

Lab Framework

Text: CORD Classic

Unit number and title: 8 Working with Shapes in Three Dimensions

Developed by: Teresa Antonoplos

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Lab Title

Another Dimension

Contact Information: tantonop@cloverpark.k12.wa.us

Short Description: Students will construct, from scratch with their own materials, a three dimensional figure, which they will then calculate the total surface area and volume of. The figure must represent something that can be found in every day life.

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

q **Lab Objective**

To give students a better understanding of where volume and surface area are used in every day life.

q **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

Student is able to read and follow written instruction to produce a product.

q **New Vocabulary**

Total surface area
Lateral area
Volume
Cylinder
Radius
Base
Height
Slant height
Rectangular prism
Cube
Cone
Sphere

q **Materials List**

Student lab worksheet
Whatever materials student chooses to construct the figure

q **GLEs addressed**

Math:

1.2.1 Understand the relationship between change in one or two linear dimension(s) and corresponding change in perimeter, area, surface area, and volume.

1.2.5 Use formulas to determine measurements related to right prisms, cylinders, cones, or pyramids.

1.3.1 Understand the properties of and the relationships among 1-dimensional, 2-dimensional, and 3-dimensional shapes and figures.

1.3.2 Use the properties of and relationships among 1-dimensional, 2-dimensional, and 3-dimensional shapes and figures including prisms, cylinders, cones, and pyramids.

2.2.1 Select and use relevant information to construct solutions.

2.2.2 Apply mathematical concepts and procedures from number sense, measurement, geometric sense, probability and statistics, and/or algebraic sense to construct solutions.

- 2.2.3 **Apply a variety of strategies and approaches to construct solutions.**
- 2.2.4 **Determine whether a solution is viable, is mathematically correct, and answers the question(s).**
- 4.2.2 **Represent mathematical information in graphs or other appropriate forms.**
- 5.3.1 **Understand that mathematics is used extensively in daily life outside the classroom.**
- 5.3.2 **Understand that mathematics is used in many occupations or careers.**

Reading:

- 2.1.6 **Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: monitor for meaning, create mental images, and generate and answer questions.**
- 3.2.2 **Apply understanding of complex information, including functional documents, to perform a task.**

Writing:

- 2.2.1 **Demonstrates understanding of different purposes for writing**
- 3.1.1 **Analyzes ideas, selects a narrow topic, and elaborates using specific details and/or examples.**
- 3.2.2 **Uses language appropriate for a specific audience and purpose.**

q **Leadership Skills**

Students will be responsible for completing the project outside of class, with their own materials, on their own time.

q **SCAN Skills**

Basic Skills

- A. Locates, understands, and interprets written information prose and documents – including manuals, graphs and schedules – to perform tasks
- B. Learns from text by determining the main idea or essential message
- C. Identifies relevant details, facts and specifications

Arithmetic

- A. Performs basic computations

Mathematics

- A. Approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- B. Uses quantitative data to construct logical explanations for real world situations
- C. Expresses mathematical ideas and concepts orally and in writing

Thinking Skills

Creative Thinking- Uses imagination freely, combines ideas or information in new ways, makes connections between seemingly unrelated ideas, and perhaps goals in ways that reveal new possibilities.

Problem Solving- Recognizes that a problem exists (i.e., there is a discrepancy between what is and what should or could be), identifies possible reasons for the discrepancy, and devises and implements a plan of action to resolve it. Evaluates and monitors progress, and revises plan as indicated by findings.

Knowing How to Learn

- A. Recognizes and can use learning techniques to apply and adapt new knowledge and skills both in familiar and changing situations

Personal Qualities

Self-Management

- A. Asses own knowledge, skills, and abilities accurately
- B. Sets well-defines and realistic personal goals
- C. Monitors progress toward goal attainment and motivates self through goal achievement

q **Set-up information**

Students will be given the project guidelines and expectations. Each student is responsible for his/her selection of three dimensional figure. They can choose from any figure in the unit. On their own time, outside of class, the students need to construct (no premade figures allowed) one of the three dimensional figures. The figure can be as large or as small as they want, as long as they decorate it to look like something they can find in everyday life. Once their figure is constructed, they then need to calculate the total surface area and volume of their figure.

q **Lab organization(-Grouping/leadership opportunities/cooperative learning expectations; -Timeline required)**

This lab will require one 20 minute introductory session in class to explain the project to the students.

Students will then have 3 evenings, on their own, to complete the construction of the three dimensional figure and find the volume and surface area for it.

This is an individual project, each student is responsible for creating their own three dimensional figure.

q **Teacher Assessment of student learning** (scoring guide, rubric)

2- proficient 1- emerging 0- developing

Follows assignment guidelines 2 1 0

Creates three dimensional figure 2 1 0

Work and model are accurate

representations of real life figures 2 1 0

q **Summary of learning** (to be finished after student completes lab)

-discuss real world application of learning from lab

-opportunity for students to share/present learning

1. Students will practice public speaking in front of class (when presenting projects) to articulate the process used to complete this problem-based activity. 2. Students will have the opportunity to edit and modify work to meet standards (following rubric guidelines). 3. Students will have the chance to write reflectively in class about the project and self-score all aspects of the project.

q **Optional activities**

Part of the exam for Unit 8 could then include the students picking out one other student's project and calculating the total surface area and volume for it.

q **Career Applications**

Students can learn about careers that deal with manufacturing, engineering, marketing, and packaging.

STUDENT INSTRUCTIONS:

q **Statement of problem addressed by lab**

Given the four types of three dimensional figures we have learned about in Unit 8, construct a three dimensional figure and compute it's volume and surface area.

q **Grouping instructions and roles**

This is an individual project! You will construct the three dimensional figure on your own, as well as do all of your own computations for volume and surface area.

q **Procedures** – steps to follow/instructions

1. Choose one of the four three dimensional figures that we have been studying in Unit 8.

2. Outside of class, you will construct this three dimensional figure.

*Your figure must be modeled after something that can be found in everyday life.

* You can make your figure as large or as small as you want

* You must construct the figure from scratch! You cannot use a pre-made figure as your three dimensional figure. For example, you can't bring in an actual cereal box, you would need to make it. And that does NOT mean taking a shoe box and covering it in paper...it means actually making it.

* The figure MUST be school appropriate!!!! You may not construct a cylinder if you are going to decorate it like a beer can. Do not test me on this, if your figure is inappropriate, you will fail the project!!!

3. Once you have constructed your figure, you will then need to find the lateral area, surface area, and volume of the figure you have made. The dimensions and the work must be done on a separate sheet of paper.

q **Outcome instructions**

Once you have constructed your figure and computed the volume and surface area, you will present your work to the class.

q **Assessment instructions** (peer-teacher)

Teacher observation- Follow directions carefully

Scored by rubric

Written reflective response

Survey about project

Lab Data Collection

Student: _____ **Date:** _____

Unit: _____

Lab Title:

Criteria: Write the problem/objective in statement form

Data Collection: Record the collected/given data

Calculations: Complete the given calculations to solve for an answer(s)

Summary Statement:

Other Assessment(s)