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Infusing the Love of Science, Technology, Engineering and Mathematics!

Lunar Design Challenge

Subject Area: Astronomy, Engineering

Grade Level: Grade 8

Lesson Objective: Students will design, build, and test a Lunar Buggy to transport astronauts and cargo on the Moon. They will collect and analyze data, take measurements, and refine their models.

Grouping: Seat students four or five at a table

Duration of program: One hour

Standards Correlation:
Grade 8 Science:
Standard 8.P.1: The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.

8.P.1A. Conceptual Understanding: The practices of science and engineering support the development of science concepts, develop the habits of mind that are necessary for scientific thinking, and allow students to engage in science in ways that are similar to those used by scientists and engineers.

Performance Indicators: Students who demonstrate this understanding can:
8.P.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.
8.P.1A.3 Plan and conduct controlled scientific investigations to answer questions, test hypotheses, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.

Standard 8.P.2: The student will demonstrate an understanding of the effects of forces on the motion and stability of an object.

Performance Indicators: Students who demonstrate this understanding can:
8.P.2A.1 Plan and conduct controlled scientific investigations to test how varying the amount of force or mass of an object affects the motion (speed and direction), shape, or orientation of an object.

8.P.2A.2 Develop and use models to compare and predict the resulting effect of balanced and unbalanced forces on an object's motion in terms of magnitude and direction.

Required Materials:
History of the Lunar Buggy video
Lunar Design Challenge Power Point
Adjustable Ramps
Digital scale
Building material stations with:
- Cardboard boxes and recyclables (egg cartons, cardboard, etc.)
- Assorted wheels
- Assorted axles
- Assorted K'Nex pieces
- Washers
- Pipe cleaners
- Rubber bands
- Duct tape
- Masking tape

Materials needed for each team's bin:
- Criteria handout. laminated
- Clipboard with data capture sheet and pencils
- 2 small plastic people (Approx. 2 cm. each)
- 1 plastic egg with 3 washers (Cargo)
- metric measuring tape
- calculator

5E Procedures:

Engage	1. Share the History of the Lunar Buggy video with the students (5 minutes). How were astronauts able to explore areas of the Moon beyond their spacecraft? (think about gravity, terrain, spacesuits, etc.) 2. Share the Engineering Design Process with students (on Powerpoint). 3. Share the Design Challenge criteria with students. 4. Have students decide who will be responsible for each job listed on the data capture sheet, then brainstorm and collect materials.
Explore	1. Students design and build their Lunar Buggies (about 20 minutes). 2. Students test their model and record their findings for Design 1 (3 trials). 3. Students reflect on what they learned from their trials. They may then modify their designs to improve them based on their first design. 4. Students test and record data for Design #2 and Design #3.
Explain	Students will share their designs with the other groups and explain what worked/didn't work. Each team will have about 1 minute for their presentation.
Elaborate	If time permits, lead students in a discussion to answer the following questions: 1. Did the cargo mass make a difference in your Lunar Buggy's performance? 2. Did the weight of your buggy affect its performance? 3. Did the wheel size affect your buggy's performance? 4. Did the axle placement affect your buggy's performance? 5. How did the slope of the ramp affect your Lunar Buggy's performance?
Evaluate	Lunar Design data capture sheet

