Lesson Overview

Topic	Lesson Information
Lesson Title:	Volume – Calculating Rectangular Prisms in Real World Situations
Lesson Author:	Angela Kenes; Carolyn McClinton; Chelsea Snyder; Jill Casey; Renee Macko – Intermediate Unit 1 Adult Education
Date Created:	October 26, 2020
Lesson Timeframe:	One class session
Content Area(s):	Math
General Topics/Skills Covered:	Finding volume of various cubes and rectangular prisms. Determine how many cubic boxes fit in a room.
NRS Level(s):	Level 5
Prerequisite Skills:	Calculate area of shapes; measure with a ruler; multiply fractions. Knowledge of prior vocabulary: length; width; square; rectangle; polygon; plane; perimeter; area; one-dimensional; two-dimensional.

Standards and Skills Addressed

Topic	Your Standards and Skills Addressed
College and Career Readiness Standards (CCRS):	College and Career Readiness Standards (CCRS): 5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. 5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. 5.MD.5a Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. 5.MD.5b Apply the formulas V = l x w x h and V = b x h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.
English Language Proficiency Standards (ELPS (if applicable):	N/A
Target Grammar/Language Forms (for ESL):	N/A

Topic	Your Standards and Skills Addressed
Standards for Mathematical Practice:	• Model with mathematics.
Foundation Skills Framework (Workforce Skills):	• Recognizes, measures, and uses geometric shapes and sizes. • Recognizes, measures, and uses distance, weight, area, and volume. • Recognizes and applies measurement formulas. • Identifies and interprets basic geometric functions, patterns, and formulas, as required.
Digital Literacy Skills (also see checklist below):	Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. (ISTE Standard 1c: Zoom polling)
Digital Literacy Skills Checklist:	☐ Are students taught how to find--and evaluate the validity of--online sources? Are they given an opportunity to practice doing so with different topics and for different tasks? ☐ Are sufficient instructions given to students around the use of digital tools and is sufficient time provided to practice the use of tools? ☐ Do students use digital tools to create and present products (e.g., papers, presentations, graphics)? ☐ Are students provided with an opportunity to select and use appropriate technology to solve problems in class?

Objectives, Materials, Vocabulary, and Culturally Responsive Teaching

Topic	Your Objectives, Materials, Vocabulary, and Culturally Responsive Teaching
Lesson Objective(s):	• The student will calculate volume units, volume of a cube and volume of a rectangular prism independently 7/8 times by the end of the instructional period. • Students will calculate how many boxes a "storage" room will hold with 1/1 accuracy
Lesson Objective Tips:	• Check it with SMART. (Is it Specific, Measurable, Achievable, Relevant, and Timely?)
Texts, Materials, Resources (also see checklist below):	• Clear cube/clear rectangular prism, one-inch cubic blocks • Tape measure and rulers • Smart phone, tablet, or computer • Digital white board • Internet connection • Cubic cardboard box • Miscellaneous three-dimensional containers • Paper and pencils • White board and markers • Twine or string • Three-dimensional objects for display: cube, rectangular prism, cone, sphere • Projector • Empower book "Over, Around, and Within," Lesson 11 • Contemporary's Number Power - Geometry, pages 112-119
Texts, Materials, Resources Checklist:	☐ Are the recommended texts relevant to adult learners, culturally responsive, and useful for building knowledge and achieving the objectives?

Volume – Calculating Rectangular Prisms in Real World Situations Lesson Plan

Topic	Your Objectives, Materials, Vocabulary, and Culturally Responsive Teaching
Lesson Vocabulary:	**Cubic Unit** – Unit used to measure volume **Volume** – The number of cubic units of space on the interior of a solid **Cube** – A three-dimensional shape that contains six square faces. At each vertex, all sides meet at right angles. **Rectangular solid (prism)** – A three-dimensional figure in which each face is either a rectangle or a square. Opposite faces are congruent. **Congruent** – Having the same size and shape **Surface area (SA)** – The sum of ALL the areas of the faces of a solid **Cylinder** – Has the shape of a common tin can. The top and bottom surfaces are circles that are parallel to each other. The distance between the top and bottom is called the height of the cylinder. **Cone** – Has one circular surface called the base. The vertex of a cone is a point that lies directly above the center of the base. The distance between the vertex and the center of the base is called the height of the cone.
Culturally Responsive Teaching Notes (also see checklist below):	Click or tap here to enter text.
Culturally Responsive Teaching Checklist:	☐ Is it evident that students will connect content to their own lives and to what they already know? ☐ Do the student resources regularly include authors, images, and ideas from a range of racial, cultural, linguistic, gender, and (dis)ability representations and backgrounds, especially those of our students? ☐ Do cultural representations and varied perspectives seem to be fair and accurate? Are stereotypes avoided?

