Classroom Activities

Jet Propulsion Laboratory
California Institute of Technology

Jet Propulsion Laboratory Classroom Activities

Search by: Type, Subject, Grades, Topics

Grades: K-12

Subjects: Science, Technology, Engineering Math, Language Arts, and Arts

NGSS standards: Provided for each activity.

Visit this website to look at hundreds of activities.

https://www.jpl.nasa.gov/edu/teach

Sample Activity

Jet Propulsion Laboratory
Classroom Activities

Sample: **Roving on the Moon Activity**

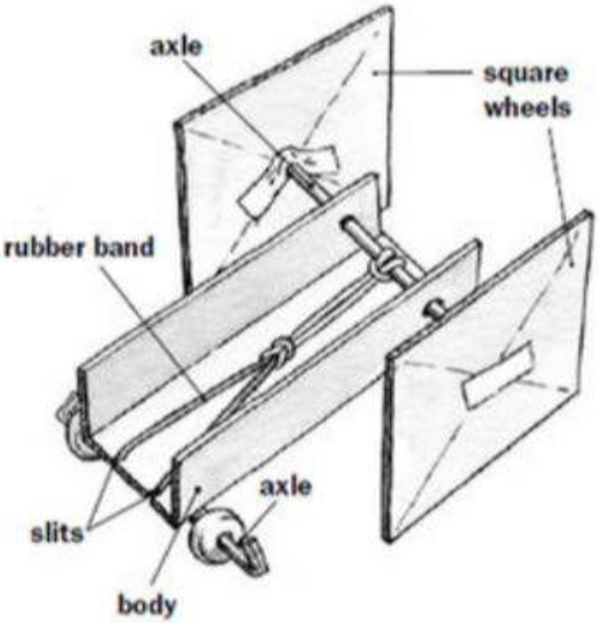
Grade level: 6 – 12

Subjects: Engineering

NGSS standards: Provided.

Engineering students design a rubber band-powered rover that can scramble across the room.

https://www.jpl.nasa.gov/edu/teach/activity/roving-on-the-moon/



Sample Activity

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Sample: Touchdown Activity

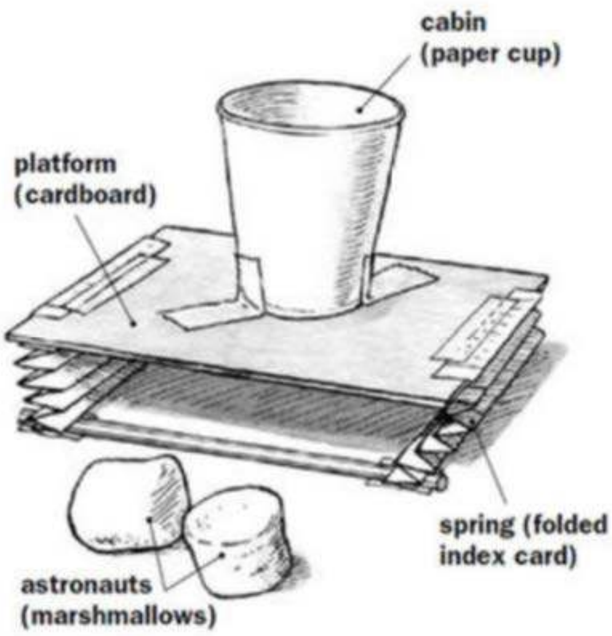
Grade level: 3 – 8

Subjects: Engineering & Technology

NGSS standards: Provided.

Students design and build a shock-absorbing system that will protect two "astronauts" when they land.

