Concepts in Geometry

Create two-dimensional figures using Google SketchUp

Time Frame: 2 Class periods

Mathematics
Grade 3- 5 Elementary School Geometry Lesson plan
In this unit, student groups will explore symmetry and two-dimensionality. Using Google SketchUp, students construct two-dimensional figures to represent three-dimensional structures.

National Council of Teachers of Mathematics Standards:

- recognize, name, build, draw, compare, and sort two- and three-dimensional shapes.
- describe attributes and parts of two- and three-dimensional shapes; investigate and predict the results of putting together and taking apart two- and three-dimensional shapes.
- identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes.
- classify two- and three-dimensional shapes according to their properties and develop definitions of classes of shapes such as triangles and pyramids.

Learning Objectives: The student will be able to

- use basic geometric language to name and describe two and three dimensional shapes.
- identify basic properties of two and three dimensional figures.
- identify and create similar and congruent shapes.
- identify and create symmetrical shapes.
- identify how different shapes serve different purposes within three-dimensional figures.
- use two dimensional shapes to represent three dimensional figures.

Prior Knowledge:

- Identify and describe properties of two-dimensional shapes.
- Demonstrate knowledge of line symmetry.

Technology components:

- Discovery Education unitedstreaming account (http://www.unitedstreaming.com*)
- Google SketchUp software (free download from http://sketchup.google.com)
- Computer with LCD projector and Internet connection
- Access to the Internet for teacher and student based research

Preparation:

- Preview the *unitedstreaming Discovering Math: Geometry* video segment on 'Geometry'
- Familiarize yourself with drawing simple two and three dimensional figures on Google SketchUp (begin with a simple triangle, then explore with the three dimensional tools to turn it into a prism)
- Plan for student access to the computer

Introduction:

- Use the chalkboard or Google SketchUp to review familiar two dimensional shapes and the concept of symmetry and congruency (note that SketchUp provides an automated way to size figures and to show flips, turns, and slides of figures you create).
- View *unitedstreaming* video *Discovering Math: Geometry* segment on 'Two Dimensional Shapes – Architecture' and the segment 'Three-Dimensional Shapes – Pyramids' and 'Prisms'.
- Introduce Google SketchUp to students as a drawing tool, providing an overview of how the application can convert two dimensional shapes into three dimensional figures.

Present New Content:

- Return to the video to review specific *unitedstreaming Discovering Math: Geometry* video segments showing two and three-dimensional figures within buildings.
- Present Quick Start: Video 1 from the Google SketchUp website at http://sketchup.google.com/tutorials.html
- Provide students with the scoring rubric.
- Students should be prepared to use the language of mathematics to
    - name the two dimensional shapes they used to develop the three dimensional figure
    - describe the symmetry and congruency in the final figure or in the methods they used to develop the three dimension figure.
- Use Google SketchUp to present Example.skp file of student group's two-dimensional representation of geometry within a real-life structure.
- Using Google SketchUp, students complete a two-dimensional representation of a building or figure they observed.

Independent Learning Experience:

- Divide the students into collaborative groups. Using SketchUp, students complete an initial design of a simple building from a *unitedstreaming* image.
    - Suggested *unitedstreaming* content:
      - Washington Monument, DC.
      - The Great Pyramids of Giza, Egypt.
      - A view of the Eiffel Tower

- Students group their representation with other groups. Students verbally identify geometric shapes used, highlighting the importance of these shape's properties within structure.

Cross-Curricular Lesson Extension:

- Add a science component by introducing the concept that certain shapes provide more strength to a structure. Students can research how the triangle shape is essential to building strength or how keystone arches are built.

Feedback:

- Teacher circulates around the room providing ongoing feedback to small groups.
- Students should submit a first draft of their building, demonstrating key ideas relating to geometric shapes used, and associated properties. Teacher will provide comments and guidance on next steps for each group.

Assessment:

- Provide students with a scoring rubric in advance to evaluate ways geometric shapes are used and these shapes' associated properties.
- Use the rubric

Transfer:

- Provide students with a list of unique buildings designed throughout the ages. Students can choose one to research and present to the class, including information about the role of geometry within the unique design of their building.

Citations:

Discovering Math: Geometry (Grades 3–5): Example 1: Two-Dimensional Shapes--Architecture. Discovery Channel School. (2005). Retrieved October 16, 2006, from unitedstreaming: http://www.unitedstreaming.com/

Discovering Math: Geometry (Grades 3–5): Example 2: Three-Dimensional Shapes -- Pyramids and Prisms. Discovery Channel School. (2005). Retrieved October 16, 2006, from unitedstreaming: http://www.unitedstreaming.com/

A view of the Eiffel Tower, late 20th century. IRC. 2005. Retrieved October 16, 2006, from unitedstreaming: http://www.unitedstreaming.com/

Washington Monument at night, Washington DC. Discovery Education (2005). Retrieved October 16, 2006, from unitedstreaming: http://www.unitedstreaming.com/

Pyramids at Giza. IRC (2005). Retrieved October 16, 2006, from unitedstreaming: http://www.unitedstreaming.com/