Lesson Plan Title: Volume and Doghouses

Developed by: Heidi Sloan, 2018 Teacher on the Trail™

Discipline / Subject: Math

Topic: volume, problem solving

Grade Level: 4^{th} – 8^{th}
Modifications for younger students, Kindergarten – 3rd, are listed below

Resources / References / Materials Teacher Needs:
Pictures of dog houses, graham crackers (each group may need a wrapped package), frosting, popsicle sticks or plastic knives, trays upon which to build dog yards, wipes for messy fingers

Lesson Summary: Students create a dog yard with doghouses that have a certain volume.

Standards Addressed: (Local, State, or National)
VA 5.8a The students will find perimeter, area, and volume in standard units of measure

CCSS.MATH.CONTENT.5.MD.C.5
Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume

Learning objectives:	**Assessment:**
1. The student will work cooperatively with others to problem solve 2. The student will demonstrate an understanding of volume using measurement to accurately create that space	1. Did the doghouses have the correct volume? 2. Observe the cooperative learning going on in the group

Procedural Activities
1. The class will have discussed volume already and when that measurement is needed.
2. Show students photos of sled dog yards with the rows of houses.
3. Put students into groups of no more than three.
4. Ask them to create a dog yard of doghouses where each doghouse has a volume of 9 cubic inches.
5. Something I have found that trips up students is the crackers are almost 3 inches square. They want to and often do, build a 3 x 3 x 3 inch dog house, ignoring the length x width x height formula to obtain 9 cubic inches. Allow them to make this error. It is a great teachable moment when you discuss their finished products later.

Materials Students Need: rulers, graham crackers, popsicle stick or plastic knife for spreading frosting, a tray of some sort on which to build multiple doghouses

Technology Utilized to Enhance Learning:

- Sled dog houses can be shown from photos on the Internet

Other Information

For younger students, discuss shapes like squares and rectangles, and have them build doghouses in the same way. They can later list the shapes they used to construct their doghouses and count how many squares or rectangles used. Strong questioning can be used to expand their understanding such as:

"Why did you use more squares than rectangles?" (Or vice versa)
"What is different about a rectangle that you felt you needed to use it, instead of a square?"
"What do squares and rectangles have in common?"
"What do squares always have that rectangles do not?"

Modifications for special learners/ Enrichment Opportunities:

For older students, or students who need enrichment, have them research the dimensions of plastic barrels that some mushers use as doghouses. Work out the volume of a barrel doghouse, which is the volume of a cylinder.