are too many in a small confined space.

If insects are difficult to capture, lay pieces of honey-soaked cloth at different locations around the field site. Once insects crawl onto the cloth, shake them off into the jars, or just lay the ant-covered cloth in the jar. To attract different kinds of ants, lay a piece of fruit, sausage, or cheese on a piece of wax paper and repeat the procedure.

SUGGESTIONS

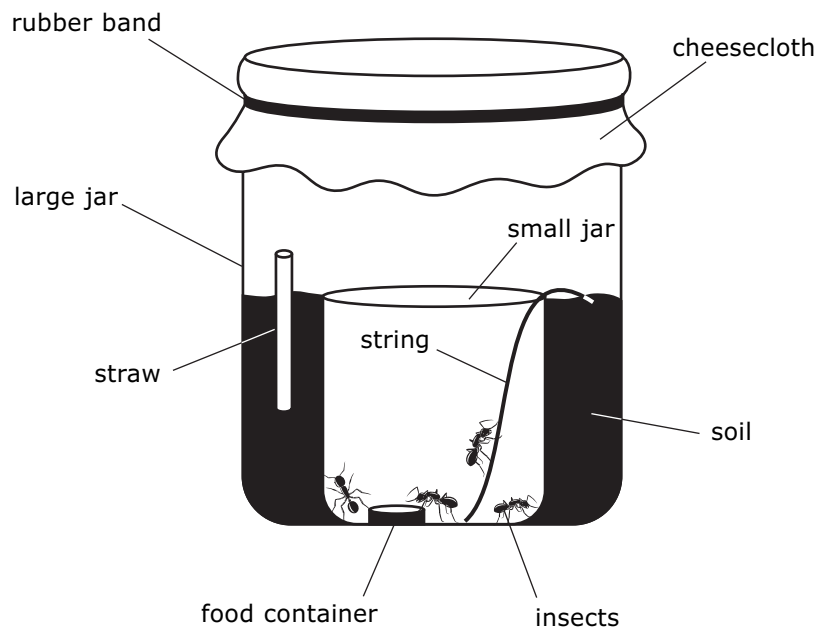
- ◆ This lesson works best for ground-crawling insects, particularly ants.
- ◆ If appropriate for the age level, show the Scholastic video, *The Magic School Bus Gets Ants in its Pants* to further acquaint the students with the anatomy and habits of ants.
- ◆ Warn students not to collect bees, wasps, hornets, or stinging/red ants.

Each group should choose one species of ant to bring back to the classroom to colonize the ant farm.

Ant Farms

Spend two weeks of class time on insect observation. Students will build ant farms and study ant interaction (see Figure 2). Groups will record their findings in the laptops.

Figure 2: Building an ant farm



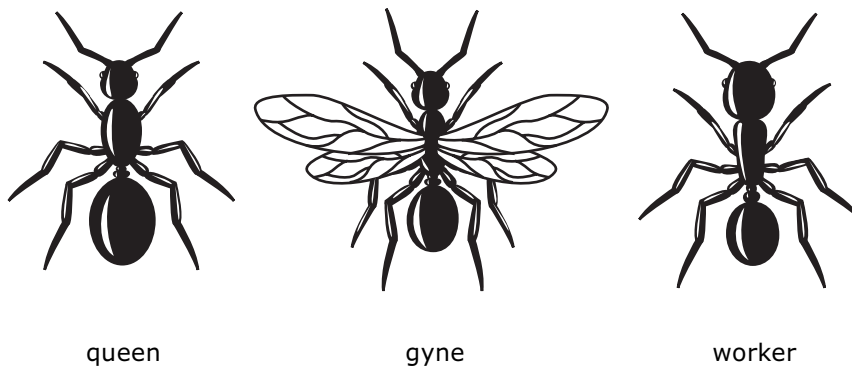
1. Place a small glass jar into a larger glass jar.
2. Fill the space between the jars with soil.
3. Push a plastic straw into the soil. Keep soil moist by dripping water through the straw, rather than wetting the surface of the soil.
4. Put a food container in the small jar. Use a bottle cap, or make one out of aluminum foil.
5. Embed a piece of string in the soil and let it hang down into the smaller jar.
6. Put insects in the refrigerator for about five minutes to calm them, then gently place them on the soil.
7. Cover the large jar with cheesecloth attached with a

rubber band, tape black construction paper around each farm, and affix a label (naming the ant and student group) to the construction paper.

Observe farm activity by removing the black paper. Feed the ants three times a week with bread crumbs, rice, carrots, seeds, and apples.

Groups should observe and record farm activity at least twice a week for two weeks. For ants, record and graph how long it takes the colony to build tunnels. Note whether the ant colony has a queen and try to determine the job of the queen ant (see Figure 3). Note how each ant farm differs. After two weeks of observation, groups should compile a detailed portfolio of their results on the laptop. Include sketches, digital photos taken on the field trip, and written descriptions of behavior, habitat, and species variation. Use one class session to prepare for group reports and one class session to hold the presentations. Use laptops to present the material to the class.

Figure 3: Types of ants



Note: Illustrations are not to scale

ASSESSMENT

Assess students based on:

- ◆ performance during the field activity;
- ◆ quality of lab notebook;
- ◆ incorporation of laptop technology in fieldwork; and
- ◆ use of technology in the group presentation.

REFERENCES

Books

Heimler, Charles H. *Focus on Life Science*. USA: Charles E. Merrill Publishing Company, 1986.

Articles

Knausenberger, Walter I. and Houston Holder. 1980. *The Who, Where and Why of Stinging Ants*. University of the Virgin Islands Cooperative Extension Program, St. Croix Campus.

Web sites

Discovery Online Ant Camera:
<http://www.learningchannel.com/cams/ant/antmain.html>

Entomology for Beginners:
<http://www.bos.nl/homes/bijlmakers/ento/begin.html>

Gordon's Ant Page: <http://www.insect-world.com/main/ants.html>

Nature's Alien Empire. An introduction to insects:
<http://www.pbs.org/wnet/nature/alienempire/>

University of Delaware General Key to Insects. An online guide to classifying insects:
<http://bluehen.ags.udel.edu/insects/keys/topkey.html>

University of Kentucky's Insect Collecting Techniques:
<http://www.uky.edu/Agriculture/Entomology/ythfacts/collecti.htm>