Engineering Adventures.

In Good Hands: Engineering Space Gloves



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In *In Good Hands: Engineering Space Gloves* students work together as materials engineers to develop space gloves that will help astronauts complete one of three missions to an asteroid, Earth's moon, and mars. Story characters guide kids through the engineering activities as they learn about space hazards and how astronauts protect themselves from extreme temperatures, impact, and dangerous dust. Students investigate different materials and their qualities before creating their own designs to support the astronauts. Designed for students in grades 3–5.

The provided sample lesson showcases the step-by-step support educators will receive through the unit.

The full unit consists of:

- Detailed lessons plans
- Duplication masters for student handouts
- Standards alignments for Math, ELA, and science
- Online educator access
- Materials kit available for separate purchase





EiE[®] is the award-winning curricula development division of the Museum of Science, Boston. Our research-based, hands-on engineering and computer science curricula (PreK–8) introduce learners to the engineering design process and create the next generation of problem solvers.

Engineering Adventures® is designed to create exciting in- and out-of-school experiences that al all learners to act as engineers and engage in the Engineering Design process. We aim to positively impact learners' attitudes about their ability to engineer.

Visit eie.org to learn more about our curricula, resources, and professional development.



About Engineering Adventures

The mission of Engineering Adventures is to create exciting out-of-school-time activities and experiences that allow *all* 3rd–5th grade learners to act as engineers and engage in the Engineering Design Process. Our goal is to positively impact children's attitudes about their ability to engineer by providing materials uniquely appropriate for the varied landscapes of out-of-school-time settings.

The main ideas that guide the developers are listed below.

We believe kids will best learn engineering when they:

- engage in activities that are fun, exciting, and connect to the world in which they live.
- choose their path through open-ended challenges that have multiple solutions.
- have the opportunity to succeed in engineering challenges.
- communicate and collaborate in innovative, active problem solving.

Through each unit, kids will learn that:

- they can use the Engineering Design Process to help solve problems.
- engineers design technologies to help people and solve problems.
- they have talent and potential for designing and *improving* technologies.
- they, too, are engineers.

As kids work through their engineering design challenges, they will have the opportunity to build problem-solving, teamwork, communication, and creative thinking skills. Most importantly, this curriculum is designed to provide a fun learning opportunity for kids!

For more information on Engineering Adventures, please visit: <u>www.engineeringadventures.org</u>.

Adventure 1 Everyday Gloves

Educator Page: Preview

Overview: Kids will explore the features of different gloves and how they perform in a series of challenges. Kids then are introduced to the concept of space hazards and spacesuit design.

Note to Educator: In this adventure, each pair of kids tests one type of glove in a series of challenges. Provide extra groups the food-safe or vinyl gloves, since there are more of these types. If pairs have trouble reusing the food-safe or vinyl gloves, let them know they can get new gloves between each station.



In Good Hands: Engineering Space Gloves

Kids will learn:

Adventure 1

Everyday Gloves

- Engineers design technologies that help protect astronauts from space hazards.
 - Asking questions about materials is part of the Engineering Design Process.



Present the Message from the Duo (5 min)

- 1. Tell kids that India and Jacob sent a message about the duo's mission. Have kids turn to *Message from the Duo*, p. 7 in their Engineering Journals, to follow along. Play track 3.
- 2. Let kids know that before launching into space, NASA tests many of their technologies, including spacesuits, at testing sites on Earth, some of which are located in Antarctica. To see where Antarctica is located, have kids look at *World Map*, p. 8 in their Engineering Journals.
- 3. To check for understanding, ask:
 - What do India and Jacob want us to do? Be materials engineers and explore the features of different gloves.

Set the Stage: What Do You Know about Gloves? (5 min)

- 1. Have kids share what they already know about gloves. Ask:
 - Why do people wear gloves? Accept all answers. Common responses include: to be warm, clean, safe, or fashionable.
- 2. Tell kids that India and Jacob have sent them 6 types of gloves to examine. Identify each glove and allow kids to feel the gloves, and make observations about the materials with which they were designed. Ask:
 - How are they similar? They all cover your hands.
 - **How are they different?** They are different colors, sizes, and materials. Some are made of just one material, and others are made of multiple materials.
- 3. Tell kids that they are going to explore how each glove performs in a series of challenges.

