

WAMC Lab Template

Math Concept(s): Surface Area and Volume of Rectangular Prisms

Source / Text:

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Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: Raised Planter Beds

Prerequisite skills: Students will know how to calculate volume and surface area of a rectangular prism.

Lab objective: Students will use surface area and volume of rectangular prisms to create a cost proposal for staining and filling the raised planter beds in the agriculture area.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- **HSG-GMD**
 - A. Explain volume formulas and use them to solve problems.
 - B. Visualize relationships between two-dimensional and three-dimensional objects.

Standards for Mathematical Practice:

- MP1 Make sense of problems and persevere in solving them.
- MP2 Reason abstractly and quantitatively.
- MP4 Model with mathematics.
- MP5 Use appropriate tools strategically.
- MP6 Attend to precision.
- MP7 Look for and make use of structure.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- RST 7 - Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

- WHST 8 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Technology

- 2: Digital Citizen - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.
- 3. Knowledge Constructor - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

Engineering

- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input checked="" type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<u>Accountability</u>
<input checked="" type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input checked="" type="checkbox"/> Manage Projects
<input type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<u>Leadership and Responsibility</u>
<u>Critical Thinking and Problem Solving</u>	<input checked="" type="checkbox"/> Analyze Media	<input checked="" type="checkbox"/> Manage Goals and Time	<input checked="" type="checkbox"/> Guide and Lead Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input checked="" type="checkbox"/> Work Independently	<input checked="" type="checkbox"/> Be Responsible to Others
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input checked="" type="checkbox"/> Be Self-Directed Learners	
<input checked="" type="checkbox"/> Make Judgments and Decisions	<input checked="" type="checkbox"/> Apply Technology Effectively	<u>Social and Cross-Cultural</u>	
<input checked="" type="checkbox"/> Solve Problems		<input checked="" type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input checked="" type="checkbox"/> Work Effectively in Diverse Teams	
<input checked="" type="checkbox"/> Communicate Clearly			
<input checked="" type="checkbox"/> Collaborate with Others			

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Tape Measures
- Planter boxes
- Lab worksheet

Set-Up Required:

- Make copies of lab worksheet

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input checked="" type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION <u>Creativity and Innovation</u>	INFORMATION, MEDIA & TECHNOLOGY SKILLS <u>Information Literacy</u>	LIFE & CAREER SKILLS <u>Flexibility and Adaptability</u>	Productivity and Accountability
<input type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input checked="" type="checkbox"/> Manage Projects
<input type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<u>Leadership and Responsibility</u>
<u>Critical Thinking and Problem Solving</u>	<input checked="" type="checkbox"/> Analyze Media	<input checked="" type="checkbox"/> Manage Goals and Time	<input checked="" type="checkbox"/> Guide and Lead Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input checked="" type="checkbox"/> Work Independently	<input checked="" type="checkbox"/> Be Responsible to Others
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<u>Social and Cross-Cultural</u>	
<input checked="" type="checkbox"/> Make Judgments and Decisions	<input checked="" type="checkbox"/> Apply Technology Effectively	<input checked="" type="checkbox"/> Interact Effectively with Others	
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<u>Communication and Collaboration</u>			
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<input checked="" type="checkbox"/> Collaborate with Others			

Cooperative Learning:

- Students will work in pairs: one taking measurements and one recording data.

Expectations:

- Students will work in pairs collaborating to collect all needed data in a timely manner with precision. Students will then work independently on the research of materials and cost. Each student will turn in their own lab.

Timeline:

- This lab should take about 30 minutes for data collecting and 30 minutes to complete the student worksheet and computations.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab:

- What if you were building a raised garden bed and needed different layers of material?
- Does it matter which soil you use? Does this effect cost?
- What if you needed to fill a tank with liquid (ie. Pool, fish tank, vases, etc.)
- If you were building these for someone, are there other costs besides material that you would need to include in your customer's quote?

Career Applications

- Farming
- Gardening/landscaping

- Chefs/Bakers
- Machinists

Optional or Extension Activities

- Students can design a garden bed with a maximum area or volume at the lowest cost possible.
- Students can work with other shapes such as cylinders.

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Lab: Planter Box

Objective: In this lab, you will find the surface area and volume of a raised planter box so that it can be stained and filled. You will then write out a bid, with supported calculations, for how much it will cost to stain and fill the planter with soil.

Steps:

- A. Measure the outside length, width and height of the raised planter. Create a sketch below the table with the measurements labeled.

<u>Outside measurements</u>	
Outside Length	
Outside Width	
Outside Height	

- B. Measure the inside length, width, and height of the raised planter. Create a sketch below with the table with the measurements labeled.

<u>Inside Measurements</u>	
Inside Length	
Inside Width	
Inside Height	

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Calculations: Show all work for full credit!

1. What is the amount of paint that will be needed to paint the outside of the planter?
Remember, we are not doing the bottom.

2. Do some research online and pick a wood stain to use.
 - a. Where are you buying it from?
 - b. What is the cost per container? How big is the container?

- c. What is the total cost of stain needed?

3. How much garden soil (or raised planter soil) is needed to completely fill the planter?

4. Do some research online a pick out the top of soil you want to use.
 - a. Where are you buying it from?
 - b. What is the cost per bag? How big is the bag?

- c. What is the total cost of the soil needed?

5. If I were to hire you to complete this project, what would be the total cost in supplies (not including labor)?

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