## ESTABLISHING PURPOSE

**1** **What are the key content standards I will focus on in this lesson?**

Content Standards:

TEKS Geometry Standards

(10) Two-dimensional and three-dimensional figures. The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. The student is expected to:

(B) determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and nonproportional dimensional change.

(11) Two-dimensional and three-dimensional figures. The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. The student is expected to:

(D) apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.

TEKS Mathematical Process Standards:

- Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.
- Analyze mathematical relationships to connect and communicate mathematical ideas.
- Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written and oral communication.

**2** **What are the learning intentions (the goal and *why* of learning, stated in student-friendly language) I will focus on in this lesson?**

*Content:* To understand how the features of a three-dimensional shape are related to the volume of that shape.

*Language:* To explain why volume formulas work by describing their components.

*Social:* To get acclimated to our new groups by asking for and offering assistance when needed.

**3** **When will I introduce and reinforce the learning intention(s) so that students understand it, see the relevance, connect it to previous learning, and can clearly communicate it themselves?**

In addition to opening the day with the learning intentions, I will reinforce the language intention when asking students to summarize their discoveries and during our independent practice PAR assignment. The social intention will also be used to spur conversation and culture building within our new groups.

## SUCCESS CRITERIA

**4** **What evidence shows that students have mastered the learning intention(s)? What criteria will I use?**

I can statements:

- I can identify the volume formulas for various types of prisms and explain their meaning.
- I can identify the volume formulas for various types of pyramids and explain their meaning.

**5** **How will I check students' understanding (assess learning) during instruction and make accommodations?**

Today is very lab-based, so I will be conducting a series of student conferences with each group. We will also end the day with a PAR assignment that will provide ongoing formative data for the next two days.

## INSTRUCTION

**6** **What activities and tasks will move students forward in their learning?**

Prism and Cylinder Lab: Students will infer the volume formulas for prisms and cylinders by discussing a series of guiding questions, starting with the area of a cube. Cubes→Rectangular Prisms→ Triangular Prisms→Any Regular Prism → Cylinders $V = Bh$

Pyramid Sand Lab: Students will explore the relationship between the volumes of prisms and pyramids, along with cylinders and cones. In this lab, they will use hollow geometric solids with congruent bases and a bin of sand to compare volumes. The lab is designed to allow students to discover that pyramids and cones have one-third the volume of their congruent-base prism and cylinder counterparts.

Peer-Assisted Reflection (PAR): Students will complete a PAR aligned to the success criteria involving a trapezoidal prism and pyramid; will not be directly discussed in class.

## 7 What resources (materials and sentence frames) are needed?

1. Printout of lab sheets
2. Geometric solids kit for each group
3. Plastic bin of sand for each group
4. Printed PAR for each student

## 8 How will I organize and facilitate the learning? What questions will I ask? How will I initiate closure?

The day will be organized in this order:

1. Prism and Cylinder Lab
    a. What is the volume of a cube with a side length of 2 cm?
    b. How did you calculate this? ($l \times w \times h$)
    c. What is the volume of a rectangular prism with a length of 2 cm, width of 2 cm, and height of 5 cm?
    d. How is this the same? How is this different?
    e. What is the area of the base of this prism?
    f. What is the volume of a triangular prism with the same dimensions?
        i. Draw a picture for scaffold if needed.
        ii. Connect the area of the triangle to the area of the rectangle.
    g. What seems to be the general truth about volumes of prisms in terms of their bases and heights?
    h. How might this apply to cylinders?
2. Pyramid Sand Lab
    a. Which shapes seem to be related to one another?
        i. Pyramids and prisms have the same bases.
        ii. Cones and cylinders have the same bases.
        iii. Pyramids and cones both go from a base to a point.
        iv. Prisms and cylinders both go from a base to a base.
    b. What is the volume of a pyramid? Which shape might it be related to?
    c. What is the volume of a cone? Which shape might it be related to?
3. Peer-Assisted Reflection
    a. See attached PAR.