

**TEACHING KATE**  
**TEACHING KIDS ABOUT THE ENVIRONMENT**  
**SPYING ON SPIDERS**

**Grade Level: 4-6**      **Time Required: 5 class periods of 50 minutes each, in September**

**SC Science Standards**

This lesson plan was correlated with only the grade level specified unless otherwise noted.

**Grade 4:**

- I. A. 1. a
- I. A. 4. a
- I. B. 1. c
- II. A. 3. c
- II. B. 1. b
- II. B. 2. a

**Grade 5:**

- I. A. 1. a
- I. A. 4. a
- I. A. 6. a
- II. B. 2. a
- II. B. 3. a, b
- II. B. 4. d

**Grade 6:**

- I. A. 1. d. 1
- I. A. 7. a

**Purpose**

Students will examine spiders. They will learn the parts of spiders and compare and contrast spiders to insects. Students will construct a food chain and a life cycle of a spider. On completion of this unit the student should be able to appreciate the role of the spider as related to biological control in an ecosystem.

**Skills**

Classification, comparison and contrast, identification of relationships, inference, observation, prediction, problem solving, written and verbal communication.

**Concepts**

Spiders have a useful place in ecosystems, biological control is a natural method for reducing numbers of defoliating insects, predator/prey relationships, unmanaged use of pesticides may disrupt the delicate balance of nature.

## Materials Needed

One or more garden spiders (black-and-yellow argiope) collected among shrubbery, tall plants, flowers in meadows, gardens or forests. This spider survives well in adequately ventilated terrariums.

One large poster drawing of this spider with parts labeled  
 Copy of Charlotte's Web by E. B. White  
 Data Observation Journals For Each Student  
 Butter Tubs (or Other Containers) For Trapping Grasshoppers  
 Diagrams of Food Chains  
 Diagrams of Life Cycles  
 Drawing Paper  
 Markers  
 Magnifying Glasses

## Definition of Terms

<u>Abdomen</u>	The posterior section of the body behind the cephalothorax.
<u>Arthropod</u>	Any of a phylum (Arthropoda) of invertebrate animals that have a jointed body and limbs, usually a chitinous shell molted at intervals.
<u>Arachnid</u>	Any of a class of arthropods comprising mostly air-breathing invertebrates having a segmented body divided into two regions of which the anterior bears four pairs of legs but no antennae.
<u>Arachnida</u>	The class to which spiders belong.
<u>Biological Control</u>	Control of population in a certain species under natural predator-prey conditions.
<u>Carnivore</u>	An organism that feeds on animals.
<u>Cephalothorax</u>	The united head and thorax of an arachnid or higher crustacean.
<u>Class</u>	A major category in biological taxonomy ranking above the order and below the phylum or division.

<u>Consumer</u>	An organism that obtains energy by feeding on other organisms and their remains. <u>primary consumers</u> - herbivores <u>secondary consumers</u> - carnivores
<u>Defoliation</u>	Loss of leaves from plants.
<u>Ecology</u>	Scientific study of the relations of living things to one another and their environment.
<u>Exoskeleton</u>	A supportive external covering.
<u>Food Chain</u>	The transfer of food energy from organisms in one nutritional level to those in another.
<u>Food Web</u>	The complex and interlocking series of food chains.
<u>Herbivores</u>	An organism that feeds on vegetation.
<u>Insect</u>	Any of a class (Insecta) of arthropods with well defined head, thorax and abdomen, only three pairs of legs, and typically one or 2 pairs of wings.
<u>Invertebrate</u>	Animals lacking a spinal column.
<u>Life Cycle</u>	The phases, changes or stages through which an organism passes during its lifetime.
<u>Molt</u>	To cast off (an outer covering) periodically.
<u>Pedipalps</u>	Either of the second pair of appendages of an arachnid that are borne near the mouth and are often modified for a special (as sensory) function.
<u>Pesticide</u>	An agent used to control undesirable organisms. Some pesticides can contaminate water, air, soil or accumulate in the tissues of living organisms, and should therefore be used carefully.
<u>Pollution</u>	Harmful substance deposited in the air, water or land, leading to a state of dirtiness, impurity or unhealthiness.

<u>Predator</u>	An animal that hunts or captures other animals (prey) for food.
<u>Prey</u>	An animal taken by a predator as food.
<u>Producer</u>	An organism that synthesizes organic compounds from inorganic substances via photosynthesis or chemosynthesis.
<u>Spinneret</u>	An organ for producing threads of silk from the secretions of silk glands.
<u>Vertebrate</u>	An animal having a spinal column.

