

## SKILLS

Sorting, classifying, comparing

## NATIONAL SCIENCE STANDARD

### Content Standard C Life Science

Students should develop an understanding of the characteristics of living organisms.

## NATIONAL SCIENCE STANDARD

### History and Nature of Science Content Standard G

Students should develop an understanding of science as a human endeavor.

## OBJECTIVES

Students will learn that scientists classify living things according to similarities and differences. Students will learn that one large group of animals is called arthropods. Students will be able to list the characteristics of arthropods. Students will learn that the largest group of arthropods is called insects. Students will be able to list the characteristics of insects and explain how they are distinguished from all other arthropods.

## ASSESSMENT

Given models or photographs of arthropods, students should be able to sort for insects, and explain why they are insects but are also called arthropods.

## MATERIALS

- “Invertebrate Pictures” template
- Chart paper or blackboard
- Plastic arthropod models (optional)

## BACKGROUND

One of the most important jobs of being a scientist is to sort and classify. The science of classification is called systematics. **Systematics** gives scientists the tools to communicate clearly about the natural world. Living organisms are grouped according to how closely related they are (their evolutionary history). These groups start out very large and become increasingly specific until finally scientists name



**SUBJECTS**  
SCIENCE



**TIME**  
Preparation  
10 minutes  
  
Teaching  
60 minutes  
  
Evaluation  
10 minutes



**VOCABULARY**  
(see definitions on page 4 of lesson)  
  
systematics  
entomologist  
exoskeleton  
vertebrae  
arthropod  
thorax  
abdomen  
antennae  
invertebrates

individual species. Each species has a scientific name that is recognized anywhere in the world no matter what language is spoken.

Most people think that mammals are the most important and numerous group of animals on the earth. If asked to name a list of animals most people will name mammals long before they name any other group. In reality mammals are a relatively small group, and insects are a much, much larger group. There are about 4,500 species of mammals and over a million known species of insects. Eighty percent of the world's animals are insects.

If an animal has an exoskeleton, segmented body and jointed legs, and is symmetrical on both sides of its body (bilaterally symmetrical) then it fits into the group scientists call arthropods. Insects are the largest group of **arthropods**. There are five major groups of arthropods. Scientists call each of these groups a **class**.

Insects are the largest class.

## **LESSON PRESENTATION**

### **Activity 1**

Use the assortment of invertebrate pictures that accompany the “Are You One of Us?” lesson (downloadable as the PDF file, Invertebrate Photographs Template). Divide the students into small groups. Each group should have 15-20 pictures. Ask the students to sort the pictures into piles. Give the students a specific time limit and have them work cooperatively, talking about how they are making the decisions.

**Sort:** Ask the students to sort the pictures in any manner they choose. When they are finished they must be able to state reasons for the categories they choose. Ask each group to share how they sorted their pictures.

**Explain** to the students that they are “doing what scientists do.”

One of the most important jobs that scientists do is to sort and classify. Scientists must have a system for grouping and naming living things when they are discovered. All scientists all over the world, no matter what language they speak, must use the same system for grouping and naming living things.

This particular field of science is called **systematics**. Scientists all over the world have to agree on a system for naming things so they can identify and name new living things as they are discovered. The need to name new living things is particularly important in the rainforests of the world because so many scientists are working there and finding living things they have never seen before. One of the largest groups of animals that still has many unclassified members is the insects. Scientists that specialize in the study of insects are called **entomologists**.

**Explain:** Entomologists know that all insects have certain characteristics that identify them as belonging to this group.

Ask students if they can describe the characteristics of insects.

Insects have:

- An exoskeleton
- Three body parts: **head, thorax, abdomen**
- Six legs attached to the thorax
- Many adult insects have wings also attached to the thorax
- Many adult insects have two **antennae** attached to the head

(Write this list on the board or large chart so children can refer to it.)

### **Activity 2**

**Sort:** Ask the students to sort their piles again. This time sort the insects from the non-insects. The students should work cooperatively in groups, talking together about their decisions.

Discuss and clarify their decisions about which animals should be placed in which piles.

**Brainstorm:** Ask students to name as many insects as they can. As they name them write them on the board or a large sheet of chart paper. If spiders or other non-insects are named, put them in a separate list. When the students have exhausted their ability to name insects (and other related organisms) ask about the separately listed group: spiders, other arachnids, millipedes, centipedes etc. Ask students why these organisms were put in a different list. Explain that they are related to insects but are part of a bigger category that scientists call **arthropods**. Ask students what characteristics they think spiders share with insects, centipedes, and crabs.

**Explain:** All of the animals named do not have backbones. They are called invertebrates. One large group of invertebrates have exoskeletons. Their skeletons are on the outside of their bodies. Their bodies are segmented and their legs are jointed. Do all of the animals that you named have exoskeletons and segmented bodies and jointed legs? (This explanation and resulting discussion should clear up any confusion about worms, slugs, snails, etc. on the list.) If an animal has an exoskeleton, segmented body and jointed legs, and is symmetrical on both sides of its body (bilaterally symmetrical) then it fits into the group scientists call **arthropods**. Insects are the largest group of arthropods. There are five major groups of arthropods. Scientists call each of these groups a class.

Insects are the largest **class**.

### **Activity 3**

**Keeping a list:** Post several large, chart-size pieces of paper in the classroom. Encourage children to continue to add names of insects to the list. Challenge them to try to fill sheets without using resource books to look up the names of specific insects. How long will it take to fill the sheets of paper?

Challenge them to be as specific as possible (for instance write “monarch butterfly” or “luna moth” instead of just butterfly or moth).

How many new sheets of chart paper will it take before the students have exhausted their knowledge of names of insects without having to consult resources?

## DEFINITIONS

**abdomen**—one of three regions of an insect's body.

**antennae**—sensory organs attached to and extending from the head.

**arthropod**—an animal that has an exoskeleton, segmented body and jointed legs, and is symmetrical on both sides of its body (bilaterally symmetrical).

**entomologist**—scientist that specializes in the study of insects.

**exoskeleton**—skeleton on the outside of an animal's body. Arthropods have exoskeletons.

**invertebrates**—group of animals without backbones.

**systematics**—the science of classification. Living organisms are grouped according to how closely related they are (their evolutionary history). These groups start out very large and become increasingly specific until finally scientists name individual species.

**thorax**—one of the three regions of an insect's body. An insect's wings and legs are attached to the thorax.

**vertebrae**—bones that make up the backbone of a vertebrate animal.