**Lesson 7: Volume and Surface Area**

**Problem statement:** What is the difference between the volume and surface area of 3-D package? Why do designers and engineers need to know both?

**Learning objectives:**

I will learn the difference between volume and surface area, and why it’s important to be able to determine both.

**Lesson standards (NGSS, CCSS, CTE):**

5.MD.C.: Geometric measurement: understand concepts of volume and relate volume to multiplication and addition

3-Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

4-Measure volumes by counting cubes, using cubic cm/in and feet.

5-Relate volume to the operations of multiplication and addition and solve real world and multiplication problems involving volume.

**Materials:**

Technical drawing from lesson 2.

**Lesson preparation:**

Review volume and surface area calculation lessons from math curriculum.

Have **Practice Problems** ready to project/copied for students (*Appendix A)*

Have **Surface Area Lesson Supports** ready to project/copied for students *(Appendix B)*

**Time required:**

One 45-minute lesson

**Grouping of students for instruction:**

Students will meet back with their project groups.

What is volume? Why is it important to find the volume?

What is surface area? Why would you need to find surface area?

How are volume and surface area different?

**Understanding the Problem**

|  |  |
| --- | --- |
| **Teacher** | **Student** |
| **Introduction:** 3 minutes  Today we are going to learn how to find the volume of your figure. The volume tells the amount of space the object occupies. Or in our case how much space can go inside of our package.  We are also going to learn how to find the surface area of our figure. The surface area is the area on the outside of our package. Finding the surface area will tell us how much material we will need to build/create our package. |  |
| **Modeling of calculations:** 22 minutes  Teachers gives equations and shows examples.  See examples of anchor charts and equations in the materials section below. | Students record:  Volume= Length x Width x height=Volume (cubic units)  Surface Area=(Base Area x 2) + (Height Area x 2) + Length Area x 2)=Surface Area (square units) |
| Teacher models finding the volume of a rectangular prism. (I do)  Teacher shares a second example (We do)  Teacher shares a third example (You do) | Students watch for understanding.  Students and teacher practice together.  Students practice independently. |
| Teacher models finding the surface area of a rectangular prism. (I do)  Teacher shares a second example (We do)  Teacher shares a third example (You do) | Students watch for understanding.  Students and teacher practice together.  Students practice independently. |
| Teacher decides how much practice their students need additional practice.  IF they do need additional practice, use the worksheet below to provide more time for practice independently or with their groups. | Students work to find the volume and surface area of practice problems. |
| **Work time:** 20 minutes  Teacher decides students are ready to apply concepts to their project and assigns task.  “Now it’s time to find the volume and the surface are of your package using your technical drawing and 3-Dimensional prototype. Keep in mind your requirements and decide if your group will need to make any changes after you’ve found both.” | Students find the volume and surface area. Recording their results. |

**Accommodations:**

Multiplication charts or calculators can easily be used to help students computate, or check their work.

**Extensions:**

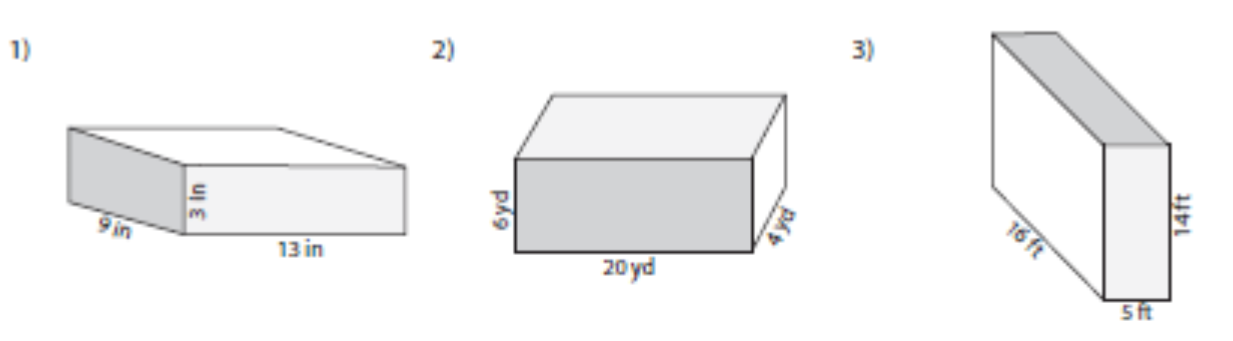
Allowing students to trade with another group. This gives them an opportunity to practice again and to check their work with another group.

**Assessment:**

Formative Assessment: Using the worksheet and their project. Could they correctly use the equations to find the surface area and volume.

*Appendix A*

Practice Problems: (I do, We do, You do)



*Appendix B*