

ABSTRACT

Computers have become indispensable in most work and educational settings, and laptop computers are especially useful in field sciences such as ornithology. *For the Birds* empowers young scientists to collect, store, analyze, and present results of hypothesis-driven ornithological investigations. Students develop original investigations, form basic hypotheses, design an experiment, and test their theories about bird communities. After completing fieldwork, students work in groups to write short research papers. *For the Birds* culminates in an oral presentation of each group's original work to the rest of the class.

TIES TO CURRICULUM

Fulfilling many of the *National Science Education Standards*, students will undertake a scientific investigation and design, conduct, communicate, and evaluate their work. Students summarize data and present results through written reports, tables, graphs, and oral presentations. They calculate sums, frequencies, and averages, and will use these calculations to create graphs of the data.

LEARNING OBJECTIVES

Students will be able to

- ◆ list features of an ecosystem;
- ◆ identify several local bird species;
- ◆ work in groups to formulate an original hypothesis and test their theory by collecting and analyzing data;
- ◆ perform math functions such as sums, average, and frequency; and
- ◆ create graphs and charts depicting data.

NUMBER OF LAPTOPS AND GROUP SIZE

You can conduct this lesson with only one laptop, but it is ideal to have one laptop for every group of four students.

TIME REQUIREMENT

For the Birds requires approximately eight hours. Time estimates for each activity are as follows:

Task	Time	Location
Set-up	1 hour	Field
Introduction	1½ hours	Classroom
Field activity	1–2 hours	Field
Data analysis	1 hour	Field
Report	2 hours	Classroom/library/homework
Presentation	1 hour	Classroom

MATERIALS

- ◆ Laptop computer(s)
- ◆ Word processing and spreadsheet software, and Internet access
- ◆ Field guides to birds
- ◆ Binoculars
- ◆ Bird feeders
- ◆ Bird seed (several types)

LESSON DESCRIPTION**Teacher Preparation**

Contact a local park or bird organization to find out what birds you might expect to find in your area.

Set-up

Approximately one week before the lesson, locate a study site with your students. The site should include trees or shrubs and other vegetation and be removed from development and noise. Set up as many feeders as there are groups, and begin putting seed out so birds will learn that food is available. Place the feeders in slightly different habitats: one feeder in the open, one near trees, another near water, etc. Use different types of feed and feeders to attract a variety of birds, such as sunflower-seed, corn and millet, and thistle and suet feeders. Refill feeders as needed. Take some students to the study site to fill feeders at least one hour prior to the lesson.

Introduction

Explain that the class will be conducting a study on feeder birds. Younger students may need a specific research question, and can work together to come up with a question (e.g., Do smaller birds come to feeders more often than larger birds? Do Black-capped Chickadees prefer sunflower seed to other types of food?). Older students can work in groups to create their own projects. Students have only a short time in which to collect data, so research questions that can be answered with a 'yes' or 'no' may work best.

Ideas for projects include:

- ◆ counting total bird species and numbers of individuals at different times;
- ◆ determining which type of seed each species prefers;
- ◆ recording bird size as a function of feeding frequency;
- ◆ noting bird species as a function of feeding frequency; and
- ◆ observing aggressiveness as a function of size.

Ask the class to brainstorm about external factors that might affect results, such as

- ◆ surrounding habitat
- ◆ feeder location
- ◆ type of food at the feeder
- ◆ species' food preference

Give groups about 20 minutes to design a data-collection sheet on the laptop computers. The data sheet should allow groups to enter data specific to their research question and then manipulate the data into a graph. Each group must include the following items in its data record: date, time, location, temperature, type of seed at feeder, and surrounding habitat. Students will collect data for 60 minutes in 10-minute intervals.

Photocopy the bird diagram in Figure 1, or make an overhead, and review the key characteristics of birds. Introduce students to using a field guide to identify birds. Point out characteristics and field marks of a bird: size, shape, structure of wings, beaks, and feet, and wing bars, eye-rings, tail spots and rump patches all distinguish species. Using slides or pictures from magazines, have students practice bird identification with field guides prior to the field activity.

SUGGESTIONS

- ◆ Familiarize yourself with the software you intend to use.
- ◆ If computers are limited, groups should create a table with headings into which they can enter data by hand. Each group member should have a copy of the data table.

Figure 1: Basic bird anatomy and field marks

REFERENCES

This lesson is based on Colorado Bird Observatory's field ornithology camp, *On the Wing*, and the idea for researching winter feeder birds was inspired by Cornell Laboratory of Ornithology's citizen science program, *Project Feeder Watch*.

