Educator Guide

Science Adventure 6: Put It Together: Mitigating Hazards for Your Mission

Educator Preview

Adventure Snapshot

Learners think about hazards and mitigation strategies for NASA missions.

Timing | 55 minutes

Get Ready & Team Up	5 min.
Prepare for the Mission	40 min.
Reflect & Wrap Up	10 min.
Total	**55 min.**

Level Up Activities 5 min. each

Prep Snapshot*

Prep Time 50 min.

Combine card decks.

**See Materials & Preparation for full info.*

21st Century Skills

Connection

- Creativity

Science Practices

- Engaging in Argument from Evidence

Guiding Question

How can we mitigate hazards on a particular NASA mission?

Learners Will Do

Choose a mission to plan, then list mission hazards and find ways to mitigate them.

Learners Will Know

Scientists predict hazards in an area they want to study, and think about ways to mitigate them.

Connecting Across Adventures

Adventure 5: Hazards in Space	Adventure 6: Mitigating Hazards for Your Mission	Adventure 7: Science Share-Out
Last time, learners learned that hazards also exist in space, some are the same as they are on Earth, and some are different.	**Today**, learners choose a NASA mission and think about the hazards, mitigation strategies, and other factors NASA should consider.	**Next time,** learners will share their proposed mission strategy with members of their community.

Adventure 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–xxv. Access more PLANETS units, research, and pathways at https://planets-stem.org/.

weblink: https://hov.to/bfc39d8d

Materials and Preparation

Materials

For the whole group

- *Our Ideas* poster (on paper or a shared digital document) Examples | Templates
- presentation materials, to make and display signs, posters, pictures, etc.

For each group of 3 or 4 learners

- *Hazards Cards* Decks B (PDF), C (PDF), D (PDF), and E (PDF)
- blank paper

For each learner

- Science Notebook (PDF)

Adventure 6 Materials Preparation (50 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.
2. Have the Educator Science Background (weblink) on hand for learners to reference.
3. For each group of 3 or 4 learners, combine Decks B, C, D, and E into a full stack.

In Your Space

4. Place the *Our Ideas* poster in a visible place in your learning setting or prepare to share it digitally.

Adventure Guide

Get Ready & Team Up (5 min.)

1. Invite learners who did Adventure 5, Hazards in Space, to share what they did with a partner or in small groups. *(They played Hazard cards and used Mitigation cards to deal with those hazards.)*
2. Revisit the *Science Comic* with learners, focusing on the different missions they can design for.
3. Say: **Today you will imagine you are helping NASA plan a mission.** Share the Guiding Question with learners aloud and write it on the *Our Ideas* poster (using multiple languages as needed): **How can we mitigate hazards on a particular NASA mission?** Ask for a volunteer to use the *Our Ideas* poster to share what the group has learned about hazards and how to mitigate the hazards in space. Ask: **How will your ideas be helpful for a NASA mission?** *(anticipating hazards can help us avoid dangers and protect spacecraft, instruments and humans).*
4. Organize learners into groups of 3 or 4 and distribute Science Notebooks. Have each group talk about the roles they like to play during group work. Have learners select roles (or assign them yourself).

Support Learner Differences

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

Prepare for the Mission (40 min.)

5. Pass out Decks B, C, D, and E to each group.
6. Have learners read the "Congratulations!" section of *Mitigate Hazards for Your Mission*, pg. 17, in their Science Notebooks.
7. Have each group choose a mission (described on *Mitigate Hazards for Your Mission*, pgs. 17-24, in their Science Notebook. There are four possible missions: 1) robots studying an asteroid, 2) people launching a rocket from Earth, 3) people going to the Moon, and 4) people going to Mars.

Support Learner Differences

Suggested group roles are listed on the Science Adventure 4 Hazards Card Game Rules Handout, pgs. 44-45. Change the role names and responsibilities to work for your group, and swap roles for each adventure. Check out the Intentional Grouping Strategies, pg. xxii.

Level Up!

Allow learners to design a mission that involves using NASA science and engineering to solve a problem in their community. Provide them with Science Activity 6 Mission 5 Handout (PDF).

