IWITNESS NEWS: BREAKING IN TO GEOMETRY
ASHLEY BAILEY, BEAR CREEK MIDDLE SCHOOL

Unit Overview
In this interactive geometry unit, students work in differentiated groups to master finding the area and volume of two-dimensional and three-dimensional shapes. Throughout the unit, students use technology – including iPads, video conferencing apps, and 3D printers – to identify shapes around the school and practice geometric calculations. The unit concludes with a final project where students diagram, label, and calculate the volume and surface area of their classroom.

Standards Addressed
1. **M.6.G.1.**: Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

2. **M.6.G.2.**: Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

3. **M.6.G.4.**: Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

4. **M.6.EE.2c.**: Write, read, and evaluate numerical expressions in which letters stand for numbers.
   a. Evaluate expressions at specific values for their variables. Include expressions that arise from formulas in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.*

5. **M.6.NS.1.**: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much*

chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?

6. **M.6.NS.2.**: Fluently divide multi-digit numbers using the standard algorithm.

7. **M.6.NS.3.**: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Day One – Prior Knowledge Assessment
Standards Addressed: 1, 5
1. To begin the unit, students complete the **Prior Knowledge Skills Assessment Quiz.** Use results of the quiz to create differentiated groups for unit activities.

2. As a class, use the **2-D Anchor Chart** printed on poster paper or displayed on the SMART Board to take notes about assorted two-dimensional shapes. Give each student an individual copy of the chart so they can follow along and incorporate additional notes. Throughout the unit, continue to add notes to the chart.

3. To conclude, students describe a shape discussed in the introduction to a partner or group without using its name. The other students then guess the correct shape. For example, if a student chooses a square, they say: "I have four congruent sides, and four right angles, who am I?"

Day Two – Prior Knowledge Review
Standards Addressed: 1, 5
1. Review the **Prior Knowledge Skills Assessment Quiz** using the **Prior Knowledge Skills Warm-Up**. Students complete additional *practice* on number sense and rational numbers in differentiated groups. Group students based on missed questions from the Prior Knowledge Skills Assessment Quiz.

2. Continue adding notes to the **2-D Anchor Chart**, incorporating new skills from the additional practice.

3. As a ticket out the door, students draw and write a description about one of the shapes discussed. Use this ticket out the door to assess students' understanding and change activity groups as needed.

Day Three – Perimeter and Area
Standards Addressed: 1, 4, 7

1. In differentiated groups, students compare two shapes using the **Double Bubble Map Shape Comparison Template**. If possible, place one student in each group who excelled in the material from the previous lesson. If time permits, have each group present their map.

2. Then, discuss the difference between perimeter and area, filling in the **2-D Anchor Chart** while students take notes. Give real-world examples of perimeter and area, such as the different amounts of material you would need to cover a bulletin board versus just adding a border. Discuss the formulas used to calculate perimeter and area.
   a. As an extension, give students the cost of fabric and tell them to calculate how much it would cost to cover a bulletin board.

3. Students individually practice calculating perimeter and area using the **Perimeter and Area Practice Activity Sheet**. After students have time to work on their own, they may discuss the activity with a partner. During discussions, assess each group's understanding and make sure they show their work.

4. When groups finish, discuss each problem, asking different students to complete problems on the board.

5. Using the _Plickers_ app, ask students multiple choice questions to review the material from the lesson. Use the results to finalize project groups.

Day Four and Five – iWitness News: Episode One
Standards Addressed: 1, 4, 7

1. Divide students into project groups based on previous assessments. As students' needs change, feel free to adjust groups accordingly, but try to keep students in the same group during each major part of the unit.

2. Instruct students to brainstorm ideas of where they might find different shapes around the school. Students look around the room and make a list of different shapes they see.

3. Then, one by one send each group with an iPad or other device around the school to search for the shapes previously discussed in the unit (triangle, square, rectangle, trapezoid, and parallelogram). Have each group pretend to be news reporters and call the classroom using the _Zoom_ app, to broadcast the following information about the shape(s) they found:
   a. Shape name,
   b. Shape location,
   c. Description of the shape (sides, angles, other characteristics used to identify the shape), and

d. Shape measurements.

