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E in STEM
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Major Project: Phase I- Research and Planning

1. Identify the "Big" concept to be covered by the engineering design challenge.

- The big concept I want to cover in this design challenge is Force and Motion. I also want to focus heavily on the engineering design process as well.

2. Research appropriate learning standards associated with the topic.

5-PS2-1. Motion and Stability- Forces and Interactions. Support an argument that the gravitational force exerted by Earth (in this case, moon) on objects is directed down.
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled
8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.

3. Identify and discuss the different types of problem solving and declarative/procedural knowledge needed.

- The problem is authentic and given in a realistic context.
- Declarative: The students should know the basic facts, concepts and principles about gravity, motion and forces.
- Procedural: The problem is ill-structured and provides constraints, multiple solutions, and an opportunity for divergent learning.

4. Explore objectives and ancillary concepts/content covered by the project.

- Understand that gravitational forces pull objects down.
- Identify a given claim to be supported about a phenomenon.
- Support an argument with evidence, data, or a model.
- Forces and Motion
- Satellites and Spacecraft
- The Engineering Design Process

5. Identify possible activities.

- JPL Touchdown STEM Activity
  https://www.jpl.nasa.gov/edu/teach/activity/touchdown/
  In this challenge, students will use what they know to investigate about gravity, motion, and forces to design and build a shock-absorbing system that will protect two "astronauts" when they land.

- NASA STEM Activity: On Target
  https://www.nasa.gov/sites/default/files/atoms/files/edu_on-target.pdf
  On Target is an engineering design activity that gives you the opportunity to design your own model to land on a target.

- NASA On the Moon Activity: Launch It
  https://www.nasa.gov/stem-ed-resources/otm-launch-it.html
  In this challenge, students follow the engineering design process to do the following:
  1. Design and build a rocket from a straw.
  2. Launch their rocket using a balloon.
  3. Use their testing results to improve their rocket.
  4. Try to hit a target consistently with their rockets.

6. Select the best activity for your classroom.

- I plan on doing this activity with 10-11 year olds. I felt that this particular activity would be most applicable for them.

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