https://www.jpl.nasa.gov/edu/teach/activity/touchdown/



Educator Guide

Exploring the Lunar Surface

Grade level: 3 – 5

6 Lesson Plans

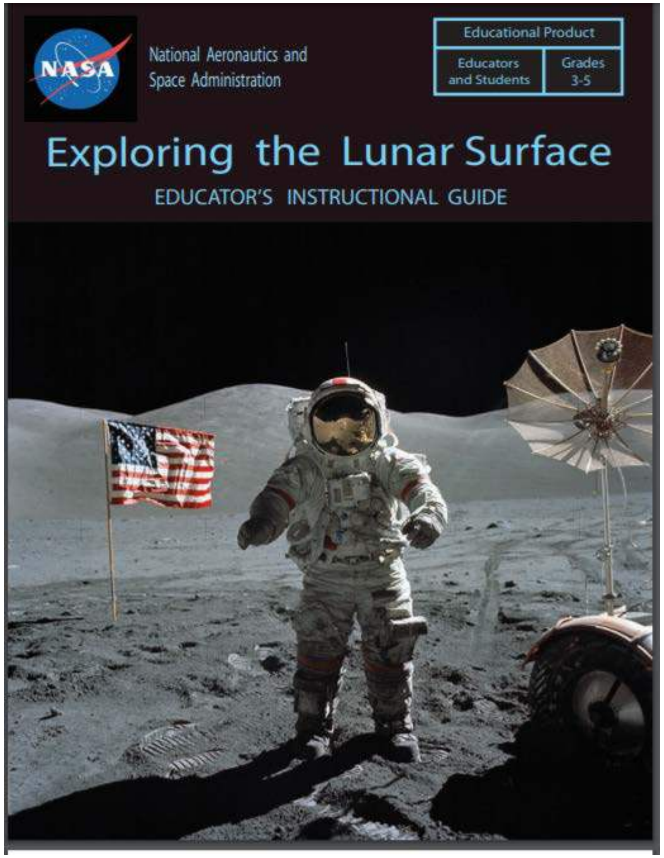
Subjects: Science, Engineering, Math

NGSS standards: Provided.

Created by: SpaceMath@NASA

Students will build models to learn about spacecraft, do experiments to understand weightlessness, and will explore the lunar surface using photos, data, math and other skills.

Download the Educator Guide here:
https://www.nasa.gov/pdf/737171main_Exploring_Lunar_Surface.pdf



STEM Activities and Teacher Guide

Lunar Math

Grade level: 5 – 12

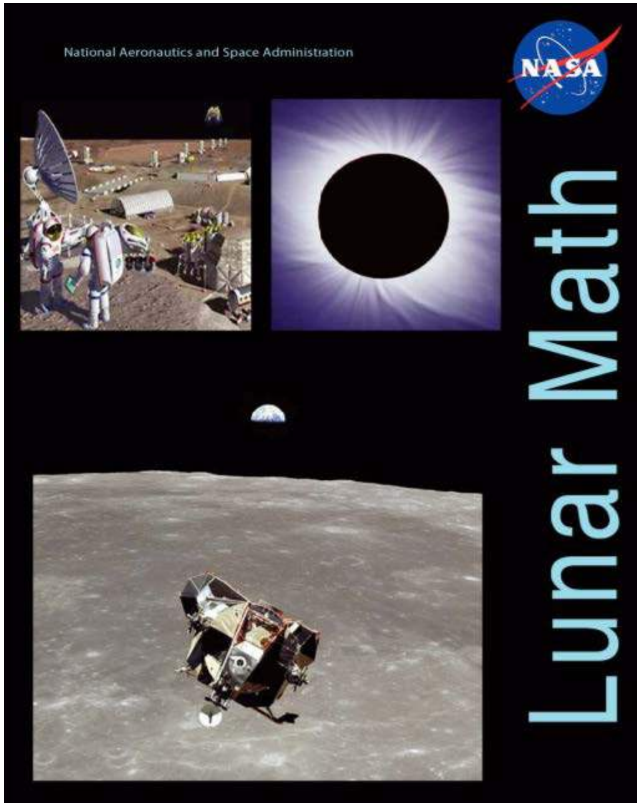
Subjects: Math and Science

NGSS standards: Provided.

Created by: SpaceMath@NASA

Students will learn about the moon, its cycles, its craters, eclipses and will learn math skills at the same time. This Guide is a collection of activities, based on one-page space science problems with an answer key and Teacher's Guide and can also be used as a classroom challenge activity.

Download the Educator Guide here:
https://www.nasa.gov/pdf/737171main_Exploring_Lunar_Surface.pdf



Educational Toolkit

EXPLORE SCIENCE Earth & Space

Explore Science: Earth & Space 2019 Toolkit

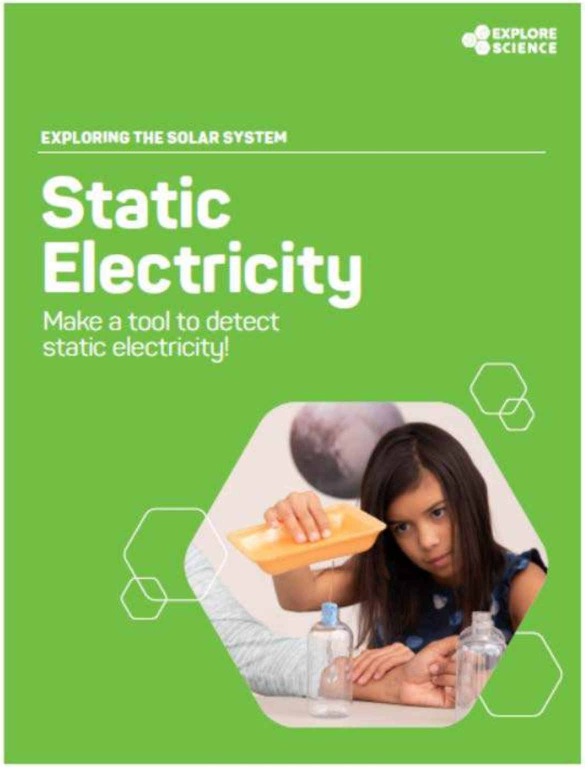
Components:

