CONSTRUCTING TASK: Build a Marshmallow Shape

(Approximately 3 days)

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

MCC.K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length).

MCC.K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

MCC.K.G.6. Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

BACKGROUND KNOWLEDGE

The students should have prior knowledge of solid geometric shapes and the vocabulary used to describe these shapes. Students will draw and name solid geometric shapes of a cube, cylinder, sphere, and cone and list the number of faces, edges, and vertices/corners of each figure.

ESSENTIAL QUESTIONS

- What makes shapes different from each other?
- How do shapes fit together and come apart?
- How can a shape be described?

MATERIALS

- Toothpicks

- 1 piece of construction paper for each student(black)
- Index cards
- Mini marshmallows (see task for choice)
- Bowls
- Small zippered plastic bags (1 per student to be used for investigation)
- *The Shape of Things* by Dayle Ann Dobbs

GROUPING

Large Group and small groups

TASK DESCRIPTION, DISCUSSION AND DEVELOPMENT

Comment: As students make a square accept both rectangle and square for the answer, (because both are correct), but make sure to discuss how calling it a square is more specific, squares are special rectangles that have all sides the same length. Then ask, "How could we use marshmallows and toothpicks to change this shape so that it is still a rectangle but it is no longer a square?" ***(Note to teacher: Remember, not all rectangles are squares, but all squares are rectangles!)***

Part I
At a central meeting place, hand each student three toothpicks and marshmallows. Allow students to explore using toothpicks and marshmallows to create a line segment. This should be a quick discussion and exploration because students are going to have an extended time creating shapes in the next part of the task. Ask students what shape they could build using the 3 marshmallows and toothpicks. Allow every student the opportunity to explore and build the triangle.

Part II
Divide the class into groups. Place marshmallows and toothpicks in bowls on each table. Emphasize that their sculptures are going on display and they will be responsible for explaining the process for making the sculptures to others. Allow groups to build as many different sizes and types of shapes as possible. Each time a new shape is constructed, it is placed in the middle of the group for other members to practice constructing. However, there should be no duplicate of a shape in the center of the group. Once a new shape has been composed everyone in the group must complete that shape before moving on to discover a new one. This is an excellent opportunity for students to collaboratively work together and helping one another to work through a task.

At this point students might be fixed on solely making flat shapes. Be sure to tell the students that they **can make any shape they want** as long as they can describe what it is and how they made it. If students do not begin to build 3-D shapes, probe through questioning and guide more.

Comment: As students begin to build "solid"/3-D shapes it is suggested to let them to build as big as they possibly can as the bigger the shapes will require more problem-solving and structural support. Students will be unable to make a circle using the marshmallows and toothpicks but should be challenged to make one. Have students justify their opinion either way. This could be an excellent intro to a class discussion.

To draw to a close, have students label the names of their shapes on the index cards provided. Once all shapes have been labeled, have the students perform a gallery walk around the classroom to observe and mentally capture the shapes that other groups constructed.

As the gallery walk is taking place, students should be discussing which shape models are shared between groups and which models can be added to their collection when they return. Students can also compare which group has the most shapes.

After completing the gallery walk, allow groups the time to construct/add some of the new found shapes to their collection. After time has been given to the groups to add shapes, ask the students what they would like to graph about the shapes constructed (most shapes, least shapes, etc…). Have each group of students share the list of shapes they made and create a bar graph and discuss the results with students.

- How many groups made a cube?
- Which shape was made the most?
- Which shape was made by the fewest groups?

FORMATIVE ASSESSMENT QUESTIONS

- How many toothpicks would you need to build a _____?
- What makes shapes different from each other?
- How do shapes fit together and come apart?
- How are these shapes different from one another? How are they alike?
- What is the difference between flat and solid?

DIFFERENTIATION

Extension

- Have students create the largest possible 3-dimensional shape they can make.
- Have students make different types of triangles (scalene, isosceles, right, equilateral), and quadrilaterals (rectangle, square, rhombus, trapezoid, etc….). The key here is that shapes must be different not by size but by attributes.

Intervention

- Provide models for students who are struggling with creating shapes or allow students to use straws or pipe cleaners. Or give students models of the shapes and have them reconstruct the shape they see.