4. Students in the classroom record the information and calculate the area and perimeter of the shape. The reporting group returns to the classroom and the next group takes their turn as news reporters.

5. While waiting for each news report, students in the classroom locate two-dimensional shapes around the room and find the area and perimeter of each shape.

6. Once all groups participate, reflect on the shapes each group found around the building. Have students compare the shape(s) they found during their report to the shape(s) they found in the classroom.

Day Six – Tangrams
Standards Addressed: 1

1. Groups receive a handful of tangram pieces and calculate the area and perimeter for two or three of the shapes. As a class, measure the area and perimeter of two grouped-together tangram shapes.

2. Then, use the **Composite Figure Guide** to show students how individual shapes come together to make one large, or *composite*, figure. Ask students how to calculate the area of this type of shape.
   a. Guide students to understand that to find the area, you: (a) divide a large shape into its smaller, individual shapes, (b) calculate the area of the smaller shapes, and (c) add the each shape's area to find the area of the composite figure.

3. For the remainder of the lesson, students work with tangram pieces and calculate the area of composite figures. Students lay tangram pieces on grid paper and trace the shape. Then, students color in the shape and calculate its area.

4. Conclude with a group discussion about the lesson, reflecting on the skills they learned. Use this time to assess students for any skills that need additional practice.

Day Seven and Eight – 3D Figures
Standards Addressed: 2, 3

1. Begin with by having students look at the bottom of a tissue box. Ask students to identify the type of shape on the bottom of the box. Explain that three-dimensional figures are stretched two-dimensional shapes. So, the tissue box is a stretched square, or cube.

2. Then, allow students to discuss their prior knowledge about three-dimensional figures. Guide students to think about the volume and the surface area of an object.

3. Using the **3-D Anchor Chart**, take notes about assorted three-dimensional shapes. Draw on prior knowledge and continue to fill out the chart for the remainder of the unit. Make sure to include information about faces, edges, vertices, volume, and surface area.

4. Students then work in partners to find an object around the room and calculate its volume and surface area.

5. Conclude with a ticket out the door of three things students learned, two things they want to know, and one thing they struggled with or did not understand. Use this ticket out the door, and the results of the partner activity, to prepare any re-teaching or remediation.

Day Nine and Ten – iWitness News: Episode Two
Standards Addressed: 2, 3

1. Instruct students to brainstorm ideas of where they might find different three-dimensional figures around the school. Students look around the room and make a list of the different three-dimensional figures they see.

2. Then, one by one, send each group with an iPad or other device around the school to search for the three-dimensional figures previously discussed in the unit (triangular prism, rectangular prism, or cube). Have each group pretend to be news reporters and call the classroom using the *Zoom* app, to broadcast the following information about the figure(s) they found:
   a. Figure name,
   b. Figure location,
   c. Description of the figure (vertices, edges, faces, etc.), and
   d. Figure measurements.

3. Students in the classroom record the information and calculate the volume and surface area of the figure. The reporting group returns to the classroom and the next group takes their turn as news reporters.

4. While waiting for each report, students in the classroom locate three-dimensional figures around the room and calculate the volume and surface area.

5. Once all groups participate, reflect on the three-dimensional figures each group found around the building. Have students compare the figures they found during their report to the figures they found in the classroom.

Day Eleven through Fifteen – Final Project

Standards Addressed: 1, 2, 3, 4, 5, 6, 7

1. Students work in groups to find the volume and surface area of the classroom. Using poster paper, rulers, and markers, students draw a diagram of the room, measuring and labeling each object.

2. Additionally, groups identify which shape or figure each object is, and, provide descriptions of each object's faces, edges, and vertices. Students choose one to three of the objects in the diagram and calculate the volume and surface area.

3. Once all groups finish their diagram, each group shares their findings in whatever format they choose (poster, PowerPoint, talking presentation, etc.) and describes the process of creating the diagram. Use the **Performance Task Model** and **Performance Task Rubric** to assess each group.