9 planning documents
5 training materials
11 hands-on STEM activities

Subjects: Earth, Science, Technology

Created by:
In collaboration with NASA, the NISE Network has assembled a new set of engaging, hands-on Earth and space science experiences with connections to science, technology, and society.

http://www.nisenet.org/earthspacekit-2019



Level: Kids all ages, Families, Educators

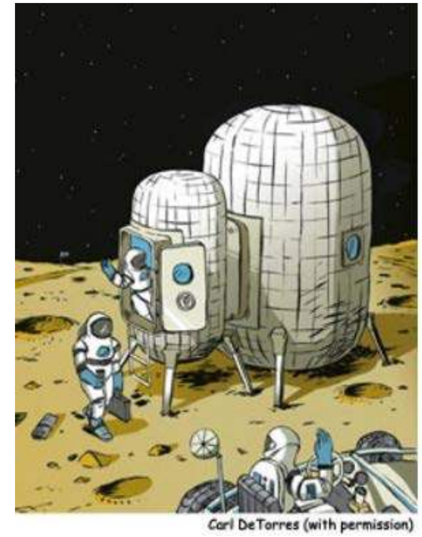
Subjects: STEM

Components: Hands-on activities, fun games, articles, short videos.

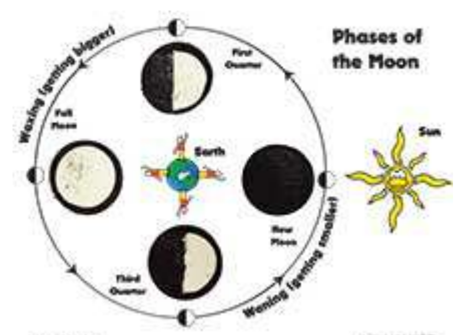
Created by: NASA Space Place Team at JPL

NASA Space Place's mission is to inspire and enrich upper-elementary-aged kids' learning of space and Earth science online through fun games, hands-on activities, informative articles and engaging short videos. Material in both English and Spanish and resources for parents and teachers.

Visit this site: https://spaceplace.nasa.gov/



Build a Lunar Habitat



Make Oreo Moon Phases

NGSS Connections for *Apollo 11: First Steps*

Teachers can use *Apollo 11: First Steps* with additional activities and discussion to support the **Next Generation Science Standards**.

What follows are the NGSS standards and film tie-ins for Upper Elementary through High School.

Upper Elementary:

3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

When we see the diagrams Apollo 11's path, it is clearly possible to make predictions about where it will go in the future.

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Students who see *Apollo 11* will be primed to do a water rocket or paper rocket design challenge when they get back to class.

5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.

Watching the Saturn V launch and the re-entry capsule splashdown are clear examples of Earth's gravity pulling down.

NGSS Connections for *Apollo 11: First Steps*

Middle School

MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

We see the difference in how the astronauts move while on the moon (where gravity is less, because if the moon's smaller mass). Also, gravity is clearly an attractive force since the large Saturn V rocket is needed to get the astronauts off the Earth.

MS-PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

This is the kind of problem that NASA engineers had to solve many times in the space program. The astronauts needed to maintain a comfortable temperature while on the moon, so the suit could warm or cool them as needed. The re-entry capsule had a heat shield to protect the crew from high temperature gasses around them on descent.

MS-ESS 1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

The diagram of Apollo 11's path from the Earth to the moon could be used to reinforce the arrangement of the Earth, moon, and sun.

MS-ESS 1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

The diagram of Apollo 11's path from the Earth to the moon helps to convey the scale of distances in the Solar System. Also, the emphasis on how many days the astronauts were in transit from Earth to the moon, even though they were travelling very, very fast. Finally, the motion of the astronauts as they moved around on the moon clearly shows that they weigh less there.

MS-ETS 1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

President Kennedy's speech could be though of as the beginning of the definition of the engineering challenge of getting to the moon. He specified a time frame, that the astronauts would land on the moon (not just orbit it), and that they would return to Earth safely.

NGSS Connections for *Apollo 11: First Steps*

High School

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

To support this, ask students to use Newton's second law to explain the staged design of the Saturn V launch vehicle. Why have sections of the rocket drop off after the fuel was consumed? Compare the size of the rocket motor at the bottom of the Saturn V to the rocket on the lunar lander. Why is the lunar lander rocket so much smaller?

HS-PS2-4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Obtain the mass and radius data for the Earth and the moon and have students calculate the difference in gravitational force at the surface of each body. At one point on the journey from Earth to the moon, the gravitational force of the Earth on the astronauts would be exactly the same as the gravitational force of the moon on the astronauts. Where would that point be?

HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

There are many examples in the film of NASA engineers working on design challenges like this. The Saturn V launch vehicle converts chemical energy into kinetic energy, which is converted into gravitational potential energy. On reentry, the kinetic energy of the vehicle is converted into heat.