

Lab Framework

Text: Cord

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

Short Description: Using Unit Origami to build three-dimensional shapes

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Lab Title Unit Origami

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

Lab Objective

SWBAT fold origami paper by following the directions given in class, then assemble unit pieces together in order to form shapes from which surface area and volume can be calculated.

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

Students will need to be able to use a ruler (both metric and standard), be able to calculate surface area, and volume of pyramids, and rectangular prisms.

Vocabulary

Bisect, rotate 180 degrees, equilateral triangles, 45-45-90 special right triangles, and obtuse scalene triangles.

Materials List

6-12 pieces of Origami paper per student, rulers, colors (optional)

GLEs (State Standards) addressed

GLE 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

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

GLE 2.2.3 Apply a variety of strategies and approaches to construct solutions

GLE 3.2.1 Draw and support conclusions, using inductive or deductive reasoning

GLE 3.1.1 Analyze, compare, and integrate mathematical information from multiple sources

GLE 3.2.1 Draw and support conclusions, using inductive or deductive reasoning

GLE 5.2.1 Use mathematical patterns and ideas to extend mathematical thinking and modeling to other disciplines

GLE 5.1.2 Relate and use different mathematical models and representations of the same situation

Leadership Skills

Students function in small learning communities geared towards cooperative problem solving. Leadership rolls are often shifted and different skills emphasized on a daily basis. (2.1)

Students are given many opportunities to lead the entire class in new and different activities on a daily basis. Students demonstrate that they understand the rules, expectations, and guidelines as well as the consequences for not following them. (2.8)

SCAN Skills/Workplace 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.

Decision Making- Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternatives.

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.

Set-up information

Lab organization(-Grouping/leadership opportunities/cooperative learning expectations)

Students work in groups of four. I teach one person from each group how to make the Unit Origami and that leader returns to the group and then instructs others on how to make the pieces. I have models of possible shapes to make but have no written or verbal instructions about how to assemble

them. Students must use their SCAN workplace skills in order to complete assembly of the figures.

Timeline required

This project is a wonderful one to do right before the holidays - using square pieces of holiday wrap for the Origami Papers. Uses a minimum of 4 hours of class time.

Teacher Assessment of student learning (scoring guide, rubric)

Students are graded on the neatness and accuracy of their boxes. 10 points for a completed, perfect box, 10 points for communication skills demonstrated, and 10 points to be awarded for completed lab write up which includes finding both the surface area and Volume of their figures.

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

This activity helps students understand and appreciate how 3-D figures are created. In addition, these skills can be used in any jobs that require creative problem solving and higher level thinking skills

Optional activities

http://en.wikipedia.org/wiki/Modular_origami

<http://www.keypress.com/x5768.xml>

<http://www.origami-resource-center.com/modular-origami.html>

http://en.wikipedia.org/wiki/Stella_octangula

<http://mathworld.wolfram.com/StellaOctangula.html>

Career Applications

These skills can be used in any jobs that require creative problem solving and higher level thinking skills

<https://wa-appliedmath.org/>

LAB TITLE: Unit Origami

STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**
Assemble your unit Origami and then find the Surface Area and Volume of your figure. Be sure to report answers in both metric and standard measures.
- **Grouping instructions and roles**
Pick your leader (not the same one from last lab) and have them come to my desk for a mini lesson. This person will be responsible for making sure you manufacture your pieces correctly.
- **Outcome instructions**
When you have all completed your objects, then have me come and grade them.
- **Assessment instructions (peer-teacher)**
Work as a group to make sure your answers are correct. Check your work.

<https://wa-appliedmath.org/>