

University of Kentucky Department of Entomology Insects in the Classroom - Lesson Plan **SPIDER SAFARI**

For Intermediate Grades (4-5)

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Activity Description

Field investigation of structures and behaviors used by spiders to hunt prey, followed by presentation/discussion
For Intermediate Grades 4-5

Objectives

- ❖ Students will learn about the structures and behaviors that different types of spiders use to hunt and survive. Students will also deliver a formal group presentation.
- ❖ Students will search a forest environment and an indoor environment and record numbers and types of spiders that they discover.
- ❖ Students will write a brief report about one of the spider families that they observe.
- ❖ Students will gather in groups during the following class period to communicate and discuss the pros and cons of different spider hunting and survival techniques.

Academic Expectations

The above objectives fall under the following KERA Academic Expectations:

- 2.2 Identify, analyze, and use patterns such as cycles and trends to understand past and present events and predicting possible future events.
- 2.3 Identify and analyze systems and the ways their components work together or affect each other.

Program of Studies

- S-4-LS-3 Organisms have different structures that serve different functions. These structures are used to sort organisms into groups.
- S-4-LS-7 Organisms' patterns of behavior are related to the nature of organisms' environments. There are many different environments on Earth that support different types of organisms
- S-5-LS-1 Recognize the relationship between structure and function at all levels of organization (e.g., organ systems, whole organisms, ecosystems)

Core Content

- SC-E-3.1.3 Each plant or animal has different structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.
- SC-E-3.3.2 The world has many different environments. Distinct environments support the lives of different types of organisms. When the environment changes, some plants and animals survive and reproduce, others die or move to new locations.
- SC-M-3.1.1 Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, tissues, organs, organ systems, organisms, and ecosystems.

SPIDER SAFARI

All spiders are predators. They eat insects, earthworms, and even other spiders. Large species prey on vertebrates like fish, rodents, and birds. All spiders have fangs and most of them use venom to immobilize their prey.

Many spiders snare prey with silken webs, but not all spiders use webs. Some spiders are active hunters that patrol the ground for crickets and beetles. Others sit camouflaged on flowers, waiting to ambush bees. In addition, the species that use webs have hunting strategies that vary tremendously depending on the type of spider. Different types of spiders have different behavioral and structural adaptations which help them capture prey and survive in their environment.

Thanks to their many hunting adaptations, spiders are very successful creatures. In fact, spiders can be found almost anywhere. There are spiders in caves, barns, streams, and trees. Some spiders are able to dive underwater in search of food. Some spiders thrive inside homes, too.

This lesson is divided into two main parts. A "Spider Safari" will allow students to introduce themselves to different kinds of spiders. The presentation which follows will allow students to compare the different survival adaptations exhibited by each kind of spider.

In addition to introducing students to spider diversity and adaptations, this exercise will reinforce such concepts as: scientific classification of organisms, food chains, interactions between organisms in their environment, ecological niches, and structure and function in living systems. This exercise also requires library or Internet research, and allows students to present and discuss their findings.

Essential question for this activity: "What kinds of spiders live in my (schoolyard, house, neighborhood) and what structures and behaviors do they use to hunt and survive?"

The Safari: Kentucky is full of spiders. A short hike through a forest or a walk through a meadow or garden will reveal dozens of different kinds of spiders. Spiders are also easy to find in homes and other man-made structures - if you look in the right places.

For this exercise, take a few minutes to describe the Spider Safari to students. Explain that the Students will be looking for eight different kinds of spiders, which are described below. These represent different spider families. All of these kinds of spiders will occur outdoors and indoors, but some are more likely to occur in one or the other. Make sure that students know the basics about spiders: eight legs, two body-parts, the fact that they are predators, etc. But don't spend too much time on the different kinds of spiders: the goal for this exercise is to let students learn about the different kinds of spiders through their own observations, research, and during the follow-up presentations. The "Spider Safari Survey Sheet" that you hand out will have the name of each kind of spider, and what it (or its web) looks like. That's all the students need for the safari.

