

EDUCATOR'S GUIDE

Lunar Landers

Preparation

Overview and Objectives

This lesson is geared toward students in grades K-5.

During its time of service, Intrepid was involved in the Space Race as a recovery vessel for two early space missions as the United States moved towards sending astronauts to the Moon. Further space missions would lead astronauts to land on

Participants will be able to identify key features that led to the success of the Lunar Module used during the Apollo missions..

This lesson includes a [slideshow](#) in which an instructor can lead participants through an investigation of the Saturn V rocket and Lunar Module of the Apollo missions. The lesson culminates with participants creating their very own lunar lander that has to absorb the shock for two “astronauts”.

Instructional Modalities

This activity was designed for both synchronous or asynchronous instruction.

For **synchronous instruction**, we recommend a platform that allows both for whole group discussion and for family members to interact in smaller groups as the family moves through the lesson and into the activity.

For **asynchronous instruction**, we recommend using the slideshow and visual instructions in the worksheet.

Materials

- [Lunar Landers Slideshow](#)
- [Lunar Landers Visual Instructions](#)
- [Lunar Landers Worksheet](#)
- Disposable Cups
- Pom-poms or Coins
- Index Cards
- Cardboard
- Straws
- Rubber Bands

Standards

Next Generation Science Standards

3-PS2-1

4-PS3-3

5-PS2-1

3-5-ETS1-2

- Scissors
- Tape

Lesson

1. Introductory Activity

- Ask Participants:
 - **What does it take to get to the moon?**
 - **What are some tasks astronauts do on their missions?**
 - Discuss the responses with the group.

2. Core Activity

- Share [video](#) of former astronaut Mike Massimino discussing the Saturn V rocket and many steps involved in landing on the Moon during the Apollo Missions.
 - **What are the different stages of the Saturn V rocket?**
 - **How did the descent stage help the lander land safely?**
- Ask participants:
 - **What might be challenging about landing on the Moon?**
- Discuss challenges with participants. Share drawing of lunar module and bring their attention to the drawings of the landing gear, focusing on the landing pad and struts
 - **What do you notice in the diagrams?**
 - **How could the compression honeycomb cartridge lessen the impact of the lander hitting the lunar surface?**
- [Guide participants](#) in creating their own lunar lander using the materials provided. Introduce the challenge by dropping a cup with two small objects inside (pom-poms or coins) and having participants think of ways to lessen the impact of that object hitting the ground. Design Requirements are that the cup must be on top of your design, the top of the cup can not be covered, and that objects must stay in the cup

when dropped. After creating your new design, have participants test it out and improve as needed.

- o **Do the astronauts stay inside the cup?**
- o **Does your design stay upright or fall to the side?**
- o **How can you improve your design?**

Asynchronous Adaptation

Have participants go through the [slideshow](#) on their own. Using a blank sheet of paper and coloring materials, participants can create their own constellation story. Have participants share their constellation stories using flipgrid using Padlet or Google Docs.

Extension Activities

To deepen student engagement with this content, you may choose to add the following activities :

Same Challenge, Fewer Materials

Engineers often have to carry out projects with limited resources or sometimes smaller budgets than anticipated. Have students create another lunar lander design with half the number of materials.

Learn more about HLS

Visit <https://www.nasa.gov/reference/human-landing-systems/> to learn about the Human Landing System (HLS), which is the mode of transportation that will take astronauts to the lunar surface as part of the Artemis program. What is similar between the Lunar Module and the HLS? What is different?

Additional Resources/ References

Apollo 11 Lunar Surface Journal:

<https://www.hq.nasa.gov/alsj/a11/a11LM5structures.html>

More Information on Apollo 11 Lunar Module:

<https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1969-059C>

More Information on Artemis 1:

https://www.youtube.com/watch?v=Oo_wZUmDjz4

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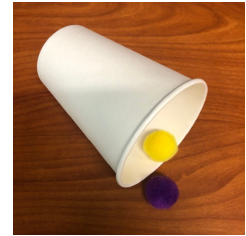
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Lunar Lander Visual Instructions

NASA designed the legs of the Lunar Module to absorb some of the impact when landing on the moon's surface. Create a design that lessens the impact on our poof astronauts. Follow the visual instructions to create your own design.



1. Put two poofs in a paper cup. Pick up the cup and drop it on the floor. What do you notice happens? If the poofs were astronauts and the cup was an Apollo Lunar Module, the astronauts would not be in good shape!



2. Use the following materials to create a lander that lessens the impact of a drop for your poof astronauts:

- Index Cards
- Cardboard
- Straws
- Rubber Bands
- Scissors
- Tape



A spring and other design elements can lessen the impact of a fall from a high distance. You can make a spring by folding an index card like an accordion or fan.



3. After creating your new design, test it by dropping it on the floor from table height. Do the poof astronauts stay inside the cup? Does your design stay upright or fall to the side? How can you make your design better?

Requirements:

- 1. The cup must be on top of your design**
- 2. The top of the cup cannot be covered**
- 3. Poofs must stay in the cup when dropped**

An example of a lunar lander can be found on the right. Try to create your own design!

