Op Art Icosododecahedrons

Subject: Visual Art and Math

Grade Level: 7

Standards Alignment: Visual Arts

Standard: Creative Expression and Communication
   Benchmark A: Apply knowledge of materials, tools, media, techniques and processes to communicate subject matter, themes or ideas in a variety of visual forms.
      Indicator: 1. Demonstrate a variety of techniques to create the illusion of depth.
   Benchmark B: Create two- and three-dimensional original artwork that demonstrates personal visual expression and communication.
      Indicator: 2. Apply the principles of design to construct a three-dimensional piece of artwork.
      3. Use a variety of sources to generate original ideas for art making.
   Benchmark E: Identify and explain reasons to support artistic decisions in the creation of artwork.
      Indicator: 7. Identify and defend artistic decisions using appropriate visual art vocabulary.

Standard: Analyzing and Responding
   Benchmark C: Establish and use criteria for making judgments about works of art.
      Indicator: 2. Use appropriate vocabulary to explain how the elements and principles of art communicate different meanings.
      Indicator: 4. Develop and use criteria to guide their reflections on a body of their own artworks.

Standard: Valuing the Arts/Aesthetic Reflection
   Benchmark B: Analyze diverse points of view about artworks and explain the factors that shape various perspectives.
      Indicator: 2. Ask clarifying questions to explain diverse viewpoints about selected works of art.

Math

Standard: Geometry and Spatial Sense Standard
   Benchmark: Characteristics and Properties
Indicator: 1. Use proportional reasoning to describe and express relationships between parts and attributes of similar and congruent figures.

Indicator: 2. Determine sufficient (not necessarily minimal) properties that define a specific two-dimensional figure or three-dimensional object.

Benchmark: Spatial Relationships

Indicator: 6. Determine and use scale factors for similar figures to solve problems using proportional reasoning.

Standard: Measurement Standard

Benchmark: Use measurement Techniques and Tools

Indicator: 4. Solve problems involving proportional relationships and scale factors; e.g., scale models that require unit conversions within the same measurement system.

Description: Students will be introduced to the Op Art Style. They will observe and discuss the artwork of various Op Art artists such as Victor Vasarely, Bridget Riley and M.C. Escher. Students will then create individual Op Art designs to be incorporated into a large-scale icosododecahedron.


Duration: Three 40-minute sessions

Vocabulary – See Attachments

Objective: Students will utilize math concepts to share personal interpretations of the Op Art Style to be displayed in a large-scale icosododecahedron.

Procedure:

Op Art and Lesson Introduction and Prep

1. Introduce Op Art style to students. Provide handout with definition and listing of some artists and art work in this style.
2. Provide examples of Op Art to be discussed and compared. This can be done electronically through the Internet or PowerPoint presentation or through books and posters.
3. Compare and contrast works of Op Art and discuss various elements and principles of art utilized to create Op Art.
4. Show class an example of a small scale icosododecahedron and explain that the students will be using this format on a larger scale to display individual pieces of Op Art in a cooperative class effort.
5. Pass out geometric shape handout, compasses, pencils, scissors, and
6. Review math terms and concepts.
7. Demonstrate how to make an equilateral triangle (The GeoArt Workbook, Chapter 3) and pentagon (The GeoArt Workbook, pages 74-78).
8. Lead students in the creation a pentagon and an equilateral triangle that has congruent sides to the pentagon.
9. Have students keep these geometric shapes in a safe place to be used as patterns for the next part of the lesson. Be sure to have additional shapes made for any absent students.

**Op Art Design Creation**
1. Have students get out patterns.
2. Use the pentagon as pattern to create twelve pentagons. Use the equilateral triangle as a pattern to create twenty triangles.
3. Using the knowledge obtained about Op Art, have students create op art designs on each of the triangles and pentagons.
4. While students are creating designs, pass out either a large-scale triangle or pentagon to each student.
5. Students continue to work on designs until the end of the class. At end of the class, explain to students that they are to choose one of their art designs from the small scale and reproduce it on the larger piece given to them. This will be a homework assignment. You may choose not to assign it for homework but an additional class period will be needed if not assigned.
Assembling
1. Have students get out homework and make sure all have names visible on the front. Be sure to have a few extra large-scale shapes available in case you have absent students or missing assignments.
2. Students will assemble their own small-scale icosododecahedron first in order to understand the concept and procedure.
3. Pass out tape and templates.
4. Using the icosododecahedron template (The GeoArt Workbook page 136) and instructions (The GeoArt Workbook Chapter 9), lead students in the construction of a small scale icosododecahedron.
5. When students have completed their small version, they may take their large shape to a designated location in the room to begin construction of the class icosododecahedron. Clear packing tape should be provided at this station.
6. As students finish insertion of their large piece, they may help other students with construction of small-scale icosododecahedron or help oversee construction of the class model.
7. Insert paperclip, wire or string in class model before closing up last piece. This will serve as a hanger for the piece,
8. Display the class models in the class, hallway, or other location in the school.
9. Have students complete a reflection (critique) for the piece chosen for their large shape.