First, arrange a trip to a local forested area, garden, or a meadow. Even a small patch of woods will do or a weedy fencerow near the school. The best time to look for spiders in Kentucky is September. This safari will involve a search of at least one indoor and outdoor environment for 30 minutes each. Note that the

time may be longer or shorter than 30 minutes depending on your schedule, but keep the searching times between the two environments equal. In the observations section, the student should write down such things as: what color the spider was, what it was doing, and what its environment was like (indoor? outdoor? shady? near water? under a rock? etc.).

You could also assign the safari as homework, especially for the “indoor” search. Encourage the students to try a number of different environments, and to search during both the day and night (if they dare!). Barns and work sheds count as “indoor” environments, and will invariably have lots of spiders. Tell students that they don’t have to go into creepy, dangerous places like basements or attics to find spiders- spiders are very common in living rooms and bedrooms if you look hard enough! It is not necessary for everyone to find all eight different kinds of spiders, but they should be able to find at least three. Also remember to warn students not to handle the spiders. Spiders are normally not dangerous, but they are wild animals, and should be treated with respect. Give the students a few days or a weekend for the Spider Safari if you assign it as homework.

As part of the Spider Safari, the students will be asked to pick one of the types of spiders that they observed. They will then find some information about this type of spider, including the family name and the adaptations that the spider uses to capture prey and survive in its environment.

Presentation: When students come back to class with their Spider Safari Survey Sheets and reports, divide the students into groups based on which kind of spider that they choose to do a report on. Or, it may be best to divide them into just two groups: “web-building spiders” vs. “hunting and ambush spiders”. Hand out the “Spider Presentation” sheets and give the groups a few minutes to prepare a brief oral presentation for their kind of spider. Following these presentations, the students can discuss the pros and cons of the different types of hunting structures and behaviors used by spiders.

Below are some basic facts about each of eight very common spider families. This information is for you – let the students find it on their own in the references listed on their “spider report” page! There are plenty more types of spiders than these, but these are the ones that are probably the easiest to find and recognize in Kentucky.

WEB-BUILDING SPIDERS

When most people hear the word “spider,” they think of web-building spiders. Orb-weavers, cobweb spiders, and others produce strands from silk glands located on their abdomens that they use to create prey-snaring structures. The type of structure varies with age, species, and (especially) spider family. Web-building spiders are probably the ones that we see the most, but that doesn’t mean that they are the most common. Generally, web-building spiders have small eyes and poor eyesight: since their webs catch food for them, web-building spiders don’t need to see as well as other kinds of spiders.

Orb Weavers: Spiders in this family (and a few other uncommon families) are the only ones that build "orb-webs." Compared to other kinds of spider webs, orb webs appear the most organized to human eyes. Orb webs consist of a series of rays and connectors that looks like a group of concentric circles. Orb-weavers typically have large, robust abdomens. Orb weavers tend to be found outdoors where they have plenty of space for their intricate webs.

Cobweb Spiders: Cobweb spiders are similar to orb-weavers, but their webs are not constructed in recognizable geometric patterns. Cobwebs also tend to be more three-dimensional than orb-webs, which are usually flat. Cobweb spiders and orb-web spiders look very similar, and the best way to tell them apart is by their webs. Cobweb spiders are fairly common inside homes, probably because they don't need much space for their webs. The notorious "black widow" is a member of this family, but all of the other cobweb spiders found in Kentucky are not dangerous.

Cellar Spiders: Cellar spiders are very common in homes where they build webs that look very much like cobwebs. Cellar spiders are much larger than most cobweb spiders though, and have very long, skinny legs. These spiders are often called "daddy-long-leg" spiders, but these spiders are not related to the other kind of daddy-long-legs (which are not really spiders at all, and do not build webs).

Funnel Weavers: Funnel weavers typically build a flat, dense web close to the ground that curls into a funnel. These spiders usually wait deep inside the funnel, and when something falls or stumbles into the web, the spider rushes out and grabs it. The end of the funnel often dips into a crevice or underneath a rock, which provides the spider with protection. Funnel webs are often especially visible on late summer mornings thanks to heavy dewfall.

