



Miner Rescue

Girlstart to the rescue! Use your knowledge of simple machines to create a sturdy piece of equipment to save miners trapped underground.

TEKS:

SCI 3/4/5.1.B: The student is expected to use scientific practices to plan and conduct descriptive investigations and use engineering practices to design solutions to problems;

SCI 3/4/5.1.G: The student is expected to develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.

SCI 4.7: Force, motion, and energy. The student knows the nature of forces and the patterns of their interactions. The student is expected to plan and conduct descriptive investigations to explore the patterns of forces such as gravity, friction, or magnetism in contact or at a distance on an object.

SCI 5.7.A: The student is expected to investigate and explain how equal and unequal forces acting on an object cause patterns of motion and transfer of energy.

Materials:

- Pencil
- Piece of yarn
- Plastic spoon
- 2 Pipe cleaners
- 2 Rubber bands
- 2 Toothpicks
- 3 Craft sticks
- 3 Straws
- Tape
- Paper towel tube
- Optional: paper plate
- Golf ball, bouncy ball, or ping pong ball.

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How To:

In 2010, a cave in Chile collapsed, trapping 33 miners underground. They got trapped because, unfortunately, many of the necessary safety measures had not been taken, which made it very difficult for the miners to be rescued. It took the engineers from both NASA and the Chilean Navy to successfully rescue all 33 miners from the collapsed cave using the drill that they designed.

You have been hired by Girlstart as a mechanical engineer to design rescue equipment. Create a piece of equipment that is sturdy and safe to allow for the most efficient rescue.

1. Tape a paper towel tube upright on a flat surface or paper plate. This represents a mine.
2. Drop a golf ball, bouncy ball, or ping pong ball into the paper towel tube. This represents the miners that need rescuing.
3. Use the materials to engineer a device that can safely lift the miners out of the model mine!

Design Tips to Consider:

- In what type of environment could you use your rescue equipment?
- How can you make your design durable, but lightweight?
- Can your device be moved from place to place easily?
- Does your design take into consideration the weight of the different objects your equipment will encounter?
- If you were to help make this design for a real rescue mission, what would be the best materials for your design?

STEM Explanation:

For the Chilean rescue mission, engineers had to think of lots of different details to ensure the safety of all 33 miners. To test for the best drill, three different companies started drilling down to the miners. This allowed for a variety of potential solutions, and, it was hoped, a faster rescue. NASA helped the Chilean government with designs for the rescue capsule, called the Phoenix. Once a secure path was drilled down to reach the trapped miners, and a rescue capsule had been tested, each miner used the rescue capsule to return to the surface one by one. The capsule safely ensured that every miner was brought up safely!

Resources:

http://ef.engr.utk.edu/efp/diversity-2011/mites-2011/tti_meeting_10.pdf

<http://www.charlesapple.com/uploads/2010/10/101019LondonTimesChile01.jpg>

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