

## Photo Description



This black-and-white photograph shows a spider web covered in water droplets or dew, which makes the sticky silk threads visible and sparkly. The web is stretched between plants and tree branches, with blurred foliage in the background. The web's geometric pattern reveals the spider's careful craftsmanship and engineering skill.

## Scientific Phenomena

**Anchoring Phenomenon:** Why can we see a spider web better when it's wet?

Spider webs become visible when covered with water droplets because the droplets catch and reflect light off the silk threads. Spiders build webs with special sticky silk to trap insects for food. The silk itself is incredibly thin and hard to see in dry conditions, but when morning dew or rain collects on it, the water droplets act like tiny mirrors, making the entire structure shine and become visible to our eyes. This happens because light bounces off the curved surface of water droplets.

## Core Science Concepts

- \* **Animal Structures and Functions:** Spiders produce silk from special glands in their bodies. This silk has specific properties—it's strong, flexible, and sticky—that allow spiders to build webs. The web structure is a tool the spider uses to catch food.
- \* **Engineering and Design in Nature:** Spider webs demonstrate geometric patterns (often circular or orb-shaped) that are engineered to be both strong and efficient at trapping prey. The spider designs and builds this structure instinctively.
- \* **Properties of Materials:** Spider silk is an example of a natural material with unique properties. It's stronger than steel of the same thickness, flexible, and can be sticky or non-sticky depending on where the spider places it on the web.
- \* **Light and Visibility:** Objects become easier to see when light reflects off them. Water droplets on the web reflect light, making the normally invisible silk threads visible to observers.

### Pedagogical Tip:

When teaching about spider webs, avoid spider-phobic responses by normalizing spiders as helpful predators that eat pest insects. Use positive language like "amazing engineers" rather than "scary." Consider showing photos first before discussing live spiders, allowing students to build comfort gradually. Some students may benefit from learning that spiders are more afraid of humans than we should be of them.

### UDL Suggestions:

**Multiple Means of Representation:** Provide images, videos, and tactile models of web structures. Some students may understand better through 3D string models or enlarged photographs rather than classroom observations. **Multiple Means of Action/Expression:** Allow students to demonstrate understanding through drawing, building physical web models, or writing rather than only through verbal discussion. **Multiple Means of Engagement:** Connect spider webs to students' interests—some may engage through the engineering aspect, others through the insect-catching function, and others through the mathematical patterns visible in the web.

## Discussion Questions

1. Why do you think the spider makes its web in the shape of a circle? (Bloom's: Analyze | DOK: 2)  
Students begin thinking about design and function—why certain structures work better for specific purposes.
2. What would happen to a spider web if there were no water droplets on it? How might that affect what the spider can do? (Bloom's: Evaluate | DOK: 3)  
Students think critically about visibility, detection by prey, and how environmental conditions affect the web's effectiveness.
3. How is a spider web similar to a fishing net that people use? How is it different? (Bloom's: Compare/Contrast | DOK: 2)  
Students make connections between natural structures and human-made tools with similar functions.
4. If you were a tiny insect, what would be dangerous about flying into a spider web? (Bloom's: Understand | DOK: 1)  
Students build empathy and understanding of the web's function in the ecosystem.

## Extension Activities

### Activity 1: Build a Web Model

Students use string, yarn, or thread to create their own web structure on a wooden frame or between two chairs. As they build, they discover which patterns are strongest and which catch objects best. This hands-on engineering activity helps them understand the spider's design choices. Safety note: Supervise closely and use child-safe materials; avoid glass frames.

### Activity 2: Water Droplet Observation

Students go outside (with supervision) to find natural spider webs in the morning when covered with dew, or they can spray a spider web gently with a water bottle to simulate dew. They observe and sketch how the water droplets change the web's visibility. This connects the classroom lesson directly to nature observation and scientific drawing skills.

### Activity 3: Food Web Investigation

Create a classroom food web diagram showing spiders' role as predators. Start with the sun, move to plants, then to insects, then to spiders, and perhaps to birds that eat spiders. Students cut out pictures and connect them with string, creating a visual 3D food web. This extends learning to ecosystems and energy flow, showing why spiders are important in nature.

## NGSS Connections

### Performance Expectation:

4-LS1-1: Use evidence to construct an explanation that plants get the materials they need for growth chiefly from air and water. (Note: While this PE focuses on plants, the structural and functional aspects of spider webs connect to life science standards below.)

### Relevant Performance Expectations:

4-LS1-2: Use evidence to support the claim that animals obtain different types of food from plants, and use the idea that energy comes from the sun to trace the movement of that energy through the food chain. (Spiders are predators in food chains)\*

### Disciplinary Core Ideas:

\* 4-LS1.A: All animals need food, water, and air to survive and grow.

4-LS1.D: Animals obtain their food from plants or from other animals. Some animals eat plants for food and other animals eat meat, and some eat both plants and meat. (Spiders as predators)\*

**Crosscutting Concepts:**

- \* Structure and Function: The web's structure allows it to function as a trap for catching food.
- \* Patterns: Spider webs display geometric patterns that repeat and are recognizable.
- \* Systems and System Models: The web is part of a larger ecosystem where spiders play a role in controlling insect populations.

**Science Vocabulary**

- \* Spider silk: A strong, thin thread that spiders make inside their bodies and spin to build webs and catch food.
- \* Web: A structure made of connected threads that a spider builds to trap insects for food.
- \* Predator: An animal that hunts and eats other animals.
- \* Reflection: When light bounces off a surface, like water bouncing light back to your eyes.
- \* Structure: The way something is built or organized, like how a web is put together with its pattern of threads.
- \* Instinct: A behavior that an animal knows how to do without being taught, like how spiders know how to build webs.

**External Resources****Children's Books:**

Spiders\* by Nic Bishop (National Geographic Little Kids series) – Engaging photos and age-appropriate facts about spider diversity and behavior.

The Very Busy Spider\* by Eric Carle – A classic story that introduces young learners to spiders and web-building in a narrative format.

Spider Silk\* by Anne Vittur Madison – Explores the amazing properties of spider silk through accessible text and illustrations.

**YouTube Videos:**

- \* "How Do Spiders Make Webs?" by National Geographic Kids (approximately 3 minutes)

[https://www.youtube.com/watch?v=VBVv\\_GoPfWI](https://www.youtube.com/watch?v=VBVv_GoPfWI)

This video shows real footage of spiders building webs step-by-step, perfect for visual learners and maintaining student engagement.

- \* "Spider Web Building in Real Time" by BBC Learning (approximately 4 minutes)

<https://www.youtube.com/watch?v=DvLQRQg8hh4>

Time-lapse footage demonstrates the complete process of web construction, helping students understand the complexity of this engineering feat.

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**Teacher Notes:** This lesson uses the spider web as an anchoring phenomenon to explore animal structures and functions, properties of materials, and light. The image's visual appeal engages students while the wet web provides a concrete, observable reason to discuss why we can see things in nature. Consider your students' comfort level with spiders and address any fears directly and compassionately.