Instructional Activities

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Lesson Introduction:	1. The instructor will write the objective on the whiteboard (classroom setting) or present via a slide or on white board in Zoom instruction. The student will be able to calculate volume units, volume of a cube, and volume of a rectangular prism independently 7/8 times. Students will be able to calculate how many boxes a "storage" room will hold with 1/1 accuracy and complete final exam with 5/6 accuracy. 2. Show the students a box and a cube. Have the students guess how many cubes will fit in the box. 3. Review the difference between one- and two-dimensional objects: Display how a piece of twine has one dimension (length) and can be used to measure a perimeter. Display how a piece of paper has two dimensions (length and width) and represents area or surface area.
Lesson Introduction Tips:	• Explain how the lesson objectives will be shared with learners. • Make connections to learners' goals and prior and future lessons.

Lesson Body, **Direct Instruction: Entire class, 30 mins.**	1. Introduce new concept: Shapes that have volume are three-dimensional and have length, width, and height. Display various three-dimensional objects. 2. Discuss shapes that have volume: **cube, rectangular prism, cone, cylinder**. (Encourage students to add vocabulary words and definitions to their vocabulary folder.) 3. Students will partner to identify real-life examples of each, e.g., can of soda, ice cream cone, shoe box, etc. 4. Complete *Number Power Geometry,* page 113, "Label each figure with its solid figure name." If utilizing Zoom instruction, have the students submit their answers using Zoom polling to obtain feedback. Show first seven minutes of the *Math Antics* "volume" video. https://www.youtube.com/watch?v=qJwecTgce6c&t=19s 5. Discuss **cubic units**: Display a one-inch cube and a larger, clear cube. Show how the one-inch cubes fill the larger cube to represent cubic units to determine the cubic volume. 6. The instructor will model finding the volume of the clear cube by filling the cube with one-inch cubic units. 7. The instructor will model how to determine how many volume units are in Problems 1 and 2 in *Number Power Geometry,* page 115, by counting the volume units. Proceed to Guided Practice 1. 8. The instructor will model how to solve the volume of the cube for Problem 1 in *Number Power Geometry,* page 117. Proceed to Guided Practice 2. 9. The instructor will model how to solve the volume of the cube for Problems 1-3 *Number Power Geometry,* page 118. Proceed to Guided Practice 3. 10. The instructor will model measuring a three-dimensional object and enter the measurements into page 118 of *Empower: Over, Around, and Within Student Book*. Proceed to Guided Practice 4. 11. The instructor will introduce the activity on page 116 of *Empower: Over, Around, and Within Student Book*. The instructor will show a sample box. The box should be cubic (all sides equal length) for the introductory exercise. The instructor will have the

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	students work in teams of two or three students, if in classroom setting. The students will complete activity independently if at home via Zoom instruction. Proceed to Independent Practice 4. 12. The instructor will have the students complete the final assessment. Proceed to Independent Practice 5.
Lesson Body, **Guided Practice:**	**Guided Practice:** • One to three students work individually • Four students work in groups of two or three • 30 minutes *(All answers calculated during Guided Practice will be submitted via Zoom Polling.)* 1. The instructor and the students will complete numbers 3-4 (*Number Power Geometry,* page 115) together using guided practice. Proceed to Independent Practice 1. 2. The instructor and the students will complete numbers 2-5 (*Number Power Geometry,* page 117) together using guided practice. Proceed to Independent Practice 2. 3. The instructor and the students will complete numbers 4-7 (*Number Power Geometry,* page 118-119) together using guided practice. Proceed to Independent Practice 3. 4. Working in teams of two or three students, they will collaborate to measure various three-dimensional objects and enter the measurements into page 118 of *Empower: Over, Around, and Within Student Book.* They will calculate the volume for each of these objects using guided practice. If utilizing Zoom technology, this could be done in breakout rooms.

