HOW CAN STUDENT LEARNING BE IMPROVED THROUGH PROJECT BASED

CURRICULUM THAT GIVES ACCESS TO ALL STUDENTS

by

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A capstone submitted in partial fulfillment of the

requirements for the degree of Master of Arts in Teaching.

Hamline University

Saint Paul, Minnesota

Summer, 2018

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PROJECT SUMMARY

My question was, How can student learning be improved by creating project based curriculum that gives access to all students? This question is answered by a project based unit curriculum. Students have often struggled with project understanding and completion during previous executions. The developed curriculum and future implementation of the curriculum strives to create a resource and example for teachers looking to implement project based learning in their classroom.

The following document contains items that can be used when implementing a project based learning curriculum. The curriculum is structured in such a way that it intermixes traditional math instruction with project based learning throughout the unit. The pieces that follow can be used to implement that project that is based on an idea found in *Geometry and the Design of Product Packaging* by Cherico, 2011). This document contains a unit plan with daily structure, resources for the project, learning targets with formative assessments, and a project rubric aligned to learning targets and state standards.

In summary created a sample curriculum for a 10th grade geometry course using; the principles and best practices of project-based learning (Larmer & Mergendoller, 2010), standards based learning (Huetinck & Munshin, 2008) the five mathematical proficiency strands (Kilpatrick et al., 2001) and the five process standards (NCTM, 2000). These structures provided a curriculum that gave access to all students. Use these resources as a guide to form your own project based learning curriculum.

DESCRIPTION OF CLASS MATERIALS

This is the daily description of each day

Article can be found at the following link.

https://www.adweek.com/brand-marketing/can-diet-cokes-new-skinny-rainbow-colored-cans-attract-the-millennials-it-covets/

Adapted from district and state standards

Formative Quiz for Day 4

Formative Quiz for Day 9

UNIT 7: 3D SOLIDS

	Monday	Tuesday	Wednesday	Thursday	Friday
Unit 7: Week 1 **Surface Area and Nets** (daily homework given this week)	**DAY 1 Project Launch** (Diet Coke Can Article). Develop Essential Question.	**DAY 2 Naming & Nets** *Students will unfold the cases of diet coke and other three dimensional real world objects to visualize their nets.* Traditional instruction and notes for vocabulary and names of 3 dimensional shapes.	**DAY 3 Surface Area** Prisms, Cylinders, Pyramids, cones, Spheres. Traditional Instruction with website exploration https://www.learner.org/interactives/geometry/sa-cylinders/	**DAY 4 Practice and Formative** Students practice surface area and nets of three dimensional shapes. Formative assessment on surface area.	**DAY 5 Project Day** Students nets and shapes due at the end of the hour. For their project.
Unit 7: Week 2 **Volume** (daily homework given this week)	**DAY 6 Volume Prisms and Cylinders** Traditional instruction. Key Idea is B*h=V	**DAY 7 Volume of Pyramids & Cones** *Do the water demonstration for volume of pyramid to a cube with same base and height. Then, students can practice volume of all solids and SA of prisms,*	**DAY 8 Volume of The Coke Cans and Original Object** Look at the original objects and find surface areas and volumes.	**DAY 9 Volume of The Coke Cans and Original Object Day 2 and Formative** Keep looking at the objects and then get the feedback from nets and surface area from the project. Formative assessment on Surface area and Volume.	**DAY 10 Project Day** Students need to look at how do they need to change their shapes so they have the same volume like the coke cans.
Unit 7: Week 3 **Project** (no daily homework given this week)	**DAY 11 Project Day** Student Work days on creating models of their packaging	**DAY 12 Project Day** Students work on reflections and summaries.	**DAY 13 Final Projects Due** Students will present their projects and the mathematics behind what they came up with.		

Project Description Handout

Designing Product Packages

Imagine that you are asked to design the packaging for one of the following:

• An existing product of your choice that you believe would sell better if the packaging were changed or

• A new product that you have created.