8. Say: **Each group will need to create a plan for your mission. The plan must explain (1) the hazards you expect on the mission and (2) mitigations that can deal with each hazard.**

9. Have groups review the cards to find information for their plans. They can add their ideas to the *Our Ideas* poster or list them on *Plan Your Mission*, pg. 25, in their Science Notebook.
    1. Have groups sort the Hazard cards and think about which apply to their missions.
    2. Have groups sort the Mitigation cards and think about which apply to their hazards.
    3. Have groups sort the Chance cards and identify other factors affecting them.
    4. Now pass out Deck B, the hand-drawn cards from Adventure 3, and ask learners if they think that any of their created cards apply to their mission. If so, they should use them!
10. Visit each group, ask which cards they want to know more about, and read them relevant information from the Educator Science Background (weblink).
11. Have each group decide how to share their plan during the Science Share-Out. Possible ways to share include the following:
    - Post Hazard cards and the corresponding Mitigation cards on a poster.
    - Explain out loud to NASA about how to mitigate each hazard on the mission.
    - Stage a play that shows how mitigations address each hazard.
    - Draw a comic showing how astronauts and mission control mitigate each hazard.

Support Learner Differences

As necessary, group learners so they can support each other in completing *Plan Your Mission*.

Teaching Tip

If learners would benefit from more movement, have them act out the various motions on the Chance cards as part of the planning process.

If time is short, pause the adventure here and have learners plan how to share during another session.

Support Learner Differences

- Some learners may disengage if the Share-Out contains too much whole-group discussion. Think about what your learners need and ensure they choose an appropriate Share-Out structure.
- If you have learners who speak multiple languages, encourage them to share in their preferred languages. Circulate and ask groups: **Where can you include your preferred language or other languages you know in your share-out?** Encourage learners to make welcome signs and present in different languages spoken by the audience.
- All learners should contribute to the Share-Out, but not everyone will feel comfortable presenting in the same style. Indigenous learners may feel it is inappropriate to present directly as the center of attention. Ensure nonverbal presentation methods are available, and encourage participation behind the scenes, not only presenting in front of the group.

Reflect & Wrap Up (10 min.)

12. Revisit the Guiding Question: **How can we mitigate hazards on a particular NASA mission?** Have each group share what they learned about the hazards on their mission. As needed, remind them of terms on the *Our Ideas* poster.

13. Say: **Next time, you will share your mission ideas with family and community members.** Hand out copies of *Science Adventure 6 Share-Out Invitation Handout,* pg. 58, for learners to give to caregivers, family, and friends.

After the Adventure

1. Clean up:
   - Keep the *Our Ideas* poster for use in the Science Share-Out.
   - Keep learners' presentation materials for use in the Science Share-Out.
2. Plan for Science Adventure 7. See Science Adventure 7 Preparation on pg. 60.
3. Take time to reflect on the following educator prompt: **How did you support multiple means of expression?**

Space Hazards Additional Resources

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

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

Support Thinking

Ask: **Which hazards are most likely? Which are least likely? Which mitigations are easiest, cheapest, or apply to the most hazards?** As learners share, add key descriptive vocabulary to *Our Ideas* poster, such as *most likely*, *least likely*, *cheapest*, and *most expensive*.

Level Up!

- The Curiosity Rover encounters a lot of rocks while it's roving around on Mars. NASA designed the wheels of the next rover, Perseverance, differently to try to mitigate this rocky hazard! Check out this article from when Perseverance was fitted with its new shoes before launch: "NASA's Perseverance Mars Rover Gets Its Wheels and Air Brakes." (5 min.)
- Ask these story prompts: **Why is it important to share ideas? When have you shared your ideas before (for example, with family or community members)?** Have learners share with a partner. Tell learners, if anyone asks them what they did today, they can tell them "We made a plan to mitigate the hazards on a space mission" and ask them the above story prompts. Consider returning to learners' ideas at the start of the next adventure. (5 min.)

Science Share-Out Invitation

You're invited to the Science Share-Out

Come see your young scientist share their plans for a NASA Mission!

Date: _____

Time: _____

Location: _____

Grantee