### Before the Session

Locate and collect one or more garden spiders (black-and-yellow argiope). One may be displayed in a well ventilated aquarium in the classroom. Once students are exposed to the spider, they will bring in additional specimens for co-operative group activities. Place a limb in the aquarium for construction of a web. Spray the web daily with water. Toss insects (grasshoppers are good) into the web. Draw a large diagram of the garden spider with parts labeled. Draw an example of a food chain. Draw an example of a life cycle. Acquire a copy of Charlotte's Web by E. B. White.

### Background Information

Spiders have been on earth for hundreds of millions of years. They are found on all continents except Antarctica. More than 30,000 species are known with 2,000 living in the United States.

Insects and spiders belong to the phylum Arthropoda. Spiders belong to the class Arachnida and the order Araneae. Arachnida is derived from the Greek myth about Arachne and Athena. Spiders and insects have exoskeletons, an external supportive covering. Spiders molt, shed old exoskeleton and form a new one, when they grow instead of experiencing metamorphosis. Life span for spiders is usually one year. An exception is the tarantula which may live as long as 20 years.

The spiders role in n ecosystem is to eat insects. They eat millions of insects yearly that are harmful to grain crops. Spiders paralyze their prey, secrete digestive juices into their bodies and then suck the liquid into their own bodies.

Six spinnerets on the abdomen are responsible for the production of silk. Spinnerets control the kind of silk produced. Different kinds of silk may be thick, thin, dry, sticky, soft, stretchy or beaded depending on its use. Uses for the silk range from making webs, traps, nests, egg sacs and draglines

to wrapping various captured insects. Spiderlings use silk strands to form balloons for changing locations. Adult spiders are sedentary in that they build a web and remain in that location.

Silk was important to primitive man for fishing, nets, lures, bags and headdresses. It has also been used for cross hairs in astronomical telescopes, levels and surveying equipment.

See diagrams of spider and grasshopper.

### **Suggested Lesson Plan**

#### Day 1

1. Students will observe physical characteristics of a garden spider by examining its physical appearance.
2. Students will draw a diagram consisting of a title, labels and a caption.
3. Teacher will display a prepared diagram and allow students to compare and contrast their observations, noting numbers of legs, body parts, presence or absence of antennae, spinnerets, eyes and presence or absence of wings.
4. Students will write a descriptive paragraph describing characteristics observed.

#### Note

After this lesson the spider may be placed on a tree, shrub or outside window. She will make a web before morning of the next day and will remain in close proximity until she dies.

#### Day 2

1. Students will take plastic butter containers to the field and trap grasshoppers.
2. Return to the spider web noting and discussing its similarities to a net.
3. To observe behavioral patterns of predator and prey, allow students to toss a grasshopper into the web. They will closely observe the spiders techniques for entrapping and wrapping its prey.
4. Students will compose an expository paragraph detailing the procedure a spider uses for catching grasshoppers.

5. Lead a discussion on the behavioral patterns of predators and prey and its relativity to an interacting ecological system.

### **Follow-up**

View a video on spiders and how they catch their prey.

### Day 3

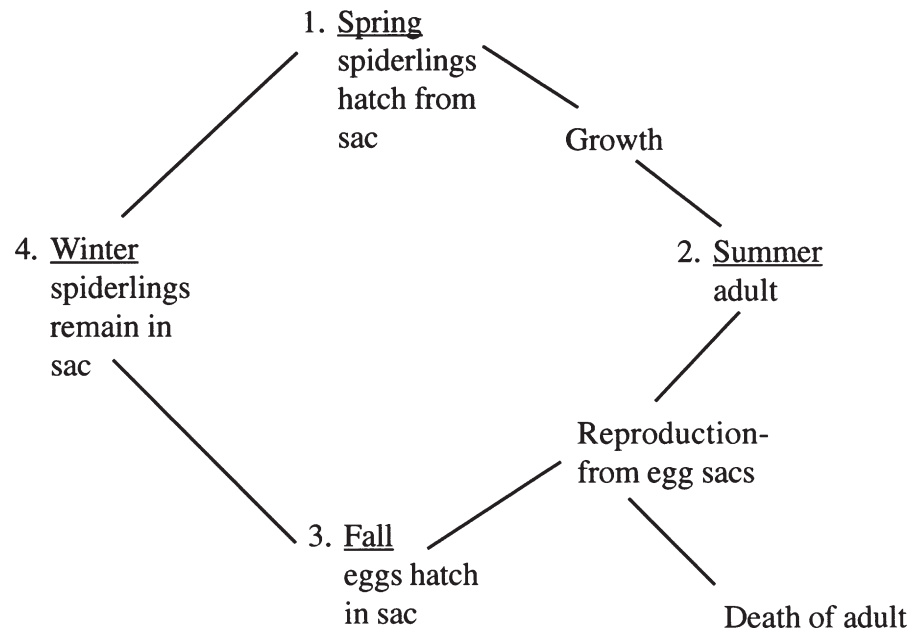
1. Students will compare and contrast the characteristics of spiders and grasshoppers for the purpose of classification by examining specimens of insects (grasshoppers and crickets) and spiders.
2. Each student or group will complete the data table.
3. After observations are made, the students will receive definitions of these terms: herbivore, carnivore, primary consumer, secondary consumer, vertebrate, invertebrate, insect, arachnid.
4. Using the classification guide listed under background information guide students in the classification of their specimens.

