Engineering Activity 7: The Final Test: Improving a Remote Sensing Device

Educator Preview

Activity Snapshot

Learners improve their remote sensing devices by making them easier to use, more compact, or better able to gather high-quality data.

Timing | 45 minutes

Get Ready and Team Up	10 min.
Improve and Test	25 min.
Reflect	10 min.
Total	**45 min.**

Level Up Activities 10 min. each

Prep Snapshot*

Prep Time 35 min.

Copy Share-Out invitations.

Set up Space Screens and a Materials Table.

**See Materials & Preparation for full info.*

21st Century Skills

Connection

- Collaboration
- Creativity
- Critical Thinking

Habits of Mind

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

Guiding Question

How can we improve our remote sensing devices?

Learners Will Do

Use test results to improve designs.

Learners Will Know

Engineers reflect upon, alter, and improve their designs.

Connecting Across Activities

Activity 6: Put It Together	Activity 7: The Final Test	Activity 8: Spread the Word
Last time, learners combined tools and systems from previous Activities and used their engineering design process to design and test remote sensing devices.	**Today,** they use what they learned from testing to improve their devices.	**Next time,** they will plan to share their designs at an Engineering Share-Out.

Activity Resources

Access background information, videos, and other resources using the link or QR code. 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/f850a25a

Materials and Preparation

Materials

For the whole group

- *Our Ideas* poster (on paper or a shared digital document). See Prep & Setup Guide (PDF)
  Examples | Templates
- crayons and markers
- Model landscape sites and Space Screens from Engineering Activity 6
- remaining materials from Engineering Activity 6
- 50 sticks, craft
- 75 sticks, fuzzy
- 50 sheets of paper

For each group of four

- remote sensing devices from Engineering Activity 6
- 1 pair of scissors
- 1 ruler
- 1 roll of tape, masking
- 2 Data Collection Grids (copied from pg. 62)

For each learner

- Engineering Notebook

Activity 7 Materials Preparation (35 min.)

Ahead of Time

1. Review the "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. Make copies of the Engineering Share-Out Invitation, pg. 96 in this guide, to distribute to learners' family and friends.

In Your Space

3. Place the *Our Ideas* poster in a visible place in your learning setting or prepare to share it digitally.
4. Arrange the Space Screens according to the Space Screen Assembly, pgs. 88-89,of this guide.
5. Create a Materials Table with the remaining materials from Activity 6.

Activity Guide

Get Ready and Team Up (10 min.)

1. Ask: **If you did the last activity, what did you do and why?** *(We designed remote sensing devices to answer scientists' questions and tested them on the test sites.)* Have groups share their results, discuss problems, or give advice from the last activity. Ask: **Which scientist did you choose to work with, and were you able to collect the information they needed?** *(The scientists are Jaime, Caris, and Alex. Learners may or may not have gathered the information they needed about topography, landing sites, and minerals.)* **What about your design is working well?** *(Features of the light redirection systems, filters, scrapers, and LiDAR.)* **What challenges did you encounter?** *(Positioning the remote sensing device and interpreting the data it provides, etc.)*

2. Say: **Today, you will improve your remote sensing devices to make sure that they can collect all the information your scientist needs about minerals, topography, and landforms. Refer to *Remote Sensing Plan, page 18* in your Engineering Notebooks (PDF), and add notes as you improve.** Share the Guiding Question with learners aloud and in writing on the *Our Ideas* poster *(using multiple languages as needed)*: **How can we improve our remote sensing devices?**

3. Organize learners into their groups of four from the previous activity.

Improve and Test (25 min.)

4. Allow groups to collect materials and begin working. Ask: **How are you improving your design?** *(We are making it fold up so it can be smaller; we are focusing on one area to get more detailed data.)* **Are your improvements working out the way you thought they would? What else can you do to improve?** *(Find a way to use fewer materials or make the device easier to position.)*

5. Have groups test their improved remote sensing devices and record the data they collect on *Data Collection: Improve, page 21* in their *Engineering Notebooks*.

6. As groups are working, circulate among them and ask questions such as the following: **Is your device collecting better-quality data for the scientists? How do you know?** *(Comparisons that the device can distinguish between minerals better or can measure topography better, etc.)* **What types of information are you able to collect so far?** *(Information about topography and minerals, data in the form of light, data in the form of sound, etc.)*

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-xvi).

Level Up!

