

Science Activity 8: Destination Mars: Choosing a Landing Site and Preparing for the Science Share-Out

Educator Preview

Activity Snapshot

Learners combine multiple data sets to choose a safe and scientifically interesting landing site for a Mars rover. They then prepare to share their findings with the whole group and with invited guests.



Timing | 45 minutes

Get Ready and Team Up	10 min.
Choose a Landing Site and Prepare for the Share-Out	25 min.
Reflect	10 min.
Total	45 min.



Prep Snapshot*

Prep Time 40 min.

(several days in advance)

Send Science Share-Out Invitations to people from the community.

**See Materials & Preparation for full info.*



21st Century Skills

Connection

- Communication

Science Practices

- Interpreting Data
- Constructing Explanations
- Communicating Information



Guiding Question

Which landing site on Mars do we recommend, and why?

Learners Will Do

Choose a landing site that is scientifically interesting and safe.

Learners Will Know

Scientists must consider a lot of data to understand an area.



Connecting Across Activities

Activity 7: Using Spectroscopy to Understand Mars	Activity 8: Choosing a Landing Site and Preparing for Science Share-Out	Activity 9: Science Share-Out
Last time , learners interpreted spectra to identify the types of minerals at each of the different landing sites. These graphs are the third set of data they will use to choose a landing site.	Today , they use the various kinds of data they have collected—landform images, topographic maps, and spectra—to choose a landing site.	Next time , they will share their findings.

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/>.

QR Code for Activity Resources



weblink: <https://hov.to/1ef83b5f>

Materials and Preparation

Materials

For the whole group

- *Our Ideas* poster (on paper or a shared digital document) in Prep & Setup Guide (PDF) [Examples](#) | [Templates](#)
- **Science Activity 7** [Audio Files \(weblink\)](#)
- Optional: Tactile [Science Activity 7 Mineral Fingerprints Handout \(PDF\)](#) from Science Activity 7
- Optional: Tactile [Science Activity 7 Mars Minerals Spectroscopy Data Packet \(PDF\)](#)
- Devices for listening to audio

For each small group

- [Science Activity 7 Mineral Fingerprints Handout \(PDF\)](#)
- [Data Packets from Science Activities 3 \(PDF\), 5 \(PDF\), and 7 \(PDF\)](#)
- [Landing Site Ovals from Science Activity 3 \(PDF\)](#)

For each learner

- [Science Notebook \(PDF\)](#)

For community members

- [Science Share-Out Invitation Handouts from Activity 7, pg. 92](#)

Activity 8 Materials Preparation (15 min.)

Ahead of Time

1. Review the *Our Ideas* poster “In-Use Example” in the [Prep & Setup Guide - Examples \(PDF\)](#) to help you think about what to add to the *Our Ideas* poster during the discussions in this activity.
2. If you have not already, send *Activity 7 Science Share-Out Invitation Handouts, pg. 92*, to invite people from the community, including families and friends of learners, to the Science Share-Out.

3. For reference:

- download the *Science Activity 7* [Audio Files \(weblink\)](#) for each spectrum and set up a listening station center for learners to refer to as they choose. Place one copy of the [Science Activity 7 Mineral Fingerprints Handout \(PDF\)](#) and one copy of the [Science Activity 7 Mars Minerals Spectroscopy Data Packet \(PDF\)](#) at the center.
- optional: place tactile *Mineral Fingerprints Handout* and tactile *Science Activity 7 Mars Minerals Spectroscopy Data Packet* at a center that is accessible to all learners so they can refer to these as they choose.

In Your Space

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

Activity Guide

Get Ready and Team Up (10 min.)

1. Ask: **If you did the last activity, what did you do and why?** (*We interpreted spectra to identify unknown minerals at each potential landing site. We ranked the sites based on the number of minerals present that form in water.*) Draw learners' attention to their findings about minerals on the *Our Ideas* poster.
2. Say: **Our challenge is to choose the best landing site to search for past liquid water.**
3. Refer to the *Our Ideas* poster. All questions related to this activity should have been answered. If there are unanswered questions, encourage learners to do some research on their own using the links on [Learner Resources weblink](#). Say: **When it's time to choose a landing site for a mission to another planetary body, NASA assembles a large team to pinpoint the best locations. They examine a lot of different types of data to make a decision. Today, you will consider all the data you have collected—on landforms, topography, and minerals—and choose the landing site you decide is safest and most likely to have evidence of past liquid water.** Share the Guiding Question with learners aloud and write it on the *Our Ideas* poster (using multiple languages as needed): **Which landing site on Mars do we recommend, and why?**
4. Organize learners into groups of four and distribute Science Notebooks.

Choose a Landing Site and Prepare for the Share-Out (25 min.)

Choose a Landing Site (10 min.)

