Lesson #1

Lesson Title: Geometry and Art

Teacher Name:

Date:

TQP Instructional Strategies: Think-Pair-Share, Formative Assessments, Advance Organizer, Higher Level Questions

Subject/Grade: Mathematics/7th Grade

Length: 90 minutes

Lesson Objective: The students will identify three-dimensional figures found in Pablo Picasso's work and in the Cubism period and make connections between art and geometry.

ISTE Nets-T 2008:
1. Facilitate and inspire student learning and creativity.
2. Design and develop digital-age learning experiences and assessments.

Essential Standards Technology:
7.SI.1 Evaluate information resources based on specified criteria.
  7.SI.1.2 Evaluate content for relevance to the assigned task
7.TT.1 Use technology and other resources for assigned tasks.
  7.TT.1.3 Use appropriate technology tools and other resources to design products to share information with others.
7.RP.1 Apply a research process to complete given tasks.
  7.RP.1.2 Implement an independent research process activity that is student selected.

Common Core Standard: Geometry 7.G.6 Solve real-world and mathematical problems involving area, volume, and surface area involving two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

North Carolina Standard Course of Study:

Goal 2, objective 2.02: The learner will understand and use measurement involving two- and three-dimensional objects.

Visual Arts Goal 7: The learner will perceive connections between visual arts and other disciplines. (National Standard 6)
**Vocabulary:** polyhedron, two-dimensional figures, three-dimensional figures, prism, pyramid, cone, cylinder, edge, vertex, face, lateral face, length, width, height, cube, triangular prism, rectangular prism, pentagonal prism, hexagonal prism

**Materials:** Math journal; three-dimensional manipulatives (prisms, pyramids, cones, cylinders); “Cubism: Pablo Picasso” PowerPoint Presentation or similar one provided in the lesson; LCD projector; computer; construction paper and crayons or colored pencils; magazines; glue sticks; scissors; Picasso by Mike Venezia. [Worldcat.org or www.ecu.edu/lib/]; one copy of “Grading Rubric for Cubist Portrait” (See page 16.) for each student

**Warm-Up (10 minutes)**

As students enter the classroom, have them copy (or provide a copy of) the Warm-Up problem (see below) from the board or overhead into their math journal. Each student will answer the problem independently in their journal (5 minutes). After they complete the problem they will conduct a Think-Pair-Share with another student.

**Think-Pair-Share**

**Think:** Give students 5 minutes to solve the problem.

**Pair:** Group students into pairs.

**Share:** Give students 2 minutes to share their answer with their partner. Take another 2 minutes to call on students from the whole class to share their answer. Provide feedback on their answers as needed.

**Warm-Up Problem:**

Brandon’s back yard is in the shape of a rectangle. The length is 50 feet and the width is 30 feet. What is the perimeter? ____ What is the area? ____ If he puts up a fence and each section of the fence is 8 feet long, how many sections would he need and how many posts? ___________ sections and ___________ posts

**Solutions:**

Brandon's back yard is in the shape of a rectangle. The length is 50 feet and the width is 30 feet. What is the perimeter? (50+50+30+30=160 feet) What is the area? (50x30=1500 sq. ft.)

If he puts up a fence and each section is 8 feet long, how many sections would he need and how many posts? (Assuming he will completely enclose the rectangular yard with fencing: 160÷8 = 20 sections, two sections will have to be cut; 21 posts.)

Draw a diagram showing the sections and posts for better comprehension.
1. **Get Attention (5 minutes)**

To get students’ attention, begin a discussion about the connection between mathematics and other subjects, especially art. You may do a brief book talk (share the title and a brief page or two) of *Picasso* by Mike Venezia, pages 19-21.

**Questions:**
Math is everywhere and used in many different subject areas. Have you ever used geometric concepts in another class? How is geometry like art? How is art like geometry?

2. **State Objective (1 minute)**

Have the lesson objective already written on the board. Read the objective to the students. Optional: call on a student to repeat back what the objective is today.

**Lesson Objective:** The students will identify three-dimensional figures found in Pablo Picasso's work and in the Cubism period and make connections between art and geometry.

