

💡 BIG IDEA

Students make space suits to protect their Spudstronauts.

🕒 TIME

30-45 minutes

❤️ WHY WE LOVE IT

This activity allows students to creatively solve one of the dilemmas of space travel: a suit to meet all safety requirements!

READY...

Gather materials:

- potatoes (1 per student)
- aluminum foil
- scrap materials: cardboard, paper or plastic plates or cups, yogurt containers, milk jugs, toilet paper tubes, packing peanuts, plastic bags, wine corks, clean soda bottles or cans, CDs, etc.
- *Optional:* heavy and/or sharp objects to drop on potatoes (books, pencils, pens, screwdrivers)
- *Optional:* food coloring, water, and a basin



SET...

A fun optional way to begin this activity is to show a video of astronauts stumbling and falling while trying to walk on the Moon. You can find these with a YouTube search for “astronauts falling on the moon.” Be sure to preview the video first and have everything ready ahead of time. If you are using the colored water challenge, mix a few drops of food coloring into a bucket of water.

GO!

1. *Optional:* Show a funny video of astronauts falling down as they climb around on the Moon.
2. Tell students that the space suits kept astronauts safe on the Moon and in outer space. Announce, *We will test space suits on our astronauts, who just happen to be potatoes. We call them Spudstronauts.*
3. *Optional:* Introduce the activity by having student volunteers do simple tasks (like tying their shoes or writing with pens) while wearing big work gloves so they understand a limitation with space suits is dexterity. Astronauts often need to work on the space shuttle, telescopes, and satellites while in space.
4. Let students determine their own challenge or objective for their space suit, or let them know they’re going to attempt one of the trials below. Then let them get started with their design! **(Figure 1)**

Trial 1: Put Spudstronauts in a cardboard box with other heavy materials. Shake the box and see how the Spudstronauts survive. Whose suit is intact, and whose isn’t?



Figure 1: Crafting the Spudstronaut

[continued from front]

Trial 2: Drop sharp objects on the Spudstronauts from above. Whose potato has been punctured, and whose hasn't?

Trial 3: Try to create an airtight suit that will hold in the oxygen from an astronaut's tank. Test this by dropping the Spudstronauts in their suits into a bucket of colored water, and then removing the suits to see which Spudstronauts weren't dyed by the food coloring.

TRY THIS

1. Ask students to come up with one experiment that astronauts would do in space and what they predict the result of the experiment would be.
2. Bring in the concept of toys in space. Ask students to predict how simple toys will behave in space. Find and play NASA's "Toys In Space" video on the Internet.
3. Have students research different features of space suits. For example, scientists are currently working to create a suit that compresses the astronaut's muscles so they do not atrophy in the absence of the force of gravity. Have students create a design for a future space suit model, imagining whatever materials they would like.

DIFFERENTIATION

- **K-1:** Give students a single objective: protect their suits from space junk. They can test this by dropping a pointy object onto their Spudstronaut from above and seeing which suits puncture and which stay intact.
- **2-3:** Students will enjoy throwing or dropping the Spudstronauts to test their suits.
- **4-5:** Encourage students to put arms and legs on the Spudstronauts. They then have to protect more spindly objects—not just the solid potatoes.
- **6-8:** Have students draw and label a diagram of their complete Spudstronaut suit, then write a paragraph explaining why each piece is essential.

WHY IS THIS SCIENCE?

It's dangerous out in space! No air or air pressure, intense ultraviolet radiation, and extreme cold are just a few of the dangers. What about space junk? Space junk is the collection of discarded man-made materials that remain in space. This includes broken satellites or rocket parts and even an astronaut's lost tool bag! There are over 500,000 pieces of debris larger than one centimeter and millions of pieces of debris smaller than one centimeter that orbit Earth. Just beyond Earth, orbiting objects travel at four miles per second. At that speed, something as small as a fleck of paint will produce the same impact as a 550-pound object traveling at 60 miles an hour! This can damage or break satellites, creating even more pieces of potentially damaging debris. Astronauts must be protected from space debris as well.

Another threat to humans traveling in space is muscle and bone deterioration. On Earth, the human body is constantly supporting itself against the pull of gravity without our ever even noticing it. In space, where there is no gravity, muscles and bones do not get much exercise and begin to deteriorate, or break apart. After six months in space, an astronaut's bone mass can decrease up to 20%, which is comparable to that of an elderly woman on Earth with dangerous osteoporosis (a condition where bones become extremely weak and brittle)! That is one reason why scientists are working on new space suits. Suits could possibly help regulate pressure put on the body and prevent bone and muscle loss.

WITH THANKS AND FOR MORE INFORMATION, VISIT:

http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Suited_for_Spacewalking_Educator_Guide.html

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