Lunar Lander

3rd Grade
Unit 5 – A Feast of Words on a Planet Called Earth and Beyond
Text Connection: *Moonshot* by Brian Floca

Design Challenge Summary

Challenge: What will the students be required to do?

"NASA is looking for safe landing sites on the moon. Once they find one, they need to design and build a spacecraft that can land there without injuring astronauts or damaging the spacecraft. Today you'll make a lander—a spacecraft that can land safely when you drop it on the floor. As you test, you'll find ways to make it work better. Improving a design based on testing is called the engineering design process." (From http://www.nasa.gov/pdf/418011main_OTM_Touchdown.pdf)

You will design a shock absorbing system that will safely drop two astronauts (marshmallows) exactly two, four, and six feet to the moon (ground). (**Note when dropping landers, the bottom of the lander should be dropped from exactly two, four and six feet.)

Standards: What standards are addressed?

Science:

NS.1.3.1 Communicate observations orally, in writing, and in graphic organizers
NS.1.3.2 Develop questions that guide scientific inquiry
NS.1.3.3 Conduct scientific investigations individually and in teams
NS.1.3.4 Communicate the results of scientific investigations
NS.1.3.5 Estimate and measure length, mass, temperature, and elapsed time
NS.1.3.6 Collect and analyze measurable empirical evidence as a team and/or as individuals
NS.1.3.7 Make and explain predictions based on prior knowledge
NS.1.3.8 Use simple equipment, age appropriate tools, technology, and mathematics in scientific investigations
NS.1.3.9 Apply lab safety rules as they relate to specific science lab activities

Math:

Mathematical Practice Standards
(Previous Grade Standard) Measure Length

ELA:

W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
W.3.10 Write routinely over extended time frames and short time frames for a range of discipline-specific tasks, purposes, and audiences.
SL.3.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Result: What will students know, value, and be able to do as a result of the lesson? What's the big idea?

Know and apply the engineering design loop. Students will be able to create a balanced lander that can successfully land the two astronauts on the moon from varying heights.

Assessment: What evidence will be used to determine student learning?

Did they successfully land the two astronauts on the moon from varying heights? How well did you lunar lander work? Did you keep your astronauts safe?

Did they follow the design loop process?
Did they work collaboratively?

Prior Knowledge/Experiences: What prior content knowledge and skills will the students need?

Experience with the Engineering Design Loop process
Connections to the Mathematical Practices
Investigations/inquiry in Science
Read *Moonshot* about Apollo 11 lunar landing and watch video (**http://www.sciencekids.co.nz/videos/space/moonlanding.html**). Also research various lunar landers and discuss with students pros and cons of various features and how they could balance their astronauts.

Summary/Connections: How will this design challenge connect with new/future learning, other content areas, real world experiences, etc.?

This lesson will help students develop problem solving skills and collaboration skills that are essential in succeeding in the 21st century. It will allow students the opportunity to transfer and apply skills from various content areas within one task.

Extension: Write an informational essay on construction of your lunar lander.
Compare/Contrast various lunar landers and their successes/failures.
Collect data on survival rate of "marshmallow" astronauts and have students create a bar graph to display data, and write questions/statements about their data.

Materials/Equipment/Preparation: What materials and equipment will students need to successfully complete this design challenge?

Paper/Plastic Cup
Cardboard
2 Large Marshmallows
4 4x6 index cards
Scissors
Tape
10 mini marshmallows
10 straws
4 rubber bands

Additional Information

- Students should not create "seat belts" to hold their marshmallows in the cup. The challenge is for them to think outside the box and create a balanced lander
- Idea Source: http://www.nasa.gov/pdf/418011main_OTM_Touchdown.pdf

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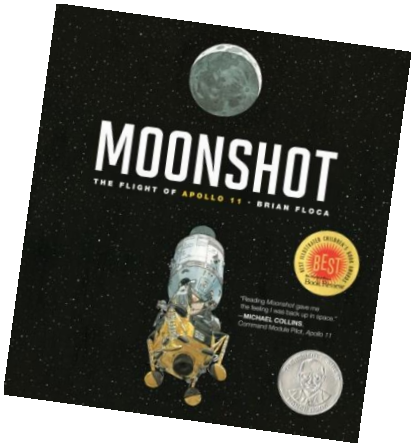

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Group Supplies:

Paper/Plastic Cup, Cardboard, 2 Large Marshmallows, 4 4x6 index cards, Scissors, Tape, 10 mini marshmallows, 10 straws, 4 rubber bands