Books

Dunn, Jon L. *National Geographic Field Guide to the Birds of North America, Third Edition*. Washington, DC: National Geographic Society, 1999.

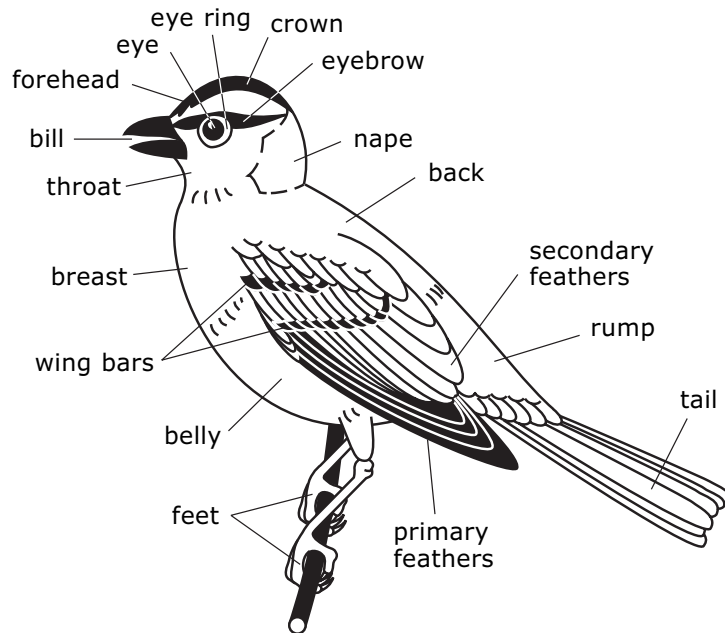
National Research Council. *National Science Education Standards*. Washington DC: National Academy Press, 1996.

Peterson, Roger T. *A Field Guide to the Birds: A Completely New Guide to All the Birds of Eastern and Central North America*. New York: Houghton Mifflin, 1998.

Peterson, Roger T. *A Field Guide to Western Birds*. New York: Houghton Mifflin, 1991.

Robbins, C.S., B. Bruun, and H.S. Zimm. *A Golden Guide to Field Identification: Birds of North America*. Racine, WI: Western Publishing, 1966.

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Activity

Working as a class and using field guides, spend time identifying the different birds at the feeders. Demonstrate a time-keeping method so that groups record data consistently. After everyone is comfortable with bird identification and data-collection methods, assign each group to a feeder. Each group member should have a specific role: timekeeper (1), data-entry specialist (1), or bird identification specialist (2+). Students switch roles every 10 minutes. After each interval, the data-entry specialist enters data into the computer. Groups should also sketch the birds on paper, and make at least five observations about the surrounding habitat (e.g., nearby vegetation, height of trees) for the "methods" section of their final research papers. Make observations for at least 40 minutes (four ten-minute intervals) or until students have rotated through all roles.

Data Analysis

After data collection/entry is finished, gather students and guide them through the process of creating a graph from the data. Let each group choose what graph type will best describe its data.

Final Report

Groups use the laptops to write research papers detailing results of their investigations. Reports should be one to three pages long, and should include title, authors, abstract, introduction, methods, results, discussion, conclusions, references. Each group will also give an oral presentation of their results to the class. Students may use resources on the Internet and from the library to supplement field research. After each group has made its presentation, engage the class in a dialogue about what they learned during the entire project: What did and did not work? Were their predictions correct? Did the graphs make analyzing the data more or less difficult? What recommendations do students have for future studies?

ASSESSMENT

Base your assessment on participation in the field activity, written report, and presentation. Students should be able to describe distinct features of an ecosystem, identify several local bird species, be proficient in using a field guide, and feel comfortable using a computer to enter data and create graphs.

REFERENCES, cont'd.

Terres, John K. *The Audubon Society Encyclopedia of North American Birds*. New York: Alfred A. Knopf, 1991.

Web sites

American Birding Association. Regional and state bird checklists: <http://www.americanbirding.org/>

BirdWatch Monitoring Project. A similar project in which students observe birds in a schoolyard habitat: <http://earth.simmons.edu/birdwatch/birdwatch.html>

Colorado Bird Observatory. Ideas, information, and materials about teaching birds in your classroom: <http://www.cbobirds.org/>

Cornell Laboratory of Ornithology. Citizen science programs: <http://www.ornith.cornell.edu/>

National Bird-Feeding Society: <http://www.birdfeeding.org/>

Journey North. A global study of wildlife migration: <http://www.learner.org/jnorth/>

Peterson's Online. Identifying birds and tips on attracting birds to a birdfeeder: <http://www.petersononline.com/>