**Below Basic:** Have handouts prepared with basic points already on the sheet so that all they have to do is create the lines to make the triangle and pentagon.

**Gifted and Talented:** Have students create their own large-scale piece using proportional reasoning. Be sure that it is the same as the pieces distributed by the teacher.

**Assignments:**
Students will complete reproduction of individual Op Art design on large-shape,
Students will complete a reflection of the Op Art design chosen for large scale reproduction.

**Supplies:**
Large GeoArt kit *(Available from the Canton Museum of Art)*
Paper
Compass
Pencils
Rulers
Scissors
Clear tape
Colored Pencils, crayons, or markers
Internet Access/Projector
Op Art Handout
Geometric Shape Handout
Template Handout
**Link Related Materials:**
<http://arthistory.about.com/cs/arthistory10one/a/op_art.htm>.
<http://arthistory.about.com/cs/arthistory10one/a/op_art.htm>.

**Assessment:** Students will create a cooperative Op Art icosododecahedron. Students will critique their individual contribution to the icosododecahedron.

**Attachments:**
- Op Art Handout
- Geometric Shape Handout
- Icosododecahedron Template
- Geometry Vocabulary

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Op Art Style
Op Art is a twentieth century art movement and style that is comprised of illusion. It often appears to be moving or breathing due to its precision and mathematically based composition. The phrase Optical Art (often referred to as Op Art) was created in an article in *Time Magazine* in October of 1964. The official life span of the movement is around three years, late 1964-1969. There are many pieces of artwork that is characteristic of this style that was created long before these dates and there are many artists who continue to create art in this style.

Victor Vasarely is considered the pioneer of the movement clear back in 1938 with a piece of work entitled Zebra. M.C. Escher's work is much earlier and he is sometimes listed as an op artist because of use of perspective and tessellations. Bridget Riley is an artist who continues to work in this style.

Key Characteristics of Op Art
- Op Art exists to fool the eye. These compositions create a visual tension in a viewer's mind. It gives the illusion of movement.
- Op Art is almost always non-representational because of its geometrically based nature.
- Elements such as color, line, and shape are carefully chosen to create maximum effect.
- The techniques used in Op Art are perspective and careful placement of color.
- Positive and negative spaces in a composition are of equal importance.

Terms:
- Elements: the basic components of art that are combined to create compositions.
- Perspective: the way an artist represents the real, three-dimensional world on a flat or two-dimensional surface.
- Composition: the arrangement of elements of art such as color, line, shape, form, texture, space, and value, into proper proportion or relation
- Positive space: the object or focus of a piece of art
- Negative space: the space around the object or focus of a piece of artwork
Creating a Equilateral Triangle

1. Put a dot in the middle of your paper. (A)
2. Set your compass to 2 3/8”.
3. Put the compass point on that dot (A) and sweep out a wide arc.
4. Mark a dot on the arc you just made. (B)
5. Place compass point on point B and make an arc that intersects with point A.
6. Make a dot where the two arcs intersect. This is point C.
7. Connect points A and B.
8. Connect points B and C.
9. Connect points A and C.
Geometric Shapes

Creating a Pentagon
1. Put a point, \( O \), in the middle of your paper.
2. Draw a circle with a 4" diameter.
3. Draw a horizontal diameter line, \( AB \)
4. Draw a vertical diameter line, \( CD \). This should bisect \( AB \) perpendicularly.
5. Bisect \( OB \). Label its midpoint \( M \).
6. Using \( M \) as a center and \( CM \) as a radius, draw an arc intersecting \( AO \).
   Label the point where they intersect \( E \).
7. \( CE \) is the length of one side of your pentagon.
8. Using the length of \( CE \) as your radius and placing your compass point on \( C \), make an arc that intersects the circle.
9. Place your compass point on this intersection. Make another arc on the circle.
10. Continue to make arcs until you have five all together.
11. Connect these intersections to form the pentagon.
Geometry Vocabulary

Equilateral Triangle – A triangle where all three sides and angles are congruent or equal

Pentagon – a polygon of five angles and five sides

Polygon - a closed plane figure bounded by straight lines

Diameter – the length of a straight line through the center of a circle

Bisect – to divide into two equal parts

Perpendicular – at a right angle to the line

Radius – a line segment extending from the center of a circle to the curve or surface

Arc – a portion of a curved line

Intersect – to meet and cross at a point

Horizontal – parallel to the horizon – a line that goes side to side

Vertical -- a line that goes up and down and is perpendicular to a horizontal line
Template
Icosodecahedron

Template - Make two.

Assemble 2 templates to make Icosodecahedron.