W 867

SPIDER WEB DESIGN CHALLENGE

Spin Your Best Web!

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Spider Web Design Challenge

Spin your best web!

Skill Level
Beginner —Advanced

Learner Outcomes
The learner will be able to:
• Articulate why spiders build webs.
• Identify the main structural components of spider webs.

Educational Standard(s) Supported
ETS1: Engineering Design (any grade level)

Success Indicator
Learners will be successful if they:
• Design a spider web that meets the challenge requirements.

Time Needed
20-30 Minutes

Materials List
• Dental floss (1 pack per team)
• Small disposable cups
• Masking tape
• "Bugs": plastic toy bugs, dominos or other small items that could be balanced on the finished webs

Introduction to Content

In this lesson, students will participate in a design challenge where they have to build a spider web that can hold "bugs."

Introduction to Methodology

Students will divide into teams. Teams will have a time limit and be challenged to make a spider web that meets the specified criteria.

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Prepared using research based practices in youth development and experiential learning.

Terms and Concepts Introduction

Basic parts of a spider web:
Bridge thread — the first thread to be laid between two anchor points.
Frame thread — forms the outside border of the web.
Radius threads — radiate from frame to center, forming the "ribs" of the web.
Auxiliary spiral — circles the radius threads.
Sticky (or capture) spiral — follows the auxiliary spiral; silk is coated with a sticky compound to catch flies.

Types of webs:
Cob, or tangle, webs — look messy and irregular.
Sheet webs — look like hammocks.
Funnel webs — look like a funnel.
Orb webs — look wheel shaped with regular spirals.

Setting the Stage and Opening Questions

Ask: Why do spiders make webs?

Explain: Spider webs help extend the spider's sensory network. It can detect (and catch) prey away from its body. Use online resources below to teach your students the basic elements of a spider web and the different types of webs (see "Terms and Concepts" above).

How a spider constructs its web:
https://animals.howstuffworks.com/arachnids/spider5.htm

VIDEO: BBC Earth: Time lapse of a spider building a web (4:36):
https://youtu.be/zNtSAQHNONo

Tips for Engagement

Play songs or videos as a timer! Here's some fun spider-themed suggestions:

"Peacock Spider Stayin' Alive" 1:54
https://youtu.be/HPh_Gi7PCqs

"Peacock Spider Dances to YMCA" 1:32 https://youtu.be/xYIUFEQeh3g

"Peacock Spider 7" 3:00
https://youtu.be/d_yYC5r8xMI

"Peacock Spider Dances Around" 3:00
https://youtu.be/PrVZCX2G3mM

Experience

1. Divide students into teams of three to four.

2. Tell teams that their challenge is to design a spider web that can hold the most "bugs."

3. Rules:
    a. Must start with a planning drawing.
    b. Use paper cups and tape as anchor points — a maximum of four cups maybe used, and cups cannot touch one another.
    c. The web itself must only be built of floss — no other materials allowed.
    d. "Bugs" must sit on the web (not the anchor cups).

4. Set a timer for 10-15 minutes.

5. Once completed, test the web by seeing how many "bugs" they can hold. The team that builds the web that can hold the most bugs wins!

Share

Which web designs were the most successful? Least successful? Why?

Life Skill(s)

- Learn to form ideas, make decisions and think critically.
- Demonstrate characteristics of teamwork.
- Use skill, effort or ability to accomplish a goal.
- Wisely use resources to achieve a purpose.

Process

Did any of the web designs include all the components of a typical web (i.e., bridge, frame, radii and spirals)? Were these more or less successful than alternate designs?

Generalize

Can you identify any man-made structures that use the same principles as a spider web?

Apply

If you had a chance to go back and redesign, what would you do differently?

Remember that engineers continuously design, test, redesign, retest over and over again to optimize, so they don't expect to get it perfect the first time!

Supplemental Information
Educational Standards Met

ETS1: Engineering Design

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

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