

Out of This World! - Week 7

Grades 3-5

Day 4: Lunar Touchdown: Create

Teacher/Parent Background:

[NASA](#) has announced its plans to return astronauts to the Moon by 2024 through a collaboration with commercial and international partners. In going to the Moon, NASA is laying the foundation that will eventually enable human exploration of Mars. The Moon will provide a proving ground to test technologies and resources that will take humans to Mars and beyond, including building sustainable, reusable architecture.

Overview:

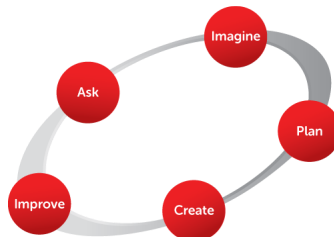
In this activity, learners will apply their knowledge of the features of the Moon (particularly craters) to imagine and develop a plan to design and build a spacecraft that can land in one of the Moon's craters without injuring astronauts or damaging the spacecraft.

Related Standards:

- **Define problems** and **design solutions** pertaining to force and motion.

Key Terms:

- moon - a natural satellite of a planet
- satellite - an object that stays in an orbit around a planet
- crater - dish-shaped pits formed when objects from space struck the moon's surface
- engineering design process - a set of steps engineers use to propose solutions to problems



Engineering Design Process

- blueprint - a design plan

Materials List:

- *Exploring the Moon* handout
- 1 piece of cardboard (4"x5")
- 1 small cup (8 oz, paper or plastic)
- 3 index cards
- 2 regular marshmallows
- 10 miniature marshmallows
- 3 rubber bands
- 8 plastic straws
- scissors
- tape
- pencil

Activity Description:

1. Revisit the student's spacecraft plan on the *Exploring the Moon* handout from Day 3.
 - Remember, just like an engineer, you have a specific blueprint/plan for how to build your spacecraft. You must build what you planned using only the materials you selected.
2. Provide the student with time, space, materials and adult support (as needed) to create his/her spacecraft based on his/her blueprint.

Closure:

Once the student has finished creating or the allotted time has elapsed, provide the student with time to test the spacecraft.

- Place the astronauts (the two regular marshmallows) in/on the spacecraft.
- Drop the spacecraft from a height of 30 cm (1 foot).
- Record the results on the *Exploring the Moon* handout.
- Then discuss successes and struggles that he/she experienced during the Create stage of the engineering design process and record on the *Exploring the Moon* handout.
 - What part(s) of creating your design did you find easy? Why?
 - What part(s) of creating your design did you find difficult? Why?
 - Did it tip over in the air or after landing? Why? What could you do to prevent that from happening?
 - Did the astronauts remain safely in the spacecraft? If not, why not? What could you do to prevent this from happening?

Before wrapping up the lesson, be sure to remind the student that he/she will have the opportunity to complete the next stage of the engineering design process tomorrow - improve. It may be difficult for the student to "walk away"

from the challenge at this point. He/she will probably want to test more and begin improvements right away. Try to avoid this as it is important to provide time for the student to reflect on his/her plan, the results of his/her test and possible improvements.

Extension:

Explore the current [lunar lander proposals](#) that NASA is pursuing.

- How is your spacecraft similar to and different from the ones proposed to NASA?
- What new ideas do you have for your spacecraft after reviewing the ideas of other engineers?

Exploring the Moon

Goal: Design and build a spacecraft that can safely land in a crater on the Moon in order to look for water and other usable resources.

CREATE

Test Results: What happened during the testing of your spacecraft? Be specific.

Reflecting on Your Test Results

What part(s) of creating your design did you find easy? Why?

What part(s) of creating your design did you find difficult? Why?

Did your spacecraft tip over in the air or after landing? Why? What could you do to prevent that from happening?

Did the astronauts remain safely in the spacecraft? If not, why not? What could you do to prevent this from happening?