

MoonStruck, Grades 3-4

Program Description:

Using hands-on activities and modeling, students examine why the Moon changes shape every night and how it orbits the Earth. They will study the Moon's features on a "trip" with the Apollo astronauts, create a scale model of the Earth and Moon, and make a Moon activity book to take home.

Vocabulary:

asteroid	eclipse	Moon Phases	scale model
atmosphere	explore	phase	solar eclipse
Comet	full	planet	Solar System
comparison	gibbous	predict	star
Crater	lunar eclipse	quarter	Sun
Crescent	model	revolve	wane
Earth	Moon	rotate	wax

Possible Class Activities

- Draw a picture of the Moon.
- [Enact a model](http://www.jpl.nasa.gov/education/educators/moonphase.html) (<http://www.jpl.nasa.gov/education/educators/moonphase.html>) of the Sun, Earth, and Moon to help understand phases.
- Examine and identify visible Moon features.
- Investigate Moon lore and stories such as <http://btc.montana.edu/ceres/html/Quemoonresource.html#myths> and "faces" you may see on the Moon.
- Explore surface features while on an astronaut trip to the Moon with these NASA images: <http://images.jsc.nasa.gov/iams/html/pao/apollo.htm>
- Compare the Earth and Moon sizes; work in groups to evaluate the distance from the Earth to the Moon and create a scale model.
- Make a Moonbook of activities to take home.

Pre-Visit Activities (in your classroom):

- Review vocabulary (above). Have students model rotation and revolution.
- Examine Moon images and maps such as:
 - Labeled Moonmap: <http://www.skypub.com/sights/images/moonmap.jpg>
 - Large unlabeled Moonmap: <http://www.seds.org/billa/pics/Luna2.jpg>
 - or [other Moon images](#) (see page 5)

- Discuss (without providing answers) students' ideas for what the features are, how they were formed, and whether similar features may exist on Earth.
- Record and draw the Moon as it appears each day for one month. Post pictures in order in the classroom, each day adding a new picture. (Leave blank pages for days that the Moon was not seen.) Predict what the Moon will look like next.

Post-Visit Activities:

At CSSC:

Visit exhibit: "Planetary Landscapes: Sculpting the Solar System."

In your classroom:

- Create impact craters in the classroom. Use Teachers' Guides from
 - (1) p.6 of "Think SMALL in a big WAY": <http://stardust.jpl.nasa.gov/classroom/guides.html>
 - (2) http://www.spacegrant.hawaii.edu/class_acts/CrateringDoc.html
 - (3) <http://www.lpi.usra.edu/education/EPO/explore/craters.pdf>
- Record and draw the Moon each day for one month. Use Moonbooks provided in CSSC class for record sheets.
- Make Earth and Moon icosahedrons: <http://solarviews.com/cap/ico/index.htm>
For accurately scaled models: enlarge Earth page to 127% size, copying onto 8.5" x 14" paper; reduce Moon page to 32% size.

State of California Science Standards:

Grade 3:

Physical Sciences

1. Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept, students know:

d. energy can be carried from one place to another by waves, such as water waves and sound, by electric current, and by moving objects.

e. matter has three forms: solid, liquid and gas.

2. Light has a source and travels in a direction. As a basis for understanding this concept, students know:

d. we see objects when light traveling from an object enters our eyes.

Life Sciences

3. Adaptations in physical structure or behavior may improve an organism's chance for survival.

As a basis for understanding this concept, students know:

d. when the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

Earth Sciences

4. Objects in the sky move in regular and predictable patterns. As a basis for understanding this concept, students know:

d. the Earth is one of several planets that orbit the sun, and the moon orbits the Earth.

Investigation and Experimentation

5. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:

c. use numerical data in describing and comparing objects, events and measurements.

d. predict the outcome of a simple investigation, and compare the result to the prediction.

e. collect data in an investigation and analyze them to develop a logical conclusion.

Grade 4:

Life Sciences

3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept, students know:

b. for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

Earth Sciences

5. Waves, wind, water, and ice shape and reshape the Earth's land surface. As a basis for understanding this concept, students know:

a. some changes in the Earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

c. moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and

deposition).

Investigation and Experimentation.

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:

b. measure and estimate weight, length, or volume of objects.

c. formulate predictions and justify predictions based on cause and effect relationships.

Moon Images, Animations and Slide Sets Online

Labeled Moonmap:

<http://www.oarval.org/MoonMapen.htm>

Moonphase animation:

<http://www.solarviews.com/cap/moon/vmoon2.htm>

Rotating Moon and other moon animations and animated slide presentations:

<http://www.solarviews.com/eng/moon.htm#movie>

Moon Slide Presentation Online – Geologic History and Future

<http://amesnews.arc.nasa.gov/erc/moonSlides/index.htm>

Explore the Moon Slide Set:

<http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/Exploring.the.Moon.Slide.Set/index.html>

Apollo missions images and animations:

<http://www.solarviews.com/cap/apo/index.htm>

Apollo missions images and text:

<http://images.jsc.nasa.gov/iams/html/pao/apollo.htm>

Apollo Landing sites and other images & information:

http://www.lpi.usra.edu/expmoon/apollo_landings.html

Clementine Mission Slides:

<http://www.lpi.usra.edu/publications/slidesets/clem2nd.html>

Impact Craters Slide Set:

<http://www.lpi.usra.edu/publications/slidesets/craters.html>

Moon and Planet icosahedron set:

<http://solarviews.com/cap/ico/index.htm>

Moon at Perigee and Apogee:

http://www.fourmilab.ch/earthview/moon_ap_per.html

Online Moonphase “Quiz”:

http://starchild.gsfc.nasa.gov/docs/StarChild/shadow/solar_system_level2/moonlight.html

Phases of the Moon Monthly Calendar:

<http://www.googol.com/moon/>

3D Lunar Image Collections:

<http://www.anomalous-images.com/3-d/3-d.html> excellent lunar geology images

http://cass.jsc.nasa.gov/research/stereo_atlas/HTDOCS/PLANETS_TOUR.HTM#moo
(montes haemus, king crater, and alan beam on apollo 12)

<http://www.lpi.usra.edu/research/stereo/moonstereo.html> landing sites and a farside crater

<http://www.lpi.usra.edu/publications/slidesets/3Dsolarsystem.html> Solar System in 3D

<http://www.nasm.edu/apollo30th/moontheater/p01.html> - includes whole moon

<http://www.rainbowsymphony.com/mars/mars3dgallery.html> alan beam image