Roving on the MOON!

Phase I – Research and Planning

The "Big" concept to be covered by the engineering design challenge

- Elastic Potential Energy
- Potential and kinetic energy
- Newton 2nd Law: Force=Mass x Acceleration
- Friction
- This challenge will help students to have a better understanding of how elastic potential energy can be stored and can be changed to kinetic energy.
- Students will also learn that when friction is applied to different parts of the rover can either increase or decrease the Rovers acceleration.

Learning standards associated with the topic

MS-PS3-5	**Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.** [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [*Assessment Boundary: Assessment does not include calculations of energy.*]
MS-PS3-2.	**Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.** [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [*Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.*]

MS-PS2-2.	**Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [*Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.*]
MS-ETS1-1.	**Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**
MS-ETS1-3.	**Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**
MS-ETS1-4.	**Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

Different types of problem solving and declarative/procedure knowledge needed.

- Students have the ability to design similar solutions using different strategies. There can be more than one solution strategy that can be used and accepted. Because different strategies and adaptations fit the problem

this would require moderately structured problems. Students will need skills of mental modeling and they must invent a strategy which suits the context.

- The declarative knowledge that students will need is that students will need to understand that roovers are used by NASA either driven by astronauts or remote controlled to move across dusty and rugged terrains. They will also need to know the parts that are used to make the rover.

Objectives and ancillary concepts/content covered by the project

- Students will design and build a rover that is powered by a rubber band.
- Students will identify how the rubberband turns the wheels of the roover.
- Students will test their rover and record data.
- Students will improve their rovver based on testing results.

Identify Possible Activities

- Roving on the MOON!
- Launch IT!
- Touch Down!

Select the Best Activity for your Class

- I chose Roving on the MOON! This lesson provided great background information on the use of Roovers in NASA and it started students out with a prototype that they can identify to help students understand strengths and weaknesses within the design that will help guide them in designing their own.