3. **Activate Prior Knowledge (10 minutes)**

To activate prior knowledge, remind students of the previous discussions in prior lessons on names of various two-dimensional and three-dimensional figures. Show manipulatives of the three-dimensional figures and have students identify their proper names. (Examples: cube, rectangular prism, hexagonal prism, tetrahedron, octahedron, cone, cylinder, square pyramid, sphere, etc.)

**Advance Organizer**

Explain to the students that today we are going to view a PowerPoint presentation on Pablo Picasso and his life and works of art. In art, two-dimensional figures are called *shapes* and three-dimensional figures are called *forms*. In math, two-dimensional figures are known as plane figures. Some plane figures are called *polygons* (see definition of *polygon* in Content Module). Three-dimensional figures are known as solid or space figures. Some solids are called *polyhedra* (see definition of *polyhedra* in Content Module). Remember, circles are not polygons and cylinders are not polyhedra. Their job today during the presentation will be to view the art and classify the figures they see in Picasso and Braque’s work into two- or three-dimensional figures. Also, they should also classify other geometric shapes the see that they have previously studied (points, lines, planes, angles, parallel lines, squares, rectangles, circles, etc.).
4. **Present Content (40 minutes)**

Use the “*Cubism: Pablo Picasso*” PowerPoint Presentation, create one of your own, or use the following: [http://www.wartgames.com/themes/art/cubism.html](http://www.wartgames.com/themes/art/cubism.html) Click the link entitled Cubism.

**Technology Integration**

Use a VoiceThread that demonstrates the art work of Picasso and Braque. Have students review [http://VoiceThread.com/?#q+cubism.b907217.i4830433](http://VoiceThread.com/?#q+cubism.b907217.i4830433)

The use of VoiceThread for this information will lend consistency and modeling throughout the lesson as AIG students have the option to create and present a VoiceThread to the class on Cubism. They can then comment on the presentation and post their responses to the VoiceThread.

5. **Provide Learner Guidance (15 minutes)**

**Part 1**

**Higher Level Questions**

After viewing the PowerPoint presentation provide learner guidance by engaging them in the following questions.

- Identify the period of time in which Picasso most used three-dimensional figures in his work (*answer: Cubism period.*) Why do you believe this name was chosen?
- What, if any, three-dimensional figures were *not* used in Picasso’s work?
- Are any of these polyhedra Platonic Solids (prior knowledge)?
- In what art forms (architecture, metalwork, ceramics, engraving, painting, furniture, photography, sculpture, glass, textiles, jewelry, etc.), would you most likely expect to see the Platonic Solids used? Least expect to see? Why?
- Did Picasso continue to incorporate three-dimensional figures into later works? If so, how? If not, was other geometry used?
- Share which works of Picasso they like the best and why.
Part 2

Examples/Non-examples and Compare and Contrast

Next, orally identify examples of geometry found in the presentation. (*Three-dimensional figures and other geometric shapes previously studied such as points, lines, planes, angles, parallel lines, squares, rectangles, circles, etc.*)

List responses on the board or SMARTboard. Use the SMART notebook file NonPolyhedra.notebook (download file from Lesson 1 folder) and have students place objects in categories under one of two headings: Examples of 3-D Figures or Non-Examples of 3-D Figures.

Students should justify their decisions by comparing and contrasting the examples and non-examples. Students should recall the attributes of a polygon and discuss how polygons are used to create a polyhedron and how circles are used as the two bases in a cylinder. Also, discuss how the other geometric figures create the 3-D figures (*lines create edges, points create vertices, polygons create faces, etc.*) Orally call on students to identify the similarities and differences between the two lists and have them use the Magic Pen with the SMART board to write their response on the SMARTboard. The SMART Notebook pages can then be saved and printed for students. (*The biggest difference is polyhedra and cylinders have three dimensions and polygons and circles have only two dimensions.*)

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**Polyhedra**

- They must have flat polygonal faces.
- rectangular prism
- pyramid
- prism
- pentagonal pyramid