HUNTING/AMBUSH SPIDERS

Wolf spiders, crab spiders, and others don't rely on webs to catch their food. Instead, these spiders actively hunt for prey, or lie in ambush. These spiders often have very keen eyesight. Although these spiders don't use silk to hunt, many of them will wrap their egg cases in webbing, or have other uses for silk. Because of this, a little webbing may be present where these spiders are found, but not enough to snare prey.

Wolf Spiders: Wolf spiders are extremely common both indoors and outdoors. They are often seen under rocks and pieces of wood. These spiders run quickly over the ground in search of prey. Most wolf spiders are gray, black, or brown, and are somewhat hairy. After laying her eggs, female wolf spiders of many species will carry their egg sacs until the eggs hatch. Upon hatching, the spiderlings will then "ride" on the mother's back until they are ready to hunt on their own.

Fishing Spiders: Fishing spiders are very similar to wolf spiders, but tend to be a little lankier. They are commonly encountered near streams and ponds, where

they will sometimes catch small fish, tadpoles, and other aquatic creatures. Fishing spiders are able to "walk on water." They are also able to go underwater to escape predators. Fishing spiders can get to be very large, with leg spans approaching three inches!

Jumping Spiders: Spiders in the family Salticidae have a distinctive, flat-faced appearance. Jumping spiders also have very large eyes: of all insects and spiders, jumping spiders may have the best eyesight. Jumping spiders are also characterized by a "herky-jerky" way of moving around. In fact, it looks like they are hopping small distances every time they move. Although they hop most of the time, jumping spiders are able to jump long distances as well. Jumping spiders are very common inside homes and in yards and gardens, and are very easy to find. Unlike many other kinds of spiders, jumping spiders are active during the day. Although jumping spiders don't use webs to catch food, they will use a strand of silk to secure themselves when they are jumping long distances (like Spider Man!).

Crab Spiders: Crab spiders don't use webs, but they aren't really active hunters either. Crab spiders are ambush predators. They sit and wait for prey. Most crab spiders are camouflaged, and are able to hide in flowers without being seen. When a bee or fly visits the flower, the crab spider is able to grab it. Crab spiders have potent venom, and are able to catch insects that are much larger than themselves. Crab spiders look a little like crabs, with long front legs and flat bodies. Many of the common crab spiders in Kentucky are brightly colored. Bright green, yellow, and orange varieties are often seen.

SPIDER RESOURCES

These online and print resources have additional information about spiders. This list is reprinted on the "spider report" section for the students to use. You may find other resources in the library or online, but these are some of the best.

- 1. Spiders and Their Kin (A Golden Guide)** by H. Levi and L. Levi
This inexpensive guide contains detailed drawings of all of the common spider families (and many species) that occur in the Eastern United States.
- 2. University of Kentucky Spider Files:**
<http://www.uky.edu/Agriculture/CritterFiles/casefile/spiders/spiderfile.htm>
This online guide contains pictures and information for most of the common types of spiders found in Kentucky.
- 3. National Audubon Society Field Guide to North American Insects and Spiders** by L. J. Milne and S. Rayfield
Contains photos of many spider families and species. Not all of the spiders listed in this book live in Kentucky, but many of them do.
- 4. BugGuide: Spiders**
<http://bugguide.net/node/view/1954>

BugGuide.net is an online picture gallery with images of many insects and their relatives. The spider section contains many spider that live in Kentucky.

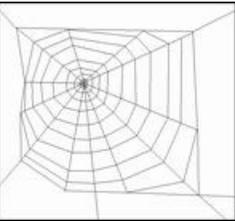
NAME _____

SPIDER SAFARI

SPIDER SAFARI SURVEY SHEET (40 points):

Find as many of the different kinds of spiders listed below as you can. You don't have to find all of them, but you should be able to find at least three kinds. And make sure you find at least one web-builder and one hunting/ambush spider. Write down where you observed the spider, and anything else interesting as well: What color was the spider? What was it doing? What did its environment look like?

REMEMBER: "Daddy-long-legs" aren't real spiders!

