

ABSTRACT

In *Tree I.D.*, students use a laptop computer to identify leaves they find on a nature walk. Using a remote access connection, students can connect to a variety of Internet sites with leaf identification guides, and develop a working knowledge of native tree species. Students also have an opportunity to use their field research in mathematics class, and develop conclusions from their field data. *Tree I.D.* brings together nature and technology to spark students' interest in science.

TIES TO CURRICULUM

This lesson fulfills several components of the *National Science Education Standards* and the *Benchmarks for Science Literacy: Project 2061* in life science, especially the diversity and unity that characterize life. In this lesson, students learn about related organisms, and learn how to classify trees. In addition, *Tree I.D.* incorporates skills mandated by the *Principles of Environmental Education*, which incorporates human components by exploring environmental problems, and includes opportunities to build skills that enhance learners' problem-solving abilities, such as investigation and data analysis.

TIME REQUIREMENT

The science class portion of *Tree I.D.* takes between 4 and 6 hours. This lesson can also be incorporated into a math class.

Task	Time	Location
Introduction		
Categorization	30 minutes	Classroom
Leaf Examination	45 minutes	Classroom
Computer review	30 minutes	Computer lab
Safety Instruction	15 minutes	Classroom
Field Activity	1–3 hours	Field
Review and assessment	45 minutes	Classroom
Math class (optional)	1½–2 hours	Classroom

LEARNING OBJECTIVES

Students will

- ◆ identify a tree species according to the characteristics of its leaves;
- ◆ develop a working knowledge of trees native to their region;
- ◆ use statistics to quantify issues in science;
- ◆ analyze scientific data mathematically to reach and defend their conclusions;
- ◆ use the Internet as an educational resource; and
- ◆ understand how the scientific community utilizes the Internet.

NUMBER OF LAPTOPS AND GROUP SIZE

Only one laptop computer is required, but one laptop per group of four students is ideal.

MATERIALS

- ◆ Laptop computers—any model that accepts a Local Area Network (LAN) adapter as a PC card
- ◆ LAN adapter PC card (e.g., the Proxim RangeLAN2 7400 PC Card. This card comes with an antenna to receive and transmit information to and from the school.)
- ◆ Access point—transmitter/receiver at the school so students in the field can share Internet access (should include power supply and omnidirectional antenna)

SUGGESTIONS

- ◆ Discuss the data with students before the field experience, and include input from the math teacher so data can be analyzed in math class. For example, students can calculate the mean and median number of leaves, look at the mode and range of findings from each of the cooperative learning teams, and develop graphs and charts to share information with classmates.
- ◆ Give students Web site addresses for leaf identification so students can prepare at home or in the library.
- ◆ Invite parents and teachers along as chaperones.

LESSON DESCRIPTION**Teacher Preparation**

Bookmark Web sites that students can use to identify leaves (see References). Collect leaves for class discussion.

Introduction

Introduce students to the ways in which scientists categorize animal and plant species. Explain that in this lesson, students will examine the classification of trees through its leaves. For example, students can compare needles from coniferous trees with leaves from deciduous trees. Discuss why deciduous trees shed their leaves on an annual basis, why leaves of many deciduous trees change color in the fall, and how losing leaves is actually beneficial for the tree.

Once students have reviewed the preliminary information, the class can begin to examine specific leaves. For example, students can examine a leaf's shape, size, symmetry, coloring, and vein structure to determine characteristics used in differentiating leaves and trees. Students can also learn how leaves are clustered on the tree—are they individual leaves, or are they found in clusters? If they are found in clusters, how many leaves normally make up a cluster? Can this information help identify the tree and the leaf?

Students may need to spend some time in the computer lab to practice using spreadsheets and the Internet. During that time, introduce students to the on-line leaf identification guides.

Instruct students on safety precautions before going into the field. Remind students to stay together and avoid poisonous plants, ticks, and other insect pests, and watch out for dead trees with branches that might fall. Find out from parents and the school which students are allergic to bees or other insects, and learn what precautions to take.

Activity

Break students into groups of four. Each team should gather 20–30 leaves. Using the laptop computer and remote Internet access, students can use on-line field guides to identify leaves. Groups should fill out the spreadsheet with data on the total number of leaves collected, the number of leaves identified, the number of specimens not identified, the species of each leaf found, and the general location of each leaf.

Once the class collects data, groups can discuss these questions: What leaves were found? What Web sites were most helpful? Were any leaves identified incorrectly? Did some teams find leaves that other teams missed? What were the easiest ways to identify leaves? In the field at school, students can graph the frequency of leaf types, and combine results for a class graph.

At school, students can use the laptop to access Web sites, look for more identifying information, or analyze data. As a follow up, schedule another day outside during which teams can only gather leaves not found the first time.

ASSESSMENT

After this activity, students should have a working knowledge of regional tree species. Students should be able to name the characteristics used to identify leaves, and compare the various ways that leaves can be differentiated. Their description will probably focus on deciduous trees, but also ask students to describe some of the distinguishing features of coniferous trees.

Reaction papers are an excellent way for students to discuss what they learned, and what they liked about the lesson. These papers also give students a chance to explain what wasn't clear about the lesson, and what wasn't understood. By developing charts and graphs in science and mathematics class, students can explain their knowledge to peers, and show teachers what they understood about the leaf data.

REFERENCES

Books

American Association for the Advancement of Science. *Benchmarks for Science Literacy-Project 2061*. New York: Oxford University Press, 1993.

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

Web sites

Environmental Education. EELink's Principles of Environmental Education: <http://www.eelink.net/>

The Global Leaf Collection. Leaf guide from Washington State University: <http://www.vpds.wsu.edu/SciForum/Leaf.html>

Foliage-Vermont. Autumn leaf guide: http://www.foliage-vermont.com/html/the_leaves_of_foliage__1_.htm

McRel. Standards and benchmarks for K–12 education: <http://www.mcrel.org/standards-benchmarks/>