Your task is to present a proposal to your boss that provides two packaging options. Each option must hold the same volume of product, just like the two cans of coke that we looked at today. Your proposal must include the following:

    1. A net for constructing each proposed package labeled with appropriate

    measurements

    2. Calculations of the surface areas of the proposed packaging

    3. Calculations of the volume of the proposed packaging

    4. A clearly articulated summary stating your reasoning behind your design

    choice and packaging recommendation that includes a mathematical explanation

    of your findings while creating the two packaging options

    5. Three-dimensional representations of your new package designs

Your finished product should include a written component that satisfies items 1 through 4 above as well as the three-dimensional models listed in item 5. Your work should be neat and organized. Your three-dimensional models should be constructed to scale and should be neatly prepared. Overall presentation is one aspect of your grade on this project, so be creative.

Don't forget to refer to the grading rubric as you work to ensure that you are meeting all project requirements. We will be working with this project throughout the unit. We will be working on the project in pieces.

(Cherico, 2011).

Rubric	4 Above Proficient	3 Proficient	2 Progressing	1 Attempted
Net Package 1 Objective 7.1	Drawing is accurately scaled, reflects shape indicated and is labeled correctly with dimensions and units.	Drawing accurately reflects shape indicated, some labels are missing or incorrect, or there is a minor error in scale.	Drawing is inaccurate but is labeled correctly with dimensions and units.	Drawing and labels both include significant errors or omissions.
Net Package 2 Objective 7.1	Drawing is accurately scaled, reflects shape indicated and is labeled correctly with dimensions and units.	Drawing accurately reflects shape indicated, some labels are missing or incorrect, or there is a minor error in scale.	Drawing is inaccurate but is labeled correctly with dimensions and units.	Drawing and labels both include significant errors or omissions.
Surface Area Package 1 Objective 7.2	Surface area is calculated correctly using correct units; all work is shown.	Surface area calculations includes minor arithmetic errors or incorrect units, or all work is not shown.	Surface area calculations include significant errors, units are incorrect, or all work is not shown.	Incorrect formula is used to calculate surface area.
Surface Area Package 2 Objective 7.2	Surface area is calculated correctly using correct units; all work is shown.	Surface area calculations includes minor arithmetic errors or incorrect units, or all work is not shown.	Surface area calculations include significant errors, units are incorrect, or all work is not shown.	Incorrect formula is used to calculate surface area.
Volume Package 1 Objective 7.3	Volume is calculated correctly using correct units; all work is shown.	Volume calculations includes minor arithmetic errors or incorrect units, or all work is not shown.	Volume calculations include significant errors, units are incorrect, or all work is not shown.	Incorrect formula is used to calculate Volume.
Volume Package 2 Objective 7.3	Volume is calculated correctly using correct units; all work is shown.	Volume calculations includes minor arithmetic errors or incorrect units, or all work is not shown.	Volume calculations include significant errors, units are incorrect, or all work is not shown.	Incorrect formula is used to calculate Volume.
3D Representation Package 1	3D representation of package design is accurate and neat.	3D representation of package design is accurate but not neat.	3D representation of package design is inaccurate but neat.	3D representation of package design is inaccurate and not neat.
3D Representation Package 2	3D representation of package design is accurate and neat.	3D representation of package design is accurate but not neat.	3D representation of package design is inaccurate but neat.	3D representation of package design is inaccurate and not neat.
Summary	Summary is clearly stated and logical and includes mathematical reasoning.	Summary is clearly stated but contains a logical error, or mathematical reasoning not present.	Summary is not clearly stated or mathematical reason is not present.	Summary is illogical or not included.
Overall Presentation	Overall presentation is neat and organized	Overall presentation is somewhat neat and organized.	Overall presentation is not neat or is disorganized	Overall Presentation is sloppy and disorganized

(Cherico, 2011).

Learning Targets Unit 7 2018-2019

Learning Target		My Score (update after tests or retakes)
	Objective 7.1: I can identify the name of polyhedrons and draw a net.	
	Objective 7.2: I can find the surface area of prisms, cylinders, pyramids, and cones	
	Objective 7.3: I can find the volume of prisms, cylinders, pyramids, and cones	

3D Shapes Volume and Surface Area Quiz 1   Name: _____

7.1: I can identify the name of polyhedrons and draw a net.