WEB-BUILDERS: Catch prey in webs	OBSERVATIONS
<p style="text-align: center;">ORB-WEAVER</p> <div style="display: flex; justify-content: space-around;"></div> <p>Webs are intricate and geometric. These spiders are very common in gardens and barns, but are found almost everywhere.</p>	
<p style="text-align: center;">COBWEB SPIDER</p> <div style="display: flex; justify-content: space-around;"></div> <p>Usually have spherical abdomens. Webs look messy and unorganized. Cobweb spiders are very common in garages, inside homes, and in sheds and barns.</p>	
<div style="display: flex; justify-content: space-between;"><p style="text-align: center;">CELLAR SPIDER</p><p>Long, skinny legs, small bodies. Webs are messy, like cobwebs. These spiders are much larger than cobweb spiders, though. Very common in attics, basements, and pantries.</p></div>	
<p style="text-align: center;">FUNNEL WEB SPIDER</p> <p>Many species also called "grass spiders." Usually brown. Look somewhat like wolf spiders, but wolf spiders do not live in webs. These spiders run very fast. Common low to the ground on lawns and near piles of rocks. As their name suggests, these spiders make webs that look like funnels.</p> 	

NAME _____

SPIDER SAFARI

HUNTING/AMBUSH SPIDERS: No webs	OBSERVATIONS
<p>WOLF SPIDER Large, hairy spiders. Usually brown, gray, or black. Look like funnel web spiders, but do not live in webs. Wolf spiders are also more common than funnel web spiders. Found under rocks, leaves, and logs.</p> 	
 <p>FISHING SPIDER Similar to wolf spiders, but usually larger and skinnier. Found beside creeks, ponds, and streams under rocks and out in the open. Very fast.</p>	
<p>JUMPING SPIDER Distinctive, flat-faced, big-eyed appearance. Move in a spastic, "herky-jerky" fashion. Usually hairy and colorful, with large eyes. Common indoors and outdoors. Look on tree trunks, the sides of buildings, and on fences.</p> 	
 <p>CRAB SPIDER Resemble crabs, with flat-bodies and long front legs. Often "neon" green, yellow, orange, or bright white. Found in flowers.</p>	

All photos courtesy R. Bessin and B. Newton, Department of Entomology, University of Kentucky

NAME _____

SPIDER REPORT

PICK A SPIDER (60 points):

Pick one of the kinds of spiders that you observed. Use your observations, books, and the Internet to answer the following questions about the **structures** and **behaviors** that your spider uses to survive and hunt for prey.

Type of Spider: _____

1. Does your spider use a web to catch prey?
2. What structure does a spider use to create webs?
3. If your spider builds a web to catch prey, what shape is the web, and how might this influence its ability to catch certain types of prey? For instance, funnel weaver spiders build webs close to the ground, and probably catch creatures on the ground, whereas orb-weaver spiders often build webs high in the air to catch flying creatures.
4. If your spider does not use a web to catch prey, what other behaviors or structures does it use to catch prey (such as: jumping, waiting in ambush, good eyesight)?
5. Many spiders that build webs have fat, round bodies. Hunting and ambush spiders are often have a flattened shape. How do you think these different shapes relate to the way that these spiders hunt?

NAME _____

SPIDER REPORT

6. What color is your spider, and how might its coloration help it capture prey? Would your spider's coloration help protect it from predators?

7. In what kind of environment did you observe your spider? Outdoors? Indoors? Under a rock? On a tree? Near water? Write down as much detail as you remember.

8. Does your spider's color match or contrast with the color of its environment?

9. What other structures or behaviors help your spider survive in its environment? For instance, many spiders quickly drop from their webs if they are threatened by predators.

Some places to look for spider information:

Spiders and Their Kin (A Golden Guide)

by H. Levi and L. Levi

The University of Kentucky Spider Files:

<http://www.uky.edu/Agriculture/CritterFiles/casefile/spiders/spiderfile.htm>

National Audubon Society Field Guide to North American Insects and Spiders by L. J.

Milne and S. Rayfield

BugGuide: Spiders

<http://bugguide.net/node/view/1954>

SPIDER PRESENTATION

Names of the people in your group:

SPIDER TYPE: _____

HUNTING STRATEGY (check one): Web-building hunting ambush

HUNTING STRUCTURE AND BEHAVIORS: For your presentation, explain to the other groups the structures and behaviors that your spider uses to survive and capture prey. List the structures and behaviors below.