Engineering Adventure 7: The Final Test: Improving a Space Glove

Educator Preview

Adventure Snapshot

Learners improve their space gloves and test them in a final test.

Timing | 50 minutes

Get Ready & Team Up	5 min.
Improve	40 min.
Reflect & Wrap Up	5 min.
Total	**50 min.**

Level Up Activities 5-15 min. each

Prep Snapshot*

Prep Time 30 min.

- Set up materials stations.
- Invite people to Share-Out.

**See Materials & Preparation for full info.*

21st Century Skills

Connection

- Creativity

Habits of Mind

- Make evidence-based decisions.
- Persist and learn from failure.

Guiding Question

How can we make our space gloves stronger, easier to use, or more protective?

Learners Will Do

Use test results to redesign space gloves so they are more effective.

Learners Will Know

Engineers think about, change, and improve their designs.

Connecting Across Adventures

Adventure 6: Creating a Space Glove	Adventure 7: Improving a Space Glove	Adventure 8: Preparing for the Engineering Share-Out
Last time, learners planned, created, and tested gloves to protect against space hazards.	**Today**, learners improve their space gloves and test them again.	**Next time**, learners will prepare to communicate their ideas about designing space gloves in the Engineering Share-Out.

Activity Resources

Access videos and digital resources using the link or QR code below. More information for teaching this curriculum is available in the Educator Guide Introduction (pgs. iii–xxvi). Access more PLANETS units, research, and pathways at https://planets-stem.org/.

weblink: https://hov.to/cb66655d

Materials and Preparation

Materials

For the whole group

- *Our Ideas* poster (on paper or a shared digital document) Examples | Templates
- chart paper and markers
- Testing Stations from Adventure 6
1. Mission Test Setup Instructions, pg. 81
- Engineering Adventure 6 Mission Profiles Handout, pg. 84

For the Materials Table

- leftover materials from Adventure 6

For each group of 4

- model space glove designs from Adventure 6
- 2 pairs of scissors

For each learner

- Engineering Notebook (PDF)

Adventure 7 Materials Preparation (30 min.)

Ahead of Time

1. Review the "In-Use Example" in the Prep & Setup Guide (PDF) to help you think about what to add to the *Our Ideas* poster during the discussions in this adventure.

In Your Space

2. Place the *Our Ideas* poster in a visible place in your learning setting or prepare to share it digitally.
3. See Mission Test Setup Instructions, pg. 81.
4. Set up a Materials Table. See list above.

Teaching Tip

Save the space gloves for the Engineering Share-Out. Invite staff, family, and community members to attend.

Adventure Guide

Get Ready & Team Up (5 min.)

1. Ask: **If you did the last activity, what did you do and why?** *(We planned and created gloves, then tested how well they protected against cold, impact, and dust. We also tested how easy they were to use and how strong they were.)* Draw learners' attention to their work on the *Our Ideas* poster about test results.

2. Say: **Today you will work on the Improve cycle of our engineering design process by improving your model gloves.** Share the Guiding Question with learners aloud and write it on the *Our Ideas* poster (using multiple languages as needed): **How can we make our space gloves stronger, easier to use, or more protective?**

3. Organize learners into their groups of 4 and distribute Engineering Notebooks.

Improve (40 min.)

4. Have groups revisit *Test Results*, pg. 20 in their Engineering Notebooks. Ask: **How can you improve your design?** Have groups record ideas on *Improved Plan*, pg. 22 in their Engineering Notebooks.

5. Have groups improve their model space gloves. If gloves were damaged during testing, learners must repair them or create new ones.

6. When each group is ready, have them test. Have them record results on *Test Results: Improve*, pg. 23 in their Engineering Notebooks.

7. After all groups of learners have tested, collect the gloves and store them.

Reflect & Wrap Up (5 min.)

8. Revisit the Guiding Question on the *Our Ideas* poster: **How can we make our space gloves stronger, easier to use, or more protective?** Ask: **What parts of your design are you improving? How are the materials working together? How do you think your improved glove will protect against hazards?**

9. Say: **Next time, you will prepare to share what you learned about materials, space hazards, and their engineering design process.** Hand out copies of Engineering Adventure 7 Share-Out Invitatiion, pg. 97, for learners to give to caregivers, family, and friends.

Support Learner Differences

If new learners are joining you, lead an inclusion activity (pgs. xx-xxi) and use other engagement strategies as necessary (pgs. viii–xviii).

Support Learner Differences

If you have learners who speak multiple languages, encourage them to share in their preferred languages.

Teaching Tip

Learners may want to use their first gloves and improved gloves in the Showcase. Encourage each group to save both designs.

After the Adventure

1. Clean up:
   - Keep the *Our Ideas* poster for use in Adventure 8.
   - Keep gloves for Adventure 8.
   - Dispose of materials that cannot be reused. Save materials for learners to repair damage to their gloves.
2. Plan for Engineering Adventure 8. See Engineering Adventure 8 Preparation on pg. 100.
3. Take time to reflect on the following educator prompt. **How did you support constructive group work during this adventure?**

Space Hazards Additional Resources

Resources include All Downloads, All Videos, Family Connections, and more.

weblink: https://hov.to/940428f7

Level Up!

- Refer to the Engineering Design Process poster (PDF). Ask: **What phases of the Engineering Design Process did you use today?** *(The Improve cycle. We improved our space gloves by creating and testing new plans.)* (5 min.)
- If you can, show and then discuss the NASA video clip Spacesuits for the Next Explorers (Full feature) (12:00), which discusses improvements needed to spacesuits for exploring planets. (15 min.)
- NASA is constantly modifying and improving equipment, sometimes even after it's been launched! Check out this article about how astronauts fixed and improved the Hubble Space Telescope while it was orbiting Earth: "Missions to Hubble - NASA Science" (5 min.)
- Ask these story prompts: **Can you tell me a story about something you built that didn't work as well as you wanted it to? What did you do to improve it?** Tell learners, if anyone asks what they did today, they can tell them "We tested and improved our astronaut glove," and then ask them the above story prompts. Consider returning to learners' ideas at the start of the next adventure. (5 min.)

Engineering Share-Out Invitation

You're invited to the Engineering Share-Out

Come see your young engineer showcase their space glove design!

Date: _____

Time: _____

Location: _____

Grantee