Room on a spacecraft is usually very limited, so another way to improve a remote sensing device is to make it as small and compact as possible. Share examples of spacecraft with multiple remote sensing instruments, such as the Mars Reconnaissance Orbiter. Learners can challenge themselves to make their remote sensing devices compact enough to fit into a box of a specific size. To make the box, fold a piece of paper in half to form a 8.5" × 5.5" rectangle. Challenge learners to fit their devices on the rectangle. (10 min.)

7. Let groups that are still working know when there are ten and five minutes remaining. Have groups label their remote sensing devices.

Reflect (10 min.)

8. Have each group come up with an answer to the Guiding Question: **How can we improve our remote sensing devices?** *(We can adjust the positioning of the light redirection system and LiDAR. We can choose different filters or scrapers to use. We can make the device smaller.)* Have learners record their answers on the *Our Ideas* poster.

9. Ask: **Why is it important to try to improve, even when things are working pretty well?** *(It is good to try to be better; there is always room for improvement, this is how we discover new ways of doing things, etc.)*

10. Say: **Good job working as engineers today! Next time, you will make a plan to share what you have done with an audience.** Hand out copies of Engineering Share-Out Invitation, pg. 96, for learners to give to caregivers, family, and friends.

After the Activity

1. Clean up:
   - Keep the *Our Ideas* poster for Activity 8.
   - Save each group's design, the Space Screens, and the landscape sites for the Engineering Share-Out.
2. Plan ahead for Engineering Activity 8. See Activity 8 Materials Preparation on pg. 98.
3. Take time to reflect on the following educator prompt: **How did you support constructive group work during this activity?**

Remote Sensing Additional Resources

QR code leads to resources available for this unit.

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

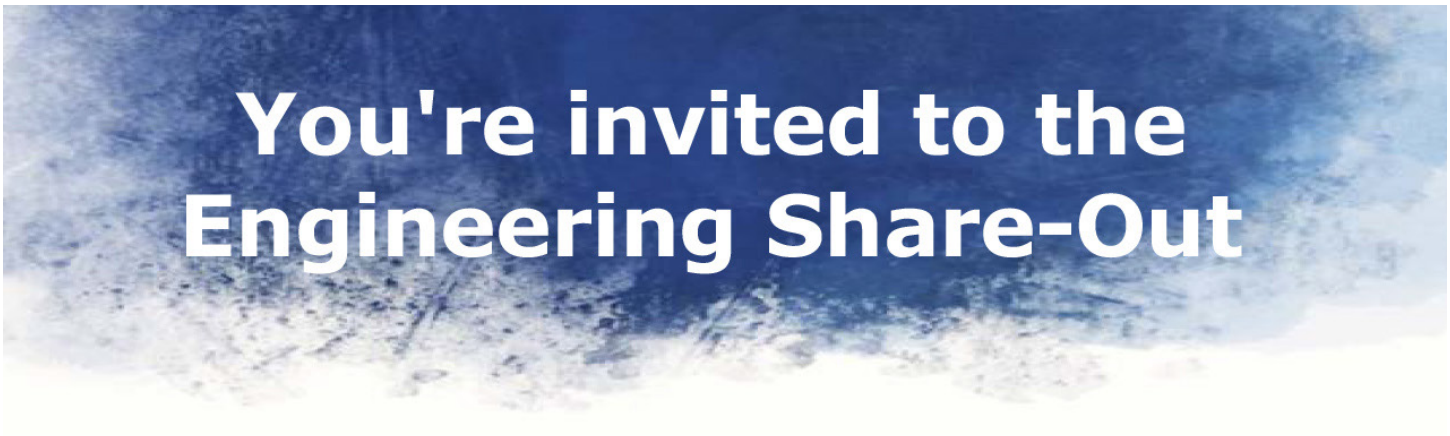
Support Thinking

Tell learners that the Lunar Reconnaissance Orbiter is a spacecraft that launched in 2009 to investigate the surface of the Moon. It has six instruments onboard to investigate temperature and radiation. It also includes one "technology demonstration." This is an instrument being tested to see if it works. Even NASA must do experiments before getting things right! Explain that failure is natural in engineering. Engineers gain information from failed designs and use it to make future designs better.

Level Up!

Refer to the Engineering Design Process (PDF) poster. Ask: **What phases of the *Engineering Design Process* did you use today?** *(We iterated our remote sensing devices and tested them again.)*

Engineering Share-Out Invitation



Come see your young engineer showcase their remote sensing device!

Date: _____

Time: _____

Location: _____

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