### Day 4

1. Teacher instructs and directs class discussion on food chains, including, the effects of exterminating one member of the ecosystem and how that affects the remaining population.
2. Students will diagram a food chain involving wheat, grasshoppers, spiders, lizards, birds, snakes and a hawk. If using a group arrangement, each student can draw one member and the group can arrange them into a chain.
3. Other related activities which can be used are Project Wild, “Interview a Spider” on pages 14-16 and “Grasshopper Gravity” on pages 16-19.

### Day 5

1. Teacher will introduce life cycles during direct instruction.
2. A class discussion of Charlotte’s Web by E. B. White can be included. If students have not been saturated with this story, the book can be read as a text set for language arts or read aloud.
3. Students will construct a life cycle. It should be constructed as a circle with death of adult breaking off the circle at the time of reproduction.



### Application

Ask students to brainstorm and cite other examples of biological control. Examples are grass carp — hydrilla, striped bass — shad, alligator weed eater — hydrilla, praying mantis — insects, lady bugs — aphids, bacteria — waste products, and sludge and crude oil. Let the students come up with why and how these could be used for the good of mankind and who would they be beneficial for, what profession.

Collect information and write on the board. Instruct students to form a food web.

### Resources Available

Charlotte's Web. E. B. White.

Critters, AIMS Activities. 1989. Aims Education Foundation.

Elements of Ecology. 1992. R. L. Smith. Harper Collins Publishers.

Environmental Education Activity Guide. 1993. American Forest Foundation.

The Audubon Society Field Guide to North American Insects and Spiders. Alfred A. Knopf, Inc.

Prepared by: Rebecca Goodnight

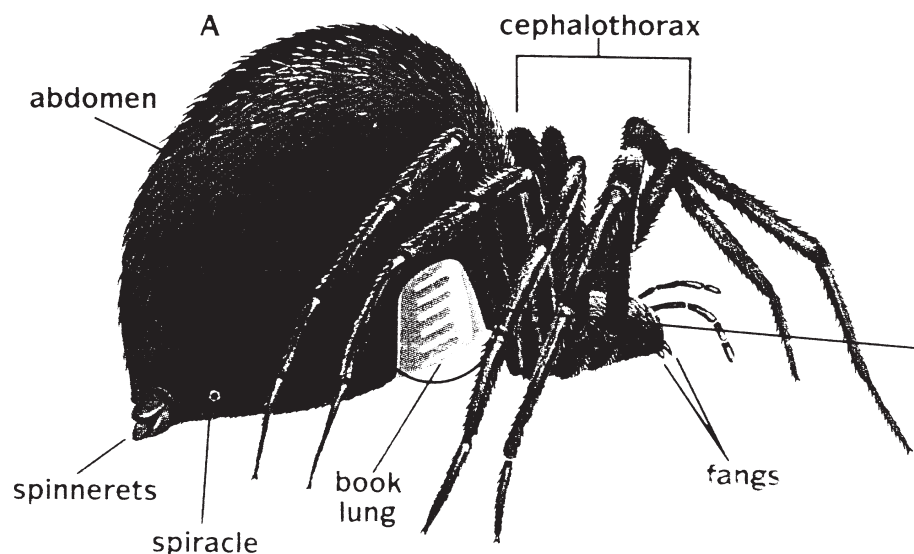
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SPIDER DIAGRAM

Spiders

1. Have 8 legs
2. Have 2 main body parts, a cephalothorax, which is the head and thorax fused together and an abdomen.
3. Usually live on land.
4. Have no antennae.
5. Usually are carnivorous and paralyze their prey with poison.
6. Most spin silk from spinnerets on their abdomens.
7. Usually have 8 simple eyes and no compound eyes.
8. Have no wings.



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**GRASSHOPPER DIAGRAM**

Insects

1. Usually have 6 legs.
2. Have 3 main body parts (head, thorax and abdomen).
3. Found on water and on land.
4. Have antennae.
5. Eat a variety of things both plant and animal.
6. Don't spin silk except rarely from glands in the mouth.
7. Usually have 2 compound eyes and several simple eyes.
8. Usually have 2 pairs of wings.

