

Design a Lunar Buggy



To design and build a model of a Lunar Buggy that will carry equipment and astronauts on the surface of the Moon as well as determine the best slope of ramp for the rover to travel the farthest distance.

OBJECTIVE

To demonstrate an understanding of the Engineering Design Process while utilizing each stage to successfully complete a team challenge.

PROCESS SKILLS

Measuring, calculating, designing, evaluating

MATERIALS

General building supplies

Meter stick

Digital scale

Small plastic people (i.e. Lego)

Plastic eggs

Pennies or washers ("cargo")

Wheels

Something to use as a ramp (preferably a flat surface that would enable the buggy to roll for 25 cm or more)

STUDENT PAGES

Design Challenge

Ask, Imagine and Plan

Experiment and Record

PRE-ACTIVITY SET-UP

Set up a small ramp for the students to use with their Lunar Buggies. It can be made with something as simple as a large book set up on a table or a piece of wood propped up on chair.



MOTIVATE

 Show the video about the Apollo 15 Lunar Rover on the Moon:

http://starchild.gsfc.nasa.gov/Videos/StarChild/space/rover2.avi

• Ask students to pay attention to the comments made about the difficulties in driving on the lunar soil.





- Share the Design Challenge with the students
- Remind students to imagine a solution and draw their ideas first. All drawings should be approved before building.

CREATE

Challenge the teams to build their Lunar Buggies based on their designs. Remind them to keep within specifications.

EXPERIMENT

- Students must test their designs down the ramp and record the distance travelled for each trial.
- Students should try a "Goldilocks" experiment with how much cargo weight their Buggies can support by adding pennies to the plastic egg.

IMPROVE

• Students should *improve* their Lunar Buggy models based on results of the *experiment* phase.





CHALLENGE CLOSURE

Engage the students in the following questions:

- Did the cargo mass make a difference in your Buggy's performance?
- How did the slope of the ramp affect your Buggy's performance?

PREVIEWING NEXT SESSION

Ask teams to bring back their Lunar Buggy models for use in next session's challenge. You may want to store them in the classroom or have the facilitator be responsible for their safe return next session.

Ask teams to think about potential landing pods for use during the next session. Tell students they will be building the landing pod out of the materials that have been available to them. The pod will be dropped from as high as possible (out a second story window, off a tall ladder, or from the top of a staircase).



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Let's Go for a Ride!

During the first set of activities, you have spent some time thinking about how to get to the Moon. Now you need to think about landing on the Moon, and how to deliver cargo to the Moon. Astronauts will need a mode of transportation in order to investigate different areas of the Moon. During the Apollo missions, astronauts drove a Lunar Buggy several kilometers away from their spacecraft. Today you get to be the engineers designing a new Lunar Buggy that can perform functions the Apollo Lunar Buggy could not. Your challenge is to build a model of a Lunar Buggy that astronauts will eventually use to carry astronauts and cargo on the Moon.





THE CHALLENGE:

Each team must design and build a Lunar Buggy with the following constraints:

1. The Lunar Buggy must carry one plastic egg snugly. The egg may not be taped or glued into place. (The

egg represents the cargo hold.)

2. The Lunar Buggy must be able to roll with the cargo hold carrying 10 pennies (or washers).



- 4. The Lunar Buggy must roll on its own down a ramp for a distance of approximately 100 cm in a straight line beyond the ramp.
- 5. The Lunar Buggy must be able to hold cargo and astronauts must stay in place and in tact as the Buggy rolls down the ramp.





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What questions do you have about today's challenge?



Draw your Lunar Buggy. Make sure to label all the parts of your Buggy, including what will hold the egg and your astronauts in place.



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Approved by: _







1. Use a digital scale to measure the mass of 10 pennies (or whatever else you use as cargo) and record it here:

2. Test your Lunar Buggy on three different styles of the landing ramp, adjusting the height of the ramp (from the floor) each time. Measure the distance the Buggy travels down the ramp with that cargo mass.

Lunar Buggy Distance Data Table

Trial	Ramp Height (cm)	Distance Travelled (cm)
1		
2		
3		

3. Now try using a different cargo mass to see if your Lunar Buggy can travel even farther.

Cargo Mass = _____

How far did your Lunar Buggy travel with the above mass?

4. Draw the ramp design that worked best for your Buggy, making sure to label the height and length of the ramp in centimeters:



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