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| <p>1. Identify the “Big” concept to be covered by the engineering design challenge.</p> | <p>Transform Potential to Kinetic Energy - tested in prototype practice</p> |
| <p>2. Research appropriate learning standards associated with the topic.</p> | <p>Standard: Physical Science</p> <ul style="list-style-type: none"> ● GLE 4: Energy can be produced, used or released by converting stored energy. <ul style="list-style-type: none"> ○ EO a: Apply scientific ideas to design, test and refine a device that converts energy from one form to another. (4-PS3-4) <i>(Clarification Statement: Examples of evidence relating speed and energy could include change of shape on impact or other results of collisions.) (Boundary Statement: Does not include quantitative measures of changes in speed of an object or on any precise or quantitative definition of energy.)</i> <p>Standard 4: Innovative Designer</p> <ul style="list-style-type: none"> ● <i>GLE 1: Students use a variety of technologies within a design process to solve problems by creating new, useful or imaginative solutions.</i> <ul style="list-style-type: none"> ○ <i>EO a: Students explore and practice how a design process works to generate ideas, consider solutions, plan to solve a problem or create innovative products that are shared with others.</i> ○ <i>EO b: Students use digital and non-digital tools to plan and manage a design process.</i> ○ <i>EO c: Students engage in a cyclical design process to develop prototypes and reflect on the role that trial and error plays.</i> ○ <i>EO d: Students demonstrate perseverance when working with open-ended problems.</i> <p>Standard 3: Data, Statistics, and Probability</p> <ul style="list-style-type: none"> ● GLE MD.A: Measurement & Data: Solve problems involving measurement ● GLE MD.B: Measurement & Data: Represent and interpret data. <ul style="list-style-type: none"> ○ EO 4: Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection. (CCSS: 4.MD.B.4) |
| <p>3. Identify and discuss the different types of problem solving and declarative/procedure knowledge needed.</p> | <p>Declarative Knowledge:</p> <ul style="list-style-type: none"> ● The length of a centimeter and foot, and what you measure with ● The meaning of “weight” “angle” “wide” “thin” “reduce” “increase” “Record” <p>Procedural Knowledge:</p> <ul style="list-style-type: none"> ● How to read and follow directions ● How to blow up a balloon, as well as use the other materials ● How to communicate with your team and teacher for help ● How to problem solve <p>Problem Solving: Design Squad. (2021). Leading Hands-On Engineering Activities with NASA and DESIGN SQUAD.</p> |

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| <p>4. Explore objectives and ancillary concepts/content covered by the project.</p> | <p><i>“Potential and kinetic energy—Blowing up a balloon stretches the rubber, which stores energy as potential energy. When the pressurized air inside the balloon rushes out, the potential energy changes to motion energy (kinetic energy), making the rocket move.”</i></p> <p><i>“Distance-angle relationships of an object in flight—By launching rockets at different angles, kids will see that the travel distance and shape of the flight path change.”</i></p> <p><i>“Path of a moving object—During flight, the rocket follows a trajectory, which is a curved path.”</i></p> <p><i>“ Measurement—Kids measure launch angles and the distance traveled by the rocket.”</i></p> <p>The above concepts were covered in the “On the Moon” resource. The following will be by thinking.</p> <p>Form- How does its shape help or hinder it? How do the materials make a difference? Could we change the form?</p> <p>Function- Does this work how we expected? Would this function on a large scale? What will keep this from functioning?</p> <p>Causation- What caused the upward motion? Did the rubber cause the motion, or did the air cause the motion?</p> <p>Connection- What else in our world moves because of potential energy? Would this type of energy help us solve any other problems?</p> <p>Change- How did you change your design? How would you change the design in the future? How has rocket technology changed? How did the measurements change?</p> <p>Critical thinking skills- Acquisition of declarative and procedural knowledge, comprehension, application, analysis, evaluation, metacognition</p> <p>Self management skills, Communication skills, Social Skills</p> |
| <p>5. Identify possible activities. Extension</p> | <p>-making rockets fly with different forms of potential energy -finding other needs for potential and kinetic energy that we could design examples of -other challenges that we could monitor measurements and data to look for change (this would be the next step in mathematics) -creating “goals” (hoops) that students could try to shoot through- They would have to examine the angle and path of motion.</p> |
| <p>6. Select the best activity for your classroom</p> | <p>“Launch it” Activity on page 9 of <u>On THE MOON- NASA and Design Squad team up to inspire a new generation of engineers</u> https://pbskids.org/designsquad/pdf/parentseducators/DS_NASA_on_the_moon_complete.pdf</p> |