Classification

Scientific Background

Classifying is grouping ideas, information, or objects based on similarities. Many objects in our daily lives are classified. Libraries, video stores, and grocery stores are some examples of a place where we group similar things to make them easier to find.

All living things can be classified into one of six *kingdoms*:

Animals - Many celled, cannot make their own food

Plants - Many celled, make their own food (photosynthesis), and do not have their own means of movement

Fungi (mold, mushrooms, yeasts) - Many celled, absorb food from living or dead things (such as logs)

Protista (protozoa and some algae) - Single celled (although some form colonies), the cell nucleus is enclosed by a membrane, some make their own food, others absorb food

Eubacteria (true bacteria, blue green algae) - Single celled without a nucleus, some make their own food, others absorb food

Archaebacteria (bacteria-like organisms that live in harsh environments without oxygen) - Single celled without a nucleus, absorb food

All members of the six kingdoms are further classified into smaller groups, or *taxa* (plural of taxon). Each species is identified by its Kingdom, Phylum, Class, Order, Family, Genus, and Species, and can only belong to one of each taxon. The *species* is the smallest classification category, with the genus and species making up the scientific name of the organism. This two-word naming system is called *binomial nomenclature*.

The science of classifying and naming organisms is called *taxonomy*. Greek philosopher and scientist Aristotle is considered the first person to create a system to classify plants and animals in about 350 B.C. In the 18th century, botanist Carolus Linnaeus adapted Aristotle's system, refining how animals and plants are classified. Scientists today are using electron microscopes and DNA analysis to observe similarities and differences between plant and animal species.

All of the ***Backyard Bugs*** are members of the Phylum Arthropoda. For an animal to be an Arthropod, it must have a hard external skeleton and jointed legs. Within the Phylum Arthropoda, there are four Classes that have their own specific characteristics.

Crustacea - crabs and prawns

Myriapoda - centipedes and millipedes

Chelicerata - spiders and scorpions

Insecta - beetles, flies, butterflies, and other insects

Within the Class Insecta there are many Orders, such as:

Orthoptera - cockroaches, mantids, and stick insects
Lepidoptera - butterflies and moths
Diptera - flies
Hymenoptera - ants and bees
Odonata – dragonflies
Coleoptera – beetles
Hemiptera – bugs
Neuroptera - antlion
Trichoptera - caddisfly

Insects are placed in orders based on physical features, such as number and type of wings, mouthparts, eyes, and legs. For example, almost all Lepidoptera have four scaly wings, sucking mouthparts, and compound eyes.

Students can classify each of the Level 2 ***Backyard Bugs***. These activities can be found by navigating to each Level 2 bug screen, then clicking the multi-level classification icon at the bottom of the screen.

Vocabulary

- Araneae
- binomial nomenclature
- Class
- Coleoptera
- Genus
- Hymenoptera
- Lepidoptera
- Neuroptera
- Order
- Phylum
- taxonomy
- Arthropoda
- Chelicerata
- classify
- Diptera
- Hemiptera
- Kingdom
- Myriapoda
- Odonata
- Orthoptera
- Species
- Trichoptera

*Vocabulary definitions can be found in the **Backyard Bugs** Glossary.*

Thinking Question

What are some of the benefits of classifying bugs?

Additional Exploratory and Extension activities are available in the *Backyard Bugs* Teacher's Guide.

Shoe Dichotomous Key

A dichotomous key is a tool that allows the user to determine the identity of items in the natural world, such as trees, wildflowers, mammals, reptiles, rocks, and fish. Keys consist of a series of choices that lead the user to the correct name of a given item. "Dichotomous" means "divided into two parts". Therefore, dichotomous keys always give two choices in each step.

In order to investigate dichotomous keys, students will classify their shoes. (You can use any group of classroom items to build a dichotomous key.)

Have each student remove one shoe and place it in a pile. Select one shoe and ask students to identify one general property of the shoe (having laces, for example). Divide the remaining shoes into two piles, the one WITH the property and the one WITHOUT the property. Next take either group of shoes and divide it again by one property (brown, for example).

Record their key using the format:

1.	a. has laces	go to step 2
1.	b. does not have laces	go to step 3
2.	a. brown	go to step 4
2.	b. not brown	go to step 5

Continue until all shoes have their own individual category. Each student should name all the characteristics to identify their shoe based on the dichotomous key that the class defines.

Name: _____

Classification of the _____

What is the scientific name or classification for this arthropod?
What are the characteristics that help classify the arthropod?
Draw a picture of the arthropod. Label its features.

Answer Key

Classification of the _____

What is the scientific name or classification for this arthropod?

Antlion:	*Myrmeleo*
Blephariceridae Larva:	*Blephariceridae*
Caddisfly:	*Trichoptera*
Centipede:	*Chilopoda*
Cockroach:	*Periplaneta americana*
Dragonfly:	*Odonata*
Giant Water Bug:	*Lethocerus americanus*
Hickory Horned Devil/Regal Moth:	*Citheronia regalis*
Honey Bee:	*Apis millifera*
Luna Moth:	*Actius luna*
Mantis:	*Tenodora aridifolia*
Millipede:	*Diplopoda*
Monarch Butterfly and Caterpillar:	*Danaus plexippus*
Mosquito:	*Culex*
Spider:	*Aphonopelma*
Stick Insect:	*Diapheromera femorata*
Tachinid Fly:	*Diptera*
Viceroy Butterfly:	*Limenitis archippus*
Whirligig Beetle:	*Gyrinidae*

What are the characteristics that help classify the arthropod?

Student answers may vary.

Some characteristics that help classify arthropods includes: descriptions of numbers of wings, numbers of legs, types of wings, types of mouthparts, type of life cycle (complete metamorphosis, incomplete metamorphosis, or another type of life cycle), and types of eyes.

Draw a picture of the arthropod. Label its features.

Student answers may vary.