**Non-Polyhedra**

- Has curved surfaces.
- Torus
- cone
- sphere
- cylinder
Part 3

Have the students create a work similar to Picasso’s during his Cubism period. Explain that they have just viewed many of Picasso’s works and hopefully been inspired enough to create their own work of art! Have the students complete a Cubist Portrait using any of the ideas on the following sites:


http://www.education.com/activity/article/cubism-fifth-dimension/

http://www.ehow.com/list_6382531_picasso-art-projects.html

http://www.princetonol.com/groups/iad/lessons/middle/Mark-cubism.htm

http://www.princetonol.com/groups/iad/lessons/middle/PicassoHeadMS.html

Students can choose from the following methods to create their portrait:

1. Paper/Pencil and art materials
2. Pattern Blocks – NLVM [http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_2.html](http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_2.html)
4. MS Paint
5. Students who exhibit mastery prior to the unit based on pre-assessment will have the opportunity to work in an independent group using VoiceThread – [http://www.VoiceThread.com](http://www.VoiceThread.com) to create a presentation that demonstrates their own artwork as well as examples they have found via Internet research.

Can the students incorporate any of the two- or three-dimensional figures discussed today into this project?

Challenge them to use as many as possible in their work. Have the students list all of the geometric figures used in the artwork on the back of their product, the bottom of their digital artwork, or the last slide of their VoiceThread. Remind them that this is an abstract piece of art and that it does not have to look realistic; it is their own interpretation. Research and offer students examples of artists that represent various cultures, genders, ethnicities, socioeconomic groups.

Explain to the class that the work will be graded and share the rubric for grading the assignment so that students are aware of the specific requirements (see rubric on page 17).

Students may begin the assignment in class as time permits.
6. **Elicit Performance (complete as homework)**
This assignment should be given two nights to complete. Students may turn it in tomorrow if it is finished.

7. **Provide Feedback**
The rubric will be used to provide feedback.

8. **Assessment**
Elicit Performance will be the assessment for this lesson.
Grading Rubric for Cubist Portrait

<table>
<thead>
<tr>
<th>Product (Project)</th>
<th>Below Avg.</th>
<th>Satisfactory</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Directions followed; completed on time</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Included at least one identifiable 2-D or 3-D figure</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Organization and structure</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Creativity</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Demonstrates knowledge of the objective</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Points: _____ = Grade:________

Teacher’s Comments:

Point Conversion Chart:
5 points = 70%
6 points = 73
7 points = 76
8 points = 79
9 points = 82
10 points = 85
11 points = 88
12 points = 91
13 points = 94
14 points = 97
15 points = 100%

Resources
Share recent news item on Picasso’s paintings being stolen:
Possible question to begin the discussion on the news article: After viewing the PowerPoint and hearing Picasso’s words and feelings about art, what are your opinions on the stealing of his work?

**Universal Design for Learning Toolbox**

- For special needs students: Provide the Warm-Up problem on a label which can be placed in the math journal where the student would normally copy the problem. Applies during: **Warm-Up**
- For special needs students: Teacher expectations for student outcome should be modified according to student ability. Applies during: **Warm-Up, Provide Learning Guidance, and Elicit Performance**
- For all students: Extensive use of manipulatives. Applies during: **Present Content** and **Provide Learning Guidance**.
- For all students: “Wallwisher” can be used to submit all answers calculated by any of the students. [http://www.wallwisher.com/](http://www.wallwisher.com/) Applies during: **Provide Learning Guidance, Elicit Performance throughout the unit when appropriate and when time permits.**
- For all students: Students may create a “ToonDoo” comic strip inspired by the cartoon example below. Students work independently on this project after they understand the ToonDoo program. Applies during: **Elicit Performance (anywhere throughout the unit.)**

**ToonDoo:** [http://www.toondoo.com](http://www.toondoo.com)

- Slideshare tutorial on ToonDoo: [http://www.slideshare.net/jfljunk/how-to-create-a-toon-doo-presentation](http://www.slideshare.net/jfljunk/how-to-create-a-toon-doo-presentation)
- Schooltube video on how to use ToonDoo: [http://www.schooltube.com/video/a0c702a2924145e28af9/How-To-Use-Toondoocom](http://www.schooltube.com/video/a0c702a2924145e28af9/How-To-Use-Toondoocom)