Lesson Title: *Architecture of the Future*


Grade level lesson: Standards addressed for grade 4.

Academic Subject Area in this lesson: Math

Art Form in this lesson: Visual Art

Brief description of lesson: This lesson introduces students to three-dimensional forms and the concepts of length, width and height: introduces students to drawing skills that help create the illusion of volume in a drawing: introduces students to modern architects who used simple geometric forms in their structures: and allows students to create imaginary architectural designs based on simple cones, cubes, spheres, cylinders, triangular prisms, rectangular prisms and pyramids.

This lesson helps build understanding by breaking structures apart and allowing the students to reassemble them into building designs. Although the lesson directly correlates with the fourth grade standards, it could be simplified, intensified, modified or adapted to adjust to other levels.

The parts of the lesson include:

- attributes of three-dimensional objects
- shading
- application of shading to three-dimensional forms
- brief overview of several modern architects
- futuristic architectural structures based on three-dimensional forms




Academic Objectives: By the end of this lesson, students will be able to….
Math standards addressed for grade 4:

2. Describe, classify, compare and model two- and three-dimensional objects using their attributes. (**Characteristics and Properties)**

2. Demonstrate and describe perimeter as surrounding and area as covering a two-dimensional

shape, and volume as filling a three-dimensional object. (**Measurement Units**)

8. Use mathematical strategies to solve problems that relate to other curriculum areas and the real world: e.g., use a timeline to sequence events; use symmetry in artwork. (**Mathematical Processes)**

Artistic Objectives: By the end of this lesson, students will be able to…
Visual Art standards addressed for grade 4:

Benchmark B: Use the elements and principles of art as a means to express ideas, emotions and experiences. **(Creative Expression and Communication)**

Benchmark B: 2. Explain the function and purpose (e.g., utilitarian, decorative, social and personal) of selected art objects**. (Analyzing and Responding)**

Benchmark A: 2. Describe how selected visual art elements or principles are used in one or two other arts disciplines (e.g., color, unity, variety and contrast). **(Connections, Relationships and Applications)**

Procedures:

Toddlers often use blocks and boxes to construct houses, forts and buildings. Their understanding of form is simple and direct. "*Here is a wall. If I have a long enough block, piece of wood or sheet of cardboard, I can add a roof. I've built my walls on the floor, so I don't need to add one."* Their understanding of scale is often skewed as they will try and crawl into a too small space.

By comparing three-dimensional forms with architectural structures, students begin to build a bond of understanding between the concepts of three-dimensional space and volume and scale. The floors, walls and ceilings become the length, width and height of the structure. The volume inside the forms becomes the space for the inhabitants. Adding shading to the simply drawn forms increases the students' awareness of light on objects and its impact in helping create the illusion of three-dimensional volume on a flat two-dimensional surface.

The **materials** are simple and include small wooden or Styrofoam cones, cubes, spheres, cylinders, rectangular prisms, triangular prisms, ellipsoids and pyramids, drawing paper and pencils.

Introduction to three-dimensional forms: students create the illusion of three-dimensional forms on a flat two-dimensional surface.

Show large paper cut outs of a square, rectangle, triangle and circle and ask the students to identify them by name and their properties. Responses should include terms such as *right angles, flat, equal side lengths, parallel lines, perpendicular*, etc.

Show examples of three-dimensional forms including a sphere, cone, cube, cylinder, pyramid, rectangular prism, triangular prism and ellipsoid. Show how in a flat world the shapes directly relate to the flat shapes, but because we live in a three-dimensional world, we must view the objects as three-dimensional forms. With each form, point out its attributes: six equal faces on a

cube, two equal flat circular ends of a cylinder connected by a tube that has parallel sides: six faces on a rectangular prism with four being identical and two identical square ends. Continue and have the students contribute attributes as they observe each form. Point out how three-dimensional forms have interior space or volume.

Demonstrate how to observe each form, analyzing its attributes and drawing it as a three-dimensional form on a flat two-dimensional surface. During the demonstration, have students look at the actual forms from all viewpoints. Point out how three of the forms can be represented by a circle in a flat world depending on how the object is observed – a sphere, a cylinder and a cone. Show how a rectangle could represent a cylinder, rectangular or triangular prism. Show how people often use schemas when drawing cubes. Ask if that schema is an actual representation or a diagram of a cube. Have students practice drawing the simple forms using lines to represent the perceived edges. Have students show searching lines as they refine the forms. Point out the importance of an ellipse when drawing circular shapes.

