

Concept Reinforcement Activity for Middle School Math Lesson 4

NCSC UDL Unit Concept Reinforcement Activity for Middle School Math Lesson 4

*If the student has not had experience (or has had very little experience) with the concepts of volume, it might be helpful to provide instruction using this Concept Reinforcement Activity (CRA) before the Introduction to Lesson 4. It might be helpful to provide the exploratory activity both before starting Lesson 4 and again after the Introduction of Lesson 4. Provide the scripted activity and data collection prior to the Body of Lesson 4. Just as with any other student, it is unlikely that he/she will learn these concepts or skills after being instructed only once so you can provide this activity at other times during the unit. But do not expect or require mastery of this CRA before the student takes part in the unit. The CRA is supplemental instruction and should only be provided **in addition to** the instruction in the unit; it does not take the place of the unit.*

**If during the course of your instruction, you find that the student could use more instruction on measuring lengths (including width and height) refer back to the scripted activity about measurement in the elementary school unit Concept Reinforcement Activity, Lesson 1.*

Key Vocabulary: The following key vocabulary terms are used in the reinforcement activities and the unit. It is important to provide these terms in the student’s communication system and describe the meaning using the definitions in the unit as provided or paraphrased as needed. The purpose is to build understanding of the terms rather than teaching the student to recite the definitions. For example, when measuring the length, height, and width of an object, explain what each is (e.g., “We are measuring height, that is how tall something is from the bottom to the top.” Model the use of the communication system when talking about each of the vocabulary terms.

Unit Definition	Possible Paraphrased Definition
Height. A straight line through a vertex and perpendicular to the opposite side of the triangle.	Height – how tall something is from the bottom to the top
Length - a measurement of the distance from one point to another	Length – how long something is from one point to another
Volume – A measure of the space within a closed figure in a space	Volume - the space inside a space figure or a 3-dimensional object
Width – measurement of the distance from one side or edge to the opposite side or edge	Width – how wide something is from one side to the other

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Exploratory Activity

Purpose: The orientation activity is to assist the student in understanding the concept of volume.

1. Review the description of volume verbally and in some type of concrete representation (e.g., drawing of a 3-dimensional object with arrow indicating the inside and lines to indicate the height, width, and length; a small box with each measurement labeled with picture symbol)

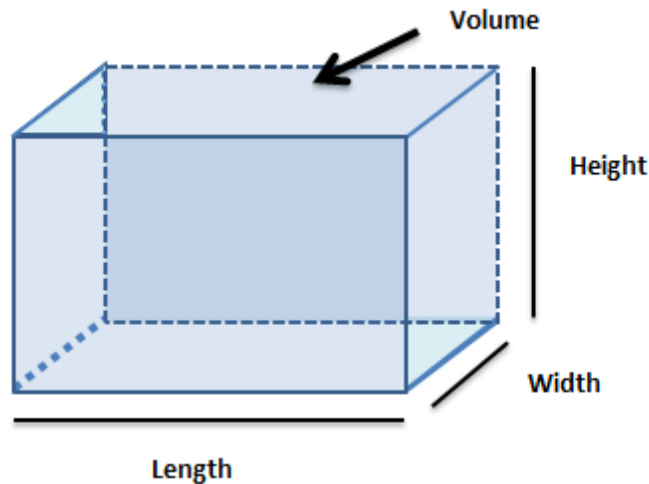


Figure 1 Example of representation of area

2. Provide the student multiple opportunities to identify the volume by providing an empty box and smaller cubes. Talk about how many cubes will fit into the box and explain that is volume. Repeat with the same box and cubes, asking the volume can be measured and assist the student as needed to find the volume by discovering how many cubes can fit into the box.
3. Repeat step 2 using different sized boxes (e.g., tissue box, small gift box, jewelry box) with the same cubes.
4. Model and then assist the student in labeling the length, width, height, and volume of a box (volume would be the space inside the box so it is important to have an open box or a box with a lid).

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5. Place one inch cubes along the labeled length, width, and height and use the formula template (figure 2). Fill the box with one inch cubes and count. Compare the two amounts to see that both methods arrive at the same volume.
6. Use systematic instruction (see NCSC Instructional Resource Guide) to have the student measure volume following the Scripted Activity with Data Collection.

Scripted Activity with Data Collection

Purpose: This activity is designed to provide extra practice to learn or refine the skills of calculating surface area (of rectangular prisms only) and volume (of rectangular prisms only) which will be used throughout this unit. The activity provides extra instruction on the concepts of surface area and volume using formulas to calculate each.

**If during the course of your instruction, you find that the student could use more instruction on finding the area of 2-dimensional rectangular shape (that would include calculation of area using a formula and understanding the concept of area), refer back to the scripted activity about area in the elementary school unit Concept Reinforcement Activity.*

There are three versions for both surface area and volume – Version A, Version B, and Version C. Each version follows the same instructional script but the materials are different (provide whatever individualized supports your student needs to interact with the materials). Use as many versions of the activity as your student needs to further develop the skill; you may need to only do one version or you may need to do all three. Mastery of this skill is not expected nor required to continue working within this unit. Instead, this activity should be used solely as practice whenever it can be worked in during instruction on the unit or at other times during the school day. It does not take the place of instruction with peers on the UDL unit; it supplements that instruction.

