



Sturdy Shoes

From earthquakes to tornadoes, rescue dogs provide life-saving support during natural disasters. Protecting their paws from the unknown environment is key to their success. Explore the work of rescue dogs, test the durability of different shoe materials, and design a sturdy shoe to keep their paws safe.

TEKS:

SCI 3.2 D: The student is expected to analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations.

SCI 3.7 C: The student is expected to explore the characteristics of natural resources that make them useful in products and materials such as clothing and furniture and how resources may be conserved.

SCI 4.2 C: The student is expected to construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data.

MATH 4.4 F: The student is expected to use strategies and algorithms, including the standard algorithm, to divide up to a four-digit dividend by a one-digit divisor.

Materials:

- Computer or smartphone with internet
- 2 5 x 5-inch pieces of fabric
- 3-ounce paper cup
- Pencil
- Piece of paper
- 2 5 x 5-inch pieces of plastic wrap
- 2 pipe cleaners
- Rock with rough edges (a rock wall or something similar can be substituted)
- 2 5 x 5-inch pieces of rubber glove material
- Scissors
- Small stuffed dog (one paw should fit inside paper cup)
- Stickers/markers for decoration
- Tape (packing tape is best, but any kind works)

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How To:

Part 1: Learning about Frida the rescue dog

1. Animals, including dogs, are used to support first responders after natural disasters. Use a computer or smartphone with internet to learn about Frida, the rescue dog who helped save dozens of people after an earthquake.
2. First, watch a clip that shows Frida in action (notice the sturdy shoes Frida wears for rescue work): <https://www.youtube.com/watch?v=dbc47rEqkSU>
3. Next, watch a news segment that explains how much Frida helped people: https://www.youtube.com/watch?v=3PBj18Z_Bos
4. Finally, watch the first 20 seconds of the video embedded in this article to see a rescue from Frida's point of view: <https://mentalfloss.com/article/504683/real-story-behind-frida-rescue-dog-mexico-gaining-viral-fame>

Part 2: Test material durability

1. Before you design your dog shoe, it is important that you understand the strength of the materials you have available. You'll need a rock with rough edges, one 5 x 5-inch piece of fabric, one 5 x 5-inch piece of rubber glove material, and one 5 x 5-inch piece of plastic wrap.
2. You're going to test the durability, or the strength, of your material pieces.
3. Rub each piece of material across the rough rock 20 times. Compare the three materials to one another. Which material looked the best after being rubbed against the rock? The most durable material will look the least damaged after the strength test.

Part 3: Design and create your sturdy shoe prototype

1. Now that you've tested the durability of these materials, you can design a prototype of a rescue dog bootie! The materials you have available for your shoe are a 3-ounce paper cup (for the foundation), 2 pipe cleaners, tape, one 5 x 5-inch piece of fabric, one 5 x 5-inch piece of rubber glove material, and one 5 x 5-inch piece of plastic wrap.
2. Before you begin to create, you need to come up with a plan. On a piece of paper, draw a design for a rescue dog bootie that will keep the dog's paws the most protected. Once you have your design, collect the required materials and create your shoe!
3. Now that your prototype is complete, test the durability of your shoe by rubbing it across rocks to simulate a dog walking. If you would like to improve your design, add or remove materials.
4. After any revisions, decorate your prototype with markers and stickers and put the shoe on your stuffed dog!

STEM Explanation:

Rescue animals are great tools to support first responders when natural disasters occur. They can help search for people and move in small places where first responders cannot fit. The areas that rescue animals work can be dangerous - they may need to walk on hot pavement, wade through water filled with debris, or search in areas with broken glass. To protect these animals, design engineers make special shoes for rescue dog's paws. Booties made for rescue dogs need to be sturdy and durable enough to protect dogs for long periods of time. Design engineers use different materials for specific parts of each shoe so that the dogs wearing them will be comfortable and safe.

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Career Connection:

Design engineers research and develop ideas for new products and the systems used to make them. They also work to improve the performance and efficiency of existing products.

Resources:

[https://en.wikipedia.org/wiki/Frida_\(dog\)](https://en.wikipedia.org/wiki/Frida_(dog))

<https://www.youtube.com/watch?v=dbc47rEqkSU>

https://www.youtube.com/watch?v=3PBj18Z_Bos

<https://mentalfloss.com/article/504683/real-story-behind-frida-rescue-dog-mexico-gaining-viral-fame>

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