NTTI Media-Rich Lesson

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NAME

It's a Bug's Life
LESSON TITLE

Grades 9 - 10
GRADE LEVELS

1 class period (90 minutes)
TIME ALLOTMENT

OVERVIEW
In this lesson, the students will explore the relation between **surface area** and **volume** and apply them to real life situations.

SUBJECT MATTER
Geometry

LEARNING OBJECTIVES
The student will be able to:

- Apply surface area and volume to real world situations.

STANDARDS

Georgia Quality Core Curriculum Standards (http://www.glc.k12.ga.us)

Euclidean Geometry Standards for grades 9-12

Topic: Problem Solving, Visualizing, Reasoning

Standard 1:

> Students will be able to solve problems and practical applications using appropriate approaches and tools (including calculators and computers) and judges the reasonableness of results.

Standard 3:

Students will be able to use visualization skills to explore and interpret both two- and three-dimensional geometric figures using such topics as projections, cross sections, and locus problems.

Topic: Perimeter, Area, and Volume

Standard 37:

Students will be able to find the volume of solids composed of prisms, pyramids, cylinders, cones, or spheres.

Standard 38:

Students will be able to compare the areas of similar polygons and the volumes of similar solids.

Standard 39:

Students will be able to solve problems involving perimeter, area, and volume.

National Council for Teachers of Mathematics Standards

Geometry Standards for Grades 9-12

Students will be able to analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Students will be able to use visualization, spatial reasoning, and geometric modeling to solve problems.

Communications Standards for Grades 9-12

Students will be able to organize and consolidate their mathematical thinking through communication.

Students will be able to communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

Students will be able to analyze and evaluate the mathematical thinking and strategies of others.

Students will be able to use the language of mathematics to express mathematical ideas precisely.

Representation Standards for Grades 9-12

Students will be able to create and use representations to organize, record, and communicate mathematical ideas.

MEDIA COMPONENTS

Videos

VideoMath: Surfaces - Comparing Surface Shape and Size, *United Streaming Series*

This video is compares the surfaces of various objects and shows that objects with the same surface areas do not necessarily have the same volume and vice versa. It can be access through the following website:

http://unitedstreaming.com/login_unitedstreaming.cfm

Your local PBS station can help you to obtain access to these movies.

MATERIALS

Per Class:

- Gateway Computer or LCD Projector/desktop or laptop computer for teacher use
- Computers for student use

Per student:

- Video Handout
- Group Activity Handout “Bug Boxes”

Per Group of Students:

- Poster Board
- Tape
- Rulers
- Scissors
- Large Plastic Insects
- Instruction Sheets

PREP FOR TEACHERS

Prior to the teaching of this lesson the teacher should do the following:

- Download the Video **VideoMath: Surfaces - Comparing Surface Shape and Size, *United Streaming Series.*** It can be access through the following website: http://unitedstreaming.com/login_unitedstreaming.cfm . Your local PBS station can help you to obtain access to these movies.
- Cue the videotape to the beginning of the video.
- Place materials at the materials station in your classroom.
- Run off Handout # 1 for each group.

INTRODUCTORY ACTIVITY: SETTING THE STAGE (Engage)

The teacher should open up lesson by saying the following: "Can you recall how we find the area of a 2-D or 3-D figures such as squares and cubes?

Do two things that have the same volume also have the same surface area? At this point the teacher will display several household items that have the same volume and then state: I have several items displayed that have the same volume, but do they have the same surface area?

Provide students with a FOCUS FOR MEDIA INTERACTION by saying, "I will now show you a video clip. The teacher should ask the students to pay attention to the items that the students use to compare surface areas. Also, what does the video clip use to show that different shapes can have the same area?

LEARNING ACTIVITIES

Step 1:
The teacher will say, "Today we will show a connections between surface area and volume.

Step 2:
The students are divided into groups of 3 or 4 students.

Step 3:
The teacher should begin the activity by setting the scenario such as the following:

> "Mary Gardner loves to work in her garden. On any given day she observes various types of insects in her garden. One morning after an unusual acid rain, Mary went out side to work in her garden. To her surprise, the insects that she normally sees in her gardens had grown to an enormous size. Mary ran into the house and called the entomology department at the University of Bugs. Representatives arrive to Mary home and captured the insects and took them back to their lab.
>
> In the lab, the scientist flash froze the insects so they could send them off to the

National Entomology lab. There was only one problem. They did not have containers to place the insects in for shipment. The university contacts several container companies to build boxes that would hold the various insects.

You have been given the task of building a box so that the genetically mutated insect you were given can be sent to the National Entomology Lab for study.

Step 4:
Have one person select a bug to work with.

Step 5:
Begin building your box. The box must have the following specifications:

1. It must be one continuous piece with a lid.
2. The box should be big enough to hold the bug.
3. The box should be built so that when you shake it, the bug will not move.

Step 6:
Fill out Handout #2 – Bug Box Specification Sheet. The following items should be included on the sheet:

- A net of the box should be drawn and the measurements should be shown on the net.
- Surface area and volume calculations.

CULMINATING ACTIVITY

Step 1:
Each group will come up with a name for their company.

Step 2:
The groups will present their box to the class and turn in their specifications sheet.

Step 3:
As an added incentive, the teacher could have a contest on who built the better box.

CROSS-CURRICULAR EXTENSIONS

Science

- Research and write a paper on the science of Entomology.

English and Social Studies

- Write a science fiction story involving mutated insects

COMMUNITY CONNECTIONS

- Take a field trip to a local entomology lab or science museum.

Handout # 1: BUG BOXES

Objective: Finding surface area and Volume.

Materials: Poster Board
Tape
Rulers
Scissors
Large Plastic Insects
Instruction Sheets

You have been given the task of building a box so that the genetically mutated bug you were given can be sent to the University of Bugs Entomology Department for study.

Instructions:

1. The box must have the following specifications:
4. It must be one continuous piece with a lid.
5. The box should be big enough to hold the bug.
6. The box should be built so that when you shake it, the bug will not move.

2. A net of the box should be drawn and the measurements should be shown on the net.

3. Calculate the surface area and the volume of the box.

Procedures:

1. Divide the class into groups of 3 or 4 students.
2. Have one person select a bug to work with.
3. Have one person collect the materials from the materials station.
4. Begin building your box.
5. Fill out the specifications sheet as you go along.
6. The groups will present their box to the class and turn in their specifications sheet.

Handout #2: Bug Boxes Specifications Sheet

Company Name: _____

Company Members: _____

_____

_____

_____

1. **Draw the net of your box and label the measurements of each length.**

2. **Calculate the surface area of the box.** _____

3. **Calculate the volume of the box.** _____