REQUIRED SOFTWARE
◆ MICROSOFT EXCEL 97 or MICROSOFT WORKS
◆ MICROSOFT ENCARTA 97 ENCYCLOPEDIA
◆ MICROSOFT WORD 97

OPTIONAL SOFTWARE
◆ INTERNET EXPLORER

ANIMAL LOGIC

Teacher Guide

SUMMARY

This lesson gives students an opportunity to study the traits of three groups of animals and use the information gathered to draw conclusions about how the animals are alike, and how they are different. This exercise is designed to give students an understanding of how shared characteristics can be used in zoological classification.

OBJECTIVES

◆ To show students how a collection of objective traits can be used to classify living things

◆ To apply the concept in a three-way statistical analysis

◆ To form conclusions based on statistical analysis

PREREQUISITE SKILLS

◆ Knows how to open and develop a *Microsoft® Excel* worksheet and use its many functions, including the Autofilter

◆ Knows how to create a *Microsoft® Word* document

◆ Can access information from *Microsoft® Encarta® 97 Encyclopedia*

◆ Knows how to use *Microsoft® Internet Explorer* to access the World Wide Web

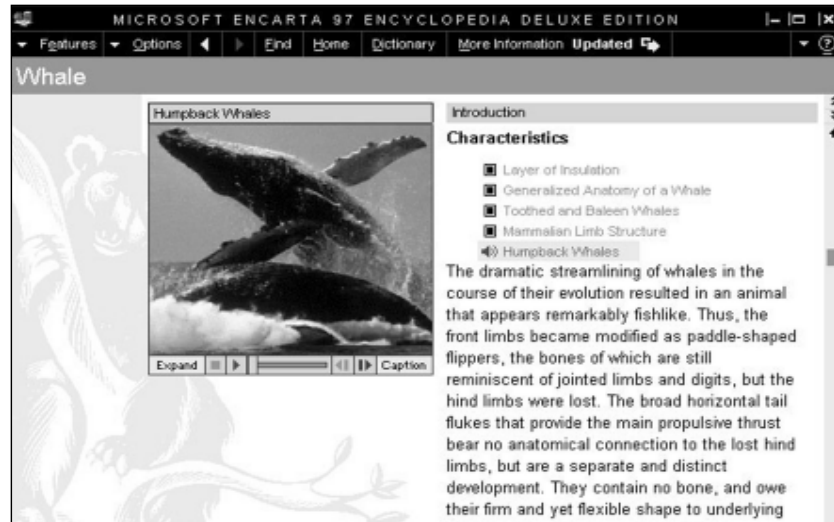### TIME ALLOTTED

Approximately one week

Screen shot of "Whales" from *Encarta 97 Encyclopedia*

HOW TO BEGIN

Explain to students that zoology is a science that deals with animals. Zoologists learn about animals by comparing how animals are similar to and different from each other.

Tell students that in this lesson they will compare three groups of animals based on a list of objective traits, and draw conclusions about the three animals. The first animal in each group is the standard to which the other two animals will be compared.

Invite students to discuss qualities that all animals have in common. What other subgroups for classification can they suggest?

(Note: The animal groups selected were chosen because a comparison of traits might lead to an unexpected conclusion.)

Extension Activities

◆ Suggest that students research the taxonomy of the animals, including their scientific names and placement on tree diagrams.

◆ Have students write a short paragraph using *Microsoft Word* explaining what they learned.

◆ Introduce the topic of biodiversity. Use *Encarta* Biodiversity Collage to learn more about the variety and complex interrelationships of other animals, plants, and living organisms.

Student Activity

DESCRIPTION

In this activity, you will research the characteristics of three different animals in three different groups and conduct a comparative analysis of those animals using *Microsoft Excel*.

STEP 1

Making Predictions

SOFTWARE: Microsoft Word

WHAT TO DO: Look at the three animal groups listed in Chart I. Open a *Word* file and write down a prediction about which two animals in each of the three groups you think might be most alike and why.

