Lesson Title: Marshmallow Geometry Structures

Standards Addressed: NGSS K-2-ETS1-3 Engineering Design
PA Core CC.2.3

Real-World Problem: How to create and identify geometric shapes and identify them in the real world.

What skills will students use or learn? How to identify, create and recognize real-world examples of geometric shapes and objects.

Objective(s): Students will investigate geometric shapes and how they apply to the real world.

Suggested Materials or Resources Needed: toothpicks, marshmallows, tape, glue, playdoh.

Instructional Procedures/Learning Tasks (grades K-5): - Use the templates online, or create your own examples of 2 dimensional shapes such as triangles, squares and rhombus. - Use materials given to create your own version of the shapes above.	**List Questions for Higher-Order Thinking (Webb's DOK) that students could process throughout (optional):** - Where can you find these shapes around your house?
Instructional Procedures/Learning Tasks (grades 6-8): - Use the templates online, or create your own examples of 2 and 3 dimensional shapes such as rhombus, pentagon, triangular prism and cube.	**List Questions for Higher-Order Thinking (Webb's DOK) that students could process throughout (optional):** - What are benefits of using certain shapes for certain tasks? - Why would you make a house with a triangle on top of a square rather than an octagon?

- **Use materials given to create your own version of the shapes above.**	
Instructional Procedures/Learning Tasks (grades 9-12): - **Identify 3 dimensional shapes in structures and buildings around your neighborhood.** - **Use materials given to create your own version of the structures above.** - **Discuss why some structures are more durable than others such as the Pyramids of Egypt and the Colosseum.**	**List Questions for Higher-Order Thinking (Webb's DOK) that students could process throughout (optional):** - **How do engineers apply geometry to create durable structures?** - **How does a tunnel maintain support without structures holding it up?**

Content Extension

Mathematics: Identify and create geometric shapes. Use alternative methods of measurement such as toothpicks instead of inches and marshmallows in place of centimeters. Investigate the surface area of your structure if it was covered, and the volume of your structure if it was filled.
Science: Investigate engineering structures
Social Studies: How have the choices of geometric shapes allowed certain structures to stand for thousands of years?
English: Informational Writing: How-to- Describe how you build your structure in a step by step, or narrative format.
Other: Explore career examples: **K-5:** Inspire Science K-2 Career Kid: Kayla, Landscape Architect **https://www.youtube.com/watch?v=HJkao0b5soA** I Want To Be An Architect! - Kids Dream Jobs - Can You Imagine That? https://www.youtube.com/watch?v=zvewCudtFZs

6-8:
How to Become an Architect? CareerBuilder Videos from funza Academy.
https://www.youtube.com/watch?v=Siyi8ka6mDk

6-8 and 9-12:
Building The Lincoln Tunnel
https://www.youtube.com/watch?v=vIJiZ58y8JE

Wanna Be an Architect · A Day In The Life Of An Architect
https://www.bing.com/videos/search?q=you+tube+career+architect&ru=%2fvideos%2fsearch%3fq%3dyou%2btube%2bcareer%2barchitect%26FORM%3dHDRSC3&view=detail&mid=EE9ECAD1DE00D48CBBBEEE9ECAD1DE00D48CBBBE&&FORM=VDRVRV

Architecture -- Career
https://www.bing.com/videos/search?q=you+tube+career+architect&ru=%2fvideos%2fsearch%3fq%3dyou%2btube%2bcareer%2barchitect%26FORM%3dHDRSC3&view=detail&mid=0555803E6D43CA0C7BFD0555803E6D43CA0C7BFD&&FORM=VDRVRV

Inside Academics: Naval Architecture and Marine Engineering
https://www.bing.com/videos/search?q=you+tube+career+architect&ru=%2fvideos%2fsearch%3fq%3dyou%2btube%2bcareer%2barchitect%26FORM%3dHDRSC3&view=detail&mid=95B9CF7C48B4A87F291B95B9CF7C48B4A87F291B&rvsmid=FD9D8A37B313D60710BAFD9D8A37B313D60710BA&FORM=VDRVRV

Student Reflection (optional): How do engineers use shapes to create sturdy structures?

Resources:
2d and 3d shape patterns, extension worksheets
https://www.helpingwithmath.com/printables/worksheets/geometry/geo0501_3D02.htm
Calculating area practice
https://www.helpingwithmath.com/printables/worksheets/geo0601area03.htm

Calculating surface area
https://www.helpingwithmath.com/printables/worksheets/geo0601area06.htm

2D and 3D shapes models and record forms with some guidance for the teacher/parent
https://stemwiththestandards.weebly.com/uploads/7/7/9/1/77916052/freemarshmallowshapesshapebuilding.pdf

Model/Guide for 2D, 3D, house, tower and more progression of building with toothpicks and marshmallows
http://brainbrigade.org/11-creative-marshmallow-and-toothpick-stem-challenges/

Lesson Model for Building a Bridge
https://cyfar.org/sites/default/files/cyfar_research_docs/Sweet%20Bridge.pdf

Upper Level Geometry Vocabulary, Model, and Equations
http://mathengaged.org/resources/activities/science-engineering-activities/marshmallow-geometry/

3d Shapes Explained Faces, Edges, and Corners/Find examples of 3D shapes in your classroom or outside
https://www.bing.com/videos/search?q=youtube+kids+3D+shapes&ru=%2fvideos%2fsearch%3fq%3dyoutube%2520kids%25203D%2520shapes%26qs%3dn%26form%3dQBVDMH%26sp%3d-1%26pq%3dyoutube%2520kids%25203d%2520shapes%26sc%3d4-22%26sk%3d%26cvid%3d5643023E26F44C88A403EF5B519E681B&view=detail&mid=AA0791DBE125D5E2545FAA0791DBE125D5E2545F&&FORM=VDRVRV