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Lesson Body, Independent Practice:	• One to three students will work individually. • In a classroom setting, number four will be completed in groups of two or three students. In Zoom, will complete independently. • 45 minutes *(All answers for Independent Practice will be entered into a prepared Google Form.)* **1.** The students will complete numbers 5-6 (*Number Power Geometry,* page 115) independently. Return to Direct Instruction 9. **2.** The students will complete numbers 6-8 (*Number Power Geometry,* page 117) independently. Return to Direct Instruction 10. **3.** The instructor and the students will complete numbers 8-10 (*Number Power Geometry,* page 118-9) independently. Return to Direct Instruction 11. **4.** The students will complete the activity on page 116 of *Empower: Over, Around, and Within Student Book.* Upon completion, the students will submit answer to instructor. Return to Direct Instruction 13 once finished.
Lesson Body Tips:	• Provide enough detail that another instructor could teach this lesson based on the information in this lesson plan. • Include how the students will be grouped, approximate timeframes for each activity, and how technology will be integrated. • Describe where in the lesson sequence, and how, the instructor will model the target skills and/or tasks for the learners.
Differentiation (also see checklist below):	Click or tap here to enter text.

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Differentiation Checklist:	☐ Are teachers cued to adapt instruction for their specific learners? ☐ Are there adequate supports to help teachers differentiate instruction to meet the needs of individual learners, including English learners and those with learning disabilities? (e.g., texts at different levels, broad topics or compelling tasks that allow teacher/student flexibility) ☐ What kinds of choices are students able to make within the lesson plan (e.g., text selection, project topics or products)?
Assessment:	**1.** Independent Practice numbers 1-3 contain eight problems in which the lesson objective is to complete 7/8 correctly. **2.** The students will correctly calculate the number of cubic storage boxes the "storage" room will hold with 1/1 accuracy. **3.** Test Practice: *Empower: Over, Around, and Within Student Book*, page 121. Criteria for mastery: 5/6 correct. **4.** Use technology to assess student understanding. Examples of technology would include Kahoot!, Quizlet, etc. Students will download the Kahoot! app on their phones or can use the website on their phones or computers. https://kahoot.com/
Assessment Tips:	• Describe the ongoing assessments that will be used to check learners' progress toward the lesson objectives. • Describe the cumulative assessments that will measure the extent to which learners met the lesson objectives.

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Lesson Conclusion:	1. Revisit the Introduction, number 2, where the student was challenged to guess how many cubes would fit into the box. The instructor will provide an answer, feedback and entertain any discussion. 2. Provide the students with an opportunity to talk about the process of today's activity and what they learned in today's lesson. 3. Ask the students to think of ways volume could be used in vocational settings. **Career Pathways**: Have students brainstorm in groups to list professions that use volume. Some examples might include construction – hauling material or filling a pool; manufacturing – how much product will fill a can; medical – how much liquid is in a beaker. 4. End the lesson with a Zoom poll to obtain student feedback regarding how confidently they feel they have learned the content.
Lesson Conclusion Tips:	• Review lesson objectives. • Provide an opportunity for student reflection. • Connect to prior and future learning.
Lesson Extension, Homework:	Aztec and/or Khan Academy: Lesson on Solid Figures

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Lesson Extension, Additional Enrichment/Practice Opportunities:	*Empower: Over, Around, and Within Student Book,* pages 119, 120.
Key Shifts:	• Check to ensure that your lesson addresses the Key Shifts in the CCRS.
ELA Key Shifts (check all that apply):	☐ Text Complexity ☐ Evidence ☐ Building Knowledge
Math Key Shifts (check all that apply):	☒ Focus ☒ Coherence ☒ Rigor

Instructor Reflection Before the Lesson

Instructor Reflection Questions (to be completed before teaching the lesson):

- Are there opportunities to position students as experts on topics?
- What implicit bias might be reflected in the lesson or instructional design of the lesson?
- Were sufficient instructions on the use of digital tools provided and do students have an opportunity to practice?
- Were students provided with the opportunity to make choices regarding the lesson topic, project, etc.?

Instructor Reflection After the Lesson

Instructor Reflection Questions (to be completed after teaching the lesson):

- What went well in the lesson?
- What did not go well in the lesson?
- Did the learners meet the lesson objectives? If not, why?
- What changes should be made for next time the lesson is taught?