Ask: Which Glove Works Best? (15 min)

- 1. Organize kids into pairs.
- 2. Review the names of the gloves and assign 1 type of glove to each pair.
- 3. Show kids the sheet posted at each station that has directions on how to test the gloves and a results chart. Let them know that:
 - First, pairs will read the directions on how to test the gloves.
 - Next, they will complete the glove challenge, with their gloves on.
 - Then, they will record their results in the results chart on the sheet.
 - Finally, kids must reset the stations.
 - Pairs must visit all 3 stations; when they finish 1 station, they can move to any available station.

- 4. Give kids a brief description of what they will do at each station. Ask:
 - For each task, which glove do you predict will work the best? The worst? Accept all answers.
- 5. Have kids move to their first station and begin testing.
- 6. Let kids know when time is winding down.

Reflect (20 min)

1. Gather kids together and review the testing results from each station. Ask:

Tip: Each station should take no more than 3 minutes. If the *Slippery Jar* station is taking longer, pairs should stop and move on to the next station.

- What surprised you about how the gloves did at each station? Guide kids to compare their predictions and how well the gloves actually did at each station.
- Which tasks did your gloves do best and worst in? Why do you think so? Guide kids to think about how the materials and features of their gloves affected their results.
- Let kids know that India has sent another message. Have kids turn to *Message from the Duo*, p. 9 in their Engineering Journals, to follow along. Play track 4.
- 3. After the message, play the video NASA Spacesuit Development (7:16): www.nasa.gov/feature/nasa-spacesuit-development.
- 4. To check for understanding, ask:
 - What hazards do engineers consider when designing spacesuits? Accept all answers, including: extreme temperatures, dust storms, space debris, vacuum, no oxygen, or trips and falls.
 - Why do materials engineers need to know about the hazards when they design spacesuits? So they can match the suit to the dangers of the mission.
- 5. Help kids make the connection that, just as the gloves they tested perform better for specific tasks, the parts of a spacesuit are designed for the goals of the mission.
- 6. Gather kids together at the *Engineering Design Process* poster. Ask:
 - Which step of the Engineering Design Process did you use most today? We asked which gloves work best for different tasks. We asked what engineers need to know when designing a spacesuit.
- 7. Let kids know that next time they will *ask* questions about how well different materials can protect against the hazard of cold temperatures.

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Tip: Hand out copies of *Gloves in Action*, p. 31 in this guide, to review the function, materials, and features of each glove.

Tip: Have kids record their ideas about spacesuits that protect from space hazards on *Hazards in Space*, p. 10 in their Engineering Journals.



Adventure 1 Everyday Gloves

Arrange the stations on separate tables by following the instructions below.

The instructions ensure that there are 4 setups at each station so that 4 pairs of kids can test simultaneously.

Arrange as many setups per station as needed so that kids in each pair have a place to test their gloves at any given time.

Station 1: Slippery Jar

Materials

- □ Station 1: Slippery Jar, p. 25 in this guide
- □ access to water
- \Box 1 bottle of dish soap
- □ 1 roll of paper towels
- □ 1 tablespoon measure
- □ 2 aluminum trays, 12" x 10"
- □ 4 pipe cleaners
- □ 4 plastic jars with twist lids
- □ 4 stopwatches
- \Box 60 beads

Instructions

- 1. Place the Station 1: Slippery Jar sheet at the station where kids can see it.
- 2. Place 15 beads in each jar and tighten the lids.
- 3. Pour 1 cup of water into each aluminum tray and add 2 tablespoons of dish soap.
- 4. Roll the jars in the soapy water and leave them in the tray.
- 5. Place 2 pipe cleaners, 2 stopwatches, and a roll of paper towels near each tray.

Interested in learning more about this unit or curricula? Please contact your <u>Regional Representative</u>.



This shows 2 setups. For 4 setups, there should be 2 of these per table.