

Lesson 15: Egg Drop Lander

This lesson is adapted from “Mars Pathfinder: Egg Drop and Landing” an activity in The Mars Activity Book, by the Mars Education Program at Arizona State University (<http://marsed.asu.edu/pages/pdfs/MSIP-MarsActivities.pdf>)

Purpose: To provide collaborative opportunity to design and test a lander and practice writing skills.

Standards

NCTE/IRA Standards for English Language Arts

- Standard 5-** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- Standard 12-** Students use spoken, written, and visual information to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

National Science Education Standards

Science as Inquiry – Content Standard A

1. Abilities necessary to do scientific inquiry.
2. Understanding about scientific inquiry.

Science and Technology – Content Standard E

1. Ability of technological design – students should develop the abilities to identify a simple problem, propose a solution, implement a proposed solution, evaluate a product or design, and communicate a problem, design, and solution.
2. Understanding about science and technology – scientists and engineers often work in teams with different individuals doing different things that contribute to the results.

Overview

The only thing more unnerving than the launch of a spacecraft to Mars is entry, descent, and landing (EDL) onto the Martian surface. Those “six minutes of terror” make even the most seasoned EDL engineer a nervous wreck. After Phoenix plunges into the atmosphere at 16,000 mph, it has six minutes to slow down to 7.9 ft/s (0.09 mph) in order to make a safe, soft landing on the surface of Mars, all controlled automatically through the robotic sensors aboard the spacecraft. Borrowing from the classical egg drop, in this activity, students will design and build a descent and landing system for an egg. The students will also practice their

writing skills by writing a letter or article about the success or failure of their spacecraft design.

Understandings

1. Simple machines make tasks easier.
2. Simple machines affect our everyday lives.
3. Robots are made up of simple machines.

Materials

1. Plastic zipper storage bags to hold lander building materials
2. Paper clips
3. Drinking straws (any size)
4. Popsicle or craft sticks
5. String
6. Masking tape
7. Rubber bands
8. Pipe cleaners
9. Paper
10. Bubble wrap
11. Styrofoam (peanuts, cups, packing materials etc...)
12. Scissors
13. Ruler
14. Eggs
15. Small zipper storage bags to hold egg

Supplemental Materials

1. Mars Exploration Rovers Video: Entry, Descent, and Landing (http://marsrovers.jpl.nasa.gov/gallery/video/movies/mer_ch_edl_TerrorCommb.mov)
2. [Phoenix Mars Lander Entry Descent and Landing Animation*](#)

* Can be found in the MarsBots Material section of <http://phoenix.lpl.arizona.edu>

Time

Sixty to 90 minutes for building and dropping the “landers”

Directions

1. Students may work with a partner or in small cooperative groups. Ask the students to imagine that they are a space engineer with the task of designing a lander that will safely get its cargo (an egg) onto a planet's surface after being launched from an orbiting spacecraft. What will it need to land safely?
2. Have each group or individual create a blueprint of what their lander will look like. Show the students what materials they will be given. *You may decide to give each engineer a specific set of materials (so that all will receive the same amount of items) or allow the students to bring items to place in a community pile. If you are allowing the students unlimited materials you may want to also ask for a supply list along with the blueprint.*



3. Once their design has been approved have the students build their lander. *Place the lander cargo (egg) in a plastic zipper storage bag to avoid splattered egg everywhere in the landing zone.*
4. Locate a safe place to have the students drop their lander. Have each group or individual drop their lander one at a time. *They should all be dropped from the same height. Be sure the landing area is clear of students and objects.*



5. Have the students respond to the following questions in writing. How successful was your design? How would you change or improve a future design? *This could be in the format of an article, or news bulletin.*
6. Discuss the different lander designs and as a class discuss what design seemed to work best and why.