Based upon the student and the skill, choose any one of the instructional strategies from the NCSC Instructional Resource Guide to use during instruction throughout the practice activity. Use the data to give you more information on what part of the skill the student may need more focused instruction on throughout the unit.

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Materials and Directions for Teacher (Volume Activity)

Version A: 3-dimensional quadrilateral (i.e., rectangular prism), ruler, inch cubes, inch squares of paper, calculator (optional materials: multiplication chart or table)

Version B: 3-dimensional quadrilateral (i.e., rectangular prism) with dimensions that are different from the figure used in Version A, ruler, inch cubes, inch squares of paper, calculator (optional materials: multiplication chart or table)

Version C: 3-dimensional quadrilateral (i.e., rectangular prism) with dimensions that are different from the figure used in Versions A & B, ruler, inch cubes, inch squares of paper, calculator (optional materials: multiplication chart or table)

Use figures that can be measured using whole units instead of figures that use partial units of measure (e.g., a box that measures 4 inches long, 2 inches high, and 2 inches wide).

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<i>Instructional Cue</i>	<i>Student Expected Response</i>	<i>Version A Date:</i>	<i>Version B Date:</i>	<i>Version C Date:</i>
<p><i>As you read the script, indicate the space inside the figure the student will be calculating. If you feel the student should be using other terminology, please make this substitution in the script as you read it:</i></p> <ul style="list-style-type: none"> <i>figure like this = 3-dimensional figure or rectangular prism. Demonstrate how to fill the figure with cubes.</i> <p><i>The space inside a space figure or a 3-dimensional object this is the called the volume. Let's figure out the volume of this figure. I can fill this figure with inch cubes to show the volume. Now you do it.</i></p>	<p>Student fills the figure with cubes.</p>			
<p><i>Demonstrate how to count the cubes using whatever method the student will be using (e.g., rote counting, one-to-one correspondence, number line).</i></p> <p><i>I can count the cubes to calculate the volume of this figure. I counted (insert number) cubes. Since I used inch cubes as units of measure, I have to say the answer in cubic inches. The volume of this figure is (insert volume; be sure to use the terminology of "cubic" units). Now you do it.</i></p>	<p>Student counts the cubes, expressing the volume in cubic units (i.e., cubic inches).</p>			

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<p>Demonstrate measuring each dimension (use whatever tool the student will be using such as a ruler or inch squares) and putting the measurements into the formula. Figure 3 provides a template for you to use. You may cue the student to measure each dimension.</p> <p><i>We can use a formula to calculate volume, too. The formula is $L \times W \times H = \underline{\quad}$. You already know that L is the length and W is the width. H is the height. First I measure the length and put that number in the formula; then I measure the width and put that number in the formula; and finally, I measure the height and put that number in the formula. Now you do it.</i></p>	<p>Student measures the length, width, and height.</p>			
<p>Demonstrate multiplying using whatever tool (e.g., multiplication table, calculator) the student will be using. you may cue the student for each sequence of the formula.</p> <p><i>Now I use the formula to calculate the volume. First I multiply the length which is (insert number) by the width which is (insert number). The answer to that is (insert number). Then I take that number, (insert number), times the height which is (insert number). The answer to that is (insert number). Now you do it.</i></p>	<p>Student calculates the answer using the formula.</p>			
<p>Point to the answer in the formula as you read the script.</p> <p><i>Remember that when we give the answer, we have to use “cubic” units. So the volume of this figure is (insert number; be sure to use the terminology of “cubic” units which, in this case, is inches). What is the volume of this figure?</i></p>	<p>Student expresses the volume in cubic units (i.e., cubic inches).</p>			

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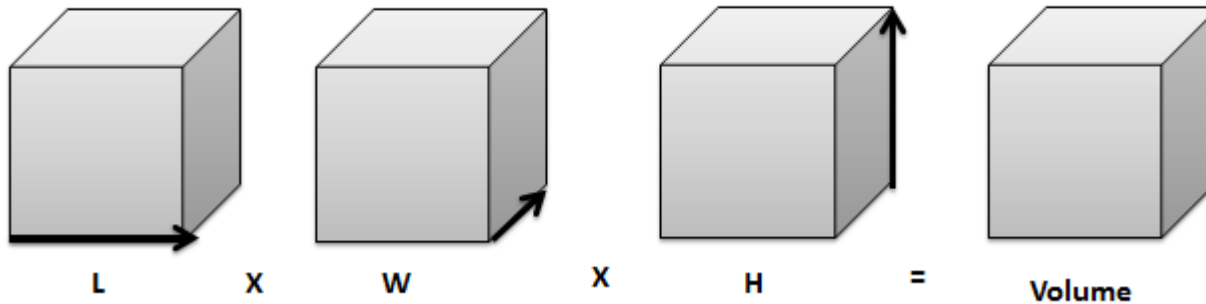


Figure 2 Template for Volume

Transition Activity: Back to the UDL Lesson

To help the student develop an understanding of volume and to work within the UDL unit, it might be helpful to provide the exploratory activity both before starting *Lesson 4* and again after the *Introduction of Lesson 4*. Provide the scripted activity and data collection prior to the *Body of Lesson 4*. Have the student complete the activities in the Introduction and the *Body* using:

- appropriate systematic instruction as needed;
- representation of volume used in the orientation activity;
- scripted activity and data collection when measuring; and
- Additional Considerations for Emerging Readers and Emerging Communicators provided at the end of the lesson (e.g., using a grid so student can count vs. calculate).