5. Say: **What are some things you have to think about when choosing a landing site?** (*The landforms, the minerals present, the landing site perimeter, the safety.*) Say: **In your groups, you will need to decide on one landing site. You will need to consider which site would offer the most interesting science but also consider the safety of the site. Sometimes one site might be the safest, but not the most interesting. (Use hand gestures as if you are weighing the options.) So you will have to consider or weigh all the factors and try to reach a decision that best balances all the factors. When you think about all of the factors and options, you are considering the compromise, or *tradeoff*, between site safety and interesting science.**
6. Say: **In your groups, review the data for (1) landforms, which you detected from images, (2) safety, which you found from topographic maps, and (3) minerals, which you detected from spectroscopy.** As you mention each type of data, refer to the Science Notebooks, the charts on the *Our Ideas* poster, or other shared documents from Science Activities 3, 5, and 7.



Support Learner Differences

If new learners are joining you, lead an [inclusion activity](#) (pgs. xx-xxi) and use other [engagement strategies as necessary](#) (pgs. iii-xxvi).



Level Up!

Have learners find out more about picking the candidate landing sites for the Artemis III mission in "[NASA Identifies Candidate Regions for Landing Next Americans on Moon](#)." (5 min.)

Prepare for the Share-Out (15 min.)

7. After about 10 minutes, say: **Once your group chooses a landing site, decide how you would like to share information about that site. You will share with the whole group and any invited guests. Ask: What are the important ideas you think we should share?** (*Our role as scientists; the problem of gathering information from a distance; the definition of remote sensing; questions we were trying to answer, the benefits of each site, the tradeoffs, etc.*) **How do you think we should share our findings?** (*Posters; drawings, mapping or graphing our findings; recording a video or audio message; staging a performance; writing a description, etc.*) Say: **If you want to, you can use the sentence starters on *Make the Case for Your Site*, page 15, in the Science Notebooks, to get started.**
8. As groups are working, help guide their thinking by asking one or more of the following questions: **What evidence can you use to help you choose your landing site? Which site do you think will be the most scientifically interesting? Why? Which is more important: site safety or interesting science? Why?**
9. The Share-Out is a chance for learners to explain their thinking and reflect on what they learned about remote sensing throughout the unit. As a group, agree upon a structure for the Share-Out. Possible structures include the following:
 - **Storytelling:** Groups use the evidence they've collected to tell stories about the Test Sites and what the scientists might find there.
 - **Gallery Walk:** Groups stand at their stations and explain their technologies, posters, graphs, maps, writings, drawings, or audio or videos on small devices.
 - **Pair-Share:** Groups pair off and share their choices with one another.
 - **Screening:** The whole group watches video or audio files that learners have created. If time permits, they can make slideshows or animations.
 - **Performance:** Some people play scientists asking questions about learners' remote sensing devices. You can develop script cards to include adults in the play.
 - **Discussion:** Learners and community members share their knowledge. You can write discussion prompts to lead this discussion.



Support Thinking

Allow learners to reference the audio and tactile data as needed. If time permits, let learners research unanswered questions from the *Our Ideas* poster.

There is no "right" answer to which site to select. Gale Crater and Jezero Crater were both selected as landing sites for NASA rovers. The Level Up Nili Fossae and Iani Chaos sites were both considered as possible landing sites, and Nili Fossae was a finalist in site selection for both the Curiosity and Perseverance rovers.



Teaching Tips

Before learners begin, consider suggesting roles that group members can fill, such as one member referring to observations from previous activities, another member tracing the landing oval on maps, and a third recording the group's choices.

If all of your groups seem to be choosing the same landing site, you can gently encourage some groups to choose a different option, which will lead to more interesting discussion and debate.

Reflect (10 min.)

10. Revisit the Guiding Question on the *Our Ideas* poster. Ask: **Which landing site on Mars do we recommend, and why?** Learners should refer to their own work to answer the question. Help learners to accept that other groups may have made a different choice, and that's fine as long as they can support their choice using the data they collected.
11. Say: **Sometimes, many sites seem interesting, so the evidence scientists use to explain their reasoning is important. A site may be "best" in terms of science, but not good for safety, so scientists need to consider tradeoffs. Important decision making requires looking at the problem in different ways, working as a group, and compromise.** Ask: **When might it be useful to work with others, consider a problem in different ways, and compromise?**
12. Say: **Good job working as scientists today! Now you are prepared for next time, when you will present to each other and to our guests. Remember, the process you are following is like the process NASA uses to choose landing sites.**

After the Activity

1. Clean up:
 - Keep the *Our Ideas* poster for use in Activity 9.
 - Collect the Science Notebooks, *Science Activity 3 Mars Landforms Data Packets*, *Science Activity 5 Mars Landing Site Topography Data Packets*, *Science Activity 7 Mineral Data Packets*, and *Landing Site Ovals*.
 - If you set up listening and tactile stations, collect the materials from each.
2. Plan ahead for Science Activity 9. See [Activity 9 Materials Preparation on pg. 102](#).
3. Take time to reflect on the following educator prompt: **What methods did learners choose to present their ideas? How did you support multiple means of expression?**



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 just in presenting in front of the class.



Teaching Tip

Provide time for learners to practice their share-out in pairs or small groups.

Remote Sensing Additional Resources

QR code leads to resources available for this unit.



weblink: <https://hov.to/248cf0d9>