Introduction to value scales: student drawings show understanding of stepped and smooth value scales

Draw a slide on the board with steps and a slippery surface. Ask the students to describe how they use this piece of equipment. The students will respond with something like "*we climb up the steps, sit at the top and slide down*." Ask if they walk up one step at a time and if the ride down is smooth or bumpy. Explain that the students will be learning to create a value scale with "steps" and a value scale or gray scale that changes smoothly. Value scales measure the amount of black, gray or white in a drawing.

Below is a value scale -- or gray scale -- in eight stepped grades of values: it has steps like a slide and is used to generally shade flat faces.

Below is a value scale employing a smoothly nuanced gradation of values: it is smooth like a slide and generally used to shade curved surfaces.

Explain how value is used to make objects appear to be three-dimensional, how it is used to show color differences, and how it is used to show highlights and shadows. Demonstrate the smooth and stepped scales and have students draw two small rectangle atone end of their paper, each rectangle about 1" X 6" and draw each of the scales.

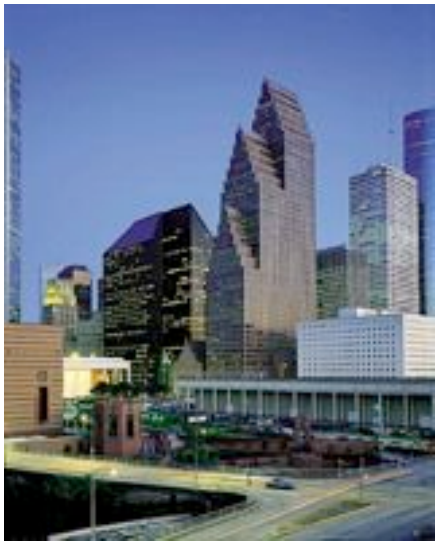
Application of value scales to three-dimensional forms: drawings show understanding of application of smooth and stepped value scales on flat planes and curved surfaces, shadows and highlights

Look at the forms to see where the light hits the objects. Point out the light source, and how shadows have different parts and different names – highlights, cast shadows and crest shadows. Demonstrate how the addition of these shadow parts further enhances the illusion of three-dimensional forms on a flat two-dimensional surface. Have students shade three-dimensional forms, using stepped scales for flat surfaces and smooth scales for curves. Strive for smooth shading as they add the values.

Explain how artists create illusions by using three-dimensional forms to represent real objects in the world.

Architecture of the future: students will combine three-dimensional forms to create architecture of the future.

Look at simple buildings, focusing on work by Philip Johnson (http://www.greatbuildings.com/architects/Philip_Johnson.html), Mies van der Rohe (http://www.greatbuildings.com/architects/Ludwig_Mies_van_der_Rohe.html), Le Corbusier (http://www.greatbuildings.com/architects/Le_Corbusier.html), and Norman Foster (http://www.greatbuildings.com/architects/Norman_Foster.html), twentieth century architects whose work is geometric in form.



Glass House, New Caanan, Connecticut, Johnson **Pennzoil Place**, Houston, Johnson

Lake Shore Drive apartments, Chicago, Illinois, Mies van der Rohe

New National Gallery, Berlin, Germany, Mies van der Rohe

Centre Le Corbusier, Zurich, Switzerland, Le Corbusier

30 St. Mary Axe, London, England, Norman Foster

(Prints, photographs or the buildings outside the classroom windows could also serve as examples of buildings.)

Dissect each building's attributes and identify the simple geometric forms that have been assembled to create the buildings. Analyze the structures and name the parts in geometric terms.

Have students interact with the wooden forms, stacking them, abutting edges and imagining new ways to join the forms. Have the students imagine what changes might need to occur in the future to accommodate our technological needs and our futuristic space-age dreams. Have students imagine the interior space, or volume, of the forms.

List features that might be needed on a building including doorways, windows, external elevators, bridges between buildings, parking areas, external walkways, etc.

Have each student create a drawing of buildings based on the simple three-dimensional forms previously studied. Each building needs to represent accurate forms, a light source and appropriate highlights, cast and crest shadows. Shading should reflect flat or curved surfaces.

Actual building models could be constructed using clay, cardboard or paper machè. Surface area could be calculated to determine how much paint would be needed to paint the exterior of the building. Square footage could be calculated to determine the size of the living spaces within of the building. Building statistics could be compared and charted. An Open House could be held for other students, the students' parents or staff featuring the constructed buildings.

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