Example 1: **Animal Logic worksheet created in *Microsoft Excel***

	ANIMAL LOGIC		
	WHALE	SHARK	ELEPHANT
VERTEBRATE	1	1	1
WARM BLOODED	1	0	1
LIVE YOUNG	1	1	1
OMNIVORE	1	0	0
SKIN	1	1	1
SOCIAL	1	1	1
LUNGS	1	0	1
TOTAL	7	4	6

STEP 2

Researching the Animals

SOFTWARE: Microsoft Encarta; Internet Explorer

WHAT TO DO: Use *Encarta* to research each of the animals listed below, putting together a list of objective traits for each animal. You can select those traits from the list in Chart II. To limit your search, enter keywords with modifications, such as "whales, zoology." For more information about these animals, you might also use *Internet Explorer* to browse a related Web site.

STEP 3

Setting Up

SOFTWARE: Microsoft Excel

WHAT TO DO: To organize your research, open a *Microsoft Excel* worksheet and type the heading: "Animal Logic" in cell A1. To set up your worksheet for the Novice Group of animals, follow these steps:

In row 2, starting in cell B2, type the first three animals to be compared (e.g., whale, shark, elephant). Be sure to list the animals in the order they are listed in Chart I.

In Column A, starting at cell A3, type a list of the objective traits that apply to the whale --

CHART I–ANIMAL GROUPS

Novice Group	Intermedia Group	Advanced Group
◆ whale	◆ bat	◆ spider
◆ shark	◆ owl	◆ shrimp
◆ elephant	◆ mouse	◆ ant

CHART II–OBJECTIVE TRAITS

◆ Vertebrate/invertebrate	◆ Gives birth to live young
◆ Exoskeleton	◆ Carnivore/herbivore/ omnivore
◆ Warm-blooded/cold-blooded	◆ Nocturnal/diurnal
◆ Number of legs	◆ Has exterior fur/feathers/skin
◆ Number of eyes	◆ Lives in a social group/alone
◆ Navigates primarily by ...	◆ Lungs/gills
◆ Lays eggs	◆ Flies/swims/walks

*Example 2: **Microsoft Excel** formula to total list of objective traits*

the first animal in the Novice Group (see Example 1). Each trait should be expressed as briefly as possible. Modify column and row size so that animal names and headings will fit.

In Column B, beginning in cell B3, type the number 1 in the cell next to each trait. The 1 indicates that the whale possesses each of the traits listed.

Using the information you've collected, fill in the cells under Shark and Elephant. For each animal, type the number 1 to indicate that the animal possesses a particular trait; type 0 to indicate that the animal does not possess the trait. For example, type 1 in Cell C3 to indicate that a shark is an animal with a vertebrate.

At the end of your list of traits in Column A, type the word Total. Then, in the cell to the right of that, type the formula **=sum(B3:BX)** where X is the number of the last row in your list of objective traits (see Example 1). Press Enter.

Now, copy the formula in the next two cells to the right. Ask the Office Assistant how to "fill adjacent cells."

STEP 4

Interpreting the Results

SOFTWARE: Microsoft Excel

WHAT TO DO: The first animal in each list of three is the standard to which the two other two animals are being compared. The total score for the first animal equals the most traits that can be shared in the analysis.

Compare the total similar traits of the other two animals. Which is most like the first animal? Is the conclusion as you expected or is it surprising?

To see the traits that all three animals have in common, use AutoFilter. Just follow these steps.

First, click cell B2, choose Filter from the Data menu, then select AutoFilter. A dropdown arrow will appear next to the name of each animal in row 2.

Click the dropdown arrow next to Whale in cell B2 and choose "1." Repeat the same procedure for cell C2 and D2.

These are the traits all of the three animals have in common. Repeat the procedure above and show the traits that none of them have.

To turn off AutoFilter, choose Filter from the Data menu, then choose AutoFilter.

STEP 5

Reporting the Results

SOFTWARE: Microsoft Word

WHAT TO DO: Record and interpret your findings using *Word*. How are the animals alike? How are they different? Did any of the results surprise you? Why or why not? Zoologists ask these questions all of the time.

Be sure you incorporate the worksheet data created in *Microsoft Excel*. Also, you can copy pictures from *Encarta Encyclopedia* or the Internet sites into your *Word* document. ∎