

Out of This World! - Week 7

Grades 3-5

Day	Topics	Related Standards
1	Lunar Touchdown: Ask - Exploring the Moon	Develop, revise, and use models based on evidence to construct explanations about the movement of the Earth and Moon within our solar system.
2	Lunar Touchdown: Making an Impact	
3	Lunar Touchdown: Imagine & Plan	Define problems and design solutions pertaining to force and motion.
4	Lunar Touchdown: Create	
5	Lunar Touchdown Improve	

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Day 1: Lunar Touchdown: Ask - Exploring the Moon

Teacher/Parent Background:

One of the most visible objects in space is Earth's moon. A moon is a natural satellite of a planet. A satellite is an object that stays in an orbit around a planet. The moon's surface is thick with dust and dotted with rocks of various sizes. Astronauts brought samples of moon rocks back to Earth for study. The side of the moon that faces Earth is covered by vast, dark plains. Other surface features include lunar mountains and craters, which are dish-shaped pits formed when objects from space struck the surface.

Overview:

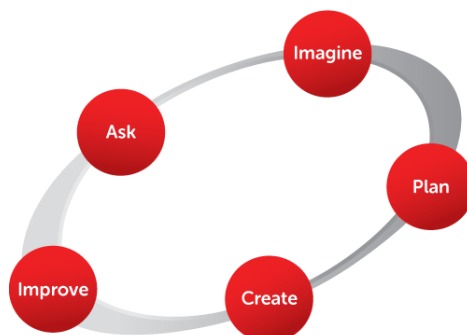
In this activity, learners will explore and document features of the Moon in order to gather background information needed to complete an engineering design challenge in which they need to design and build a spacecraft that can land in one of the Moon's craters without injuring astronauts or damaging the spacecraft.

Related Standards:

- **Develop, revise, and use models** based on evidence to **construct explanations** about the movement of the Earth and Moon within our solar system.

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

Materials List:

- *Exploring the Moon* handout
- Research materials about the Moon:
 - <https://solarsystem.nasa.gov/moons/earths-moon/overview/>
 - <https://solarsystem.nasa.gov/moons/earths-moon/in-depth/>
 - <https://www.natgeokids.com/au/discover/science/space/facts-ab-out-the-moon/>
 - <https://www.planetsforkids.org/moon-moon.html>
 - <https://www.brainpop.com/science/space/apolloproject/>
 - <https://www.brainpop.com/science/space/moon/>

- [Over \(to\) the Moon](#) Crash Course Kids video

Activity Description:

1. Introduce the engineering design challenge that the student will be exploring this week:
 - NASA is looking to further explore the Moon, in particular, several craters observed while orbiting the Moon during previous trips. Testing and studying these craters may help NASA identify areas on the Moon that are rich in water and other resources to determine how to best use those materials while on the lunar surface.
 - Before they can even consider sending a spacecraft and astronauts, NASA must locate safe landing sites within a crater.
 - Once they find one, they need to design and build a spacecraft that can land there without injuring astronauts or damaging the spacecraft.
2. Prompt the student to begin the challenge by responding to the question prompts under the “Ask” phase of the *Exploring the Moon* handout.
 - What is the problem?
 - What has NASA already done related to the problem?
 - What are your constraints?

Closure:

Revisit the student's responses to the question prompts under the “Ask” phase of the *Exploring the Moon* handout:

- What is the problem?
 - 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.
- What has NASA already done related to the problem?
 - Provide the student with access to research materials to study prior lunar expeditions and the make-up/composition of the Moon's surface.
- What are your constraints?
 - Spacecraft must land in the designated crater on the Moon's surface.

Then prompt the student to consider additional information needed to solve the problem:

- How long do I have to build the spacecraft?
- What materials are available?
- How will I know if my spacecraft successfully completes the challenge?

Extension:

Watch *Over (to) the Moon* Crash Course Kids video. Use the ideas and models presented to respond to the following:

- What effect does gravity have on a spacecraft trying to travel to the moon?
 - Earth's gravity pulls the spacecraft towards Earth's center. The spacecraft must fly fast enough to overcome the effect of Earth's gravity. Once the spacecraft nears the Moon, the Moon's gravity pulls the spacecraft toward the center of the Moon.
- What two factors affect how strong the force of gravity is on an object?
 - The mass of the objects and their distance from one another.
- Using what you learned about gravity, explain why the moon revolves around the Earth.
 - Both the Moon and Earth have gravity. Because the Earth has a much greater mass than the Moon, the Earth's gravity is much stronger. This causes the Moon to be pulled toward the Earth, keeping it in orbit around the Earth.

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.

ASK

What is the problem?

What has NASA already done related to the problem?

What are your constraints?

Need to Knows