7.2: I can find the surface area of **prisms, cylinders, pyramids, and cones**

For each question, name the polyhedron, draw its net, find the surface area, and find the volume.
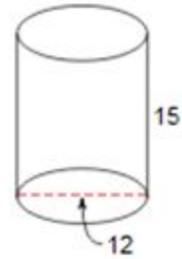
1.

11
10
8.7

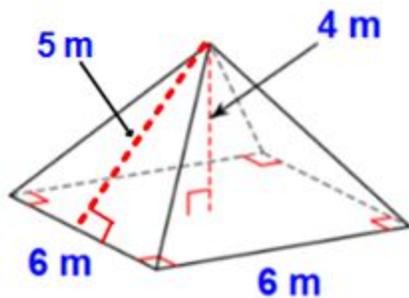Name:_____
Net:

2.
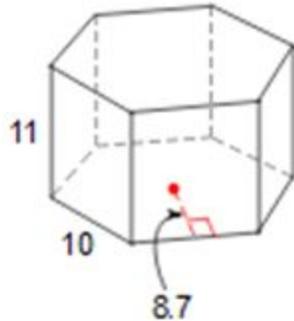
15
12

Name:_____
Net:

Surface Area = _____

Surface Area = _____

For each question, name the polyhedron, draw its net, find the surface area

3.

4.

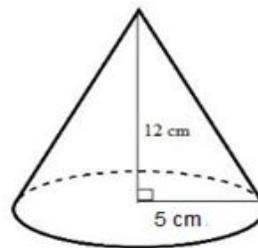Name:_____   Name:_____

Net: Net:

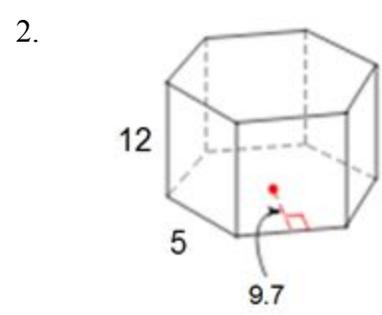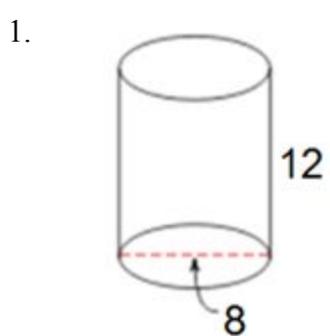Surface Area = _____   Surface Area = _____

3D Shapes Volume and Surface Area Quiz 2   Name: _____

7.1: I can identify the name of polyhedrons and draw a net.

7.2: I can find the volume and surface area of prisms, cylinders, pyramids, and cones

7.3: I can find the volume and surface area **of prisms, cylinders, pyramids, and cones**

For each question, name the polyhedron, draw its net, find the surface area, and find the volume.

1.

12

8

2.

12

5

9.7

Name:_____   Name:_____

Net: Net:

Surface Area = _____   Surface Area = _____
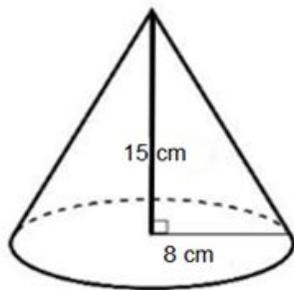Volume = _____   Volume = _____

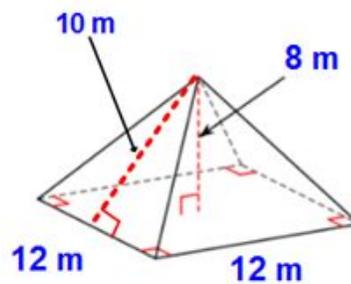**For each question, name the polyhedron, draw its net, find the surface area**

3.

15 cm

8 cm

Name:_____

Net:

4.

10 m

8 m

12 m

12 m

Name:_____

Net:

Surface Area = _____

Volume = _____

Surface Area = _____

Voume = _____

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