Bar Graph & Abstract Painting

2 sessions – 90 minutes each

Essential Question: How can we use math and art to show the same data in different ways?

Lesson Goal: Students create an abstract painting based on the amounts of color in their bar graphs.

Essential Objectives

Students will be able to:

- identify and mix primary and secondary colors.
- generate data and then organize that data.
- create an abstract painting based on the amounts of color in the bar graph.

Common Core State Standards for Mathematics

Measurement & Data 3.MD: Represent & Interpret Data

3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

California Visual Art Content Standards

Artistic Perception 1.5: *Identify and describe elements of art in works of art, emphasizing line, color, shape/form, texture, space, and value.*

Creative Expression 2.2: *Mix and apply tempera paints to create tints, shades, and neutral colors.*

Historical and Cultural Context 3.1: *Compare and describe various works of art that have a similar theme and were created at different time periods.*

Aesthetic Valuing 4.1: *Compare and contrast selected works of art and describe them, using appropriate vocabulary of art.*

Materials

- Cardstock
- Grid paper (attached)
- Watercolor paper
- Brushes
- Paint (primary colors)
- Water containers
- Styrofoam plate (for paint palette)
- Colored pencils or color sticks

Preparation: cut 3" spinners from cardstock; cut watercolor paper into 11"x 11"; print grid on 11" x 11"

Key Vocabulary

Visual Art: primary; secondary; color wheel; abstract; organic; geometric

Math: bar graph; data; grid

Pre-Session Math Lesson

- **Focus Question 1:** Why is it important to keep track (or organize) what you are counting? What could happen if you do not keep track (or organize) what you are counting? Explain.

In small groups, have students discuss the questions. The Kagan Structure Timed Round Robin can be used effectively here. Give the students sufficient think time, and then tell them each member of the group has 30 seconds to share their answer with the table group. The other members do not interrupt the speaker. After students have shared, ask groups to share what they talked about.

Create a human bar graph:

This is an inside/outside activity.

Pass out post-its or scraps of paper to each table. Choose a few questions students can answer easily. (ex. favorite color, fruit, ice cream flavor, month they were born, etc). Write one of those questions on the board and ask students to answer the question on the paper. No talking. Line students up to go outside, making sure to have a piece of chalk. Have students find people with the same answer silently, by holding up their paper.

What's your favorite ice cream flavor?

Chocolate	strawberry	rocky road	mint choc chip	don't like ice cream
xxxxxxx	xxxxxx	xxxxx	xxxxxxxxxxxx	xx

Teacher: How did you organize your choices?

Students: We're in groups.

Teacher: In math, your answers are now data. Your groups are data sets. Look around at the answers in our class. Which set is the smallest?

Students: The group that doesn't like ice cream.

Teacher: How do you know?

Students: We counted.

Teacher: We can organize data sets in different ways to help us compare the value of all the answer. *(Teacher writes the names of the favorite flavors on the pavement next to each other, like this):*

chocolate	strawberry	rocky road	mint choc chip	don't like ice cream
x	x	x	x	x
x	x	x	x	x
x	x	x	x	
x	x	x	x	
x	x	x	x	
x	x		x	
x			x	

Teacher: Can you compare a bit easier when the data is organized **<u>this</u>** way? This is a bar graph. The structure of the bar graph helps us compare numbers without having to count each person. We can see by looking at our bar graph that mint chocolate chip has the most people (because the line is longer) and the “don’t like ice cream” group has the smallest number.

Teacher: Now, when you get really close in numbers (like with chocolate and straw berry, or strawberry and rocky road) you might want to do some counting.

Take students inside and give them another question.

Teacher: You will gather data today at lunch and we will each create our own bar graphs.

Session 1 – Discuss Art, Make Color Grid, Make Bar Graph

ACCESS PRIOR KNOWLEDGE (5 min)

- What is data? How can you organize data? Why do we organize data?

ART OBSERVATION (10 min)

Show students Ellsworth Kelly image and ask the following questions:

- What do you see?
- What colors do you notice?
- What kind of pattern does he create with his use of color?
- How do you think he made this image?
- How do you think he decided where to put the colors?

Explain Ellsworth Kelly's idea of art making as a process of chance.

WARM UP ACTIVITY (60 min)

- Ask students to choose 6 colors from their colored pencil or color sticks pack.
- Show students how to use colored pencils to create rich, solid colors in the grid.
- Tell students to fill each square in the grid with a color.
  Note: Students can fill in their colors randomly or create a pattern, as long as they can explain their process for filling in the grid.
- After completing the grid, students count the number of squares of each color.
- Students create a bar graph showing the amount of squares of each of the six colors.
  Note: The bars in the graph can be placed in order from least to greatest or greatest to least, if that is what is taught in the math classroom.

Note: Students are likely to not have more than 12 squares in each color, but if so they can add squares to the graph area.

CLOSURE (15 min)

- Which color had the most squares? Least amount of squares?
- Describe the system you used for placing colors in the grid.
- If you could do this art project again, what would you do differently?
- If you could give a title to this work, what would it be?

Session 2: Discuss Art & Create Abstract Paintings

<u>ACCESS PRIOR KNOWLEDGE</u> (5 min)

- Who can describe the process we went through to collect our color data last week?
- Why do we need to organize data?

<u>ART OBSERVATION</u>

Show students Bridget Riley and/or Ingrid Calame images and ask the following questions:

- What do you notice?
- How many different colors do you see?
- Estimate what color you see the most of. How would you use estimation to rank the colors from greatest amount of a color to least amount of color?
- What do you notice about how the colors are arranged? Introduce the term “abstract.”
- What kind of shapes do you see? Introduce “organic” and “geometric”
- How do you think the artists decided where to place the colors?

<u>ART ACTIVITY</u> (45 min)

- Students use a pencil to map out an abstract design on the watercolor paper. Once they have created the shapes for their design, they can mark each space with the color they are going to fill their space with, making sure that the amount of space corresponds to the amount of that color on the grid.
- Give students paint cups with the colors they chose for their grid.
- Students then paint abstract painting by filling in the shapes they have created with the colors they have designated for each shape.
  <u>Note:</u> Students can use watercolor instead of tempera paint, using oil pastel to outline the shapes so that watercolor does not blend between spaces.

<u>CLOSURE</u> (25 mins)

- Which color did this student use the most? Least? How do you know?
- How did you think about the work of artists Ingrid Calame and Bridget Riley when creating your own painting?
- If you could do this art project again, what would you differently?
- If you could give a title to this work, what would it be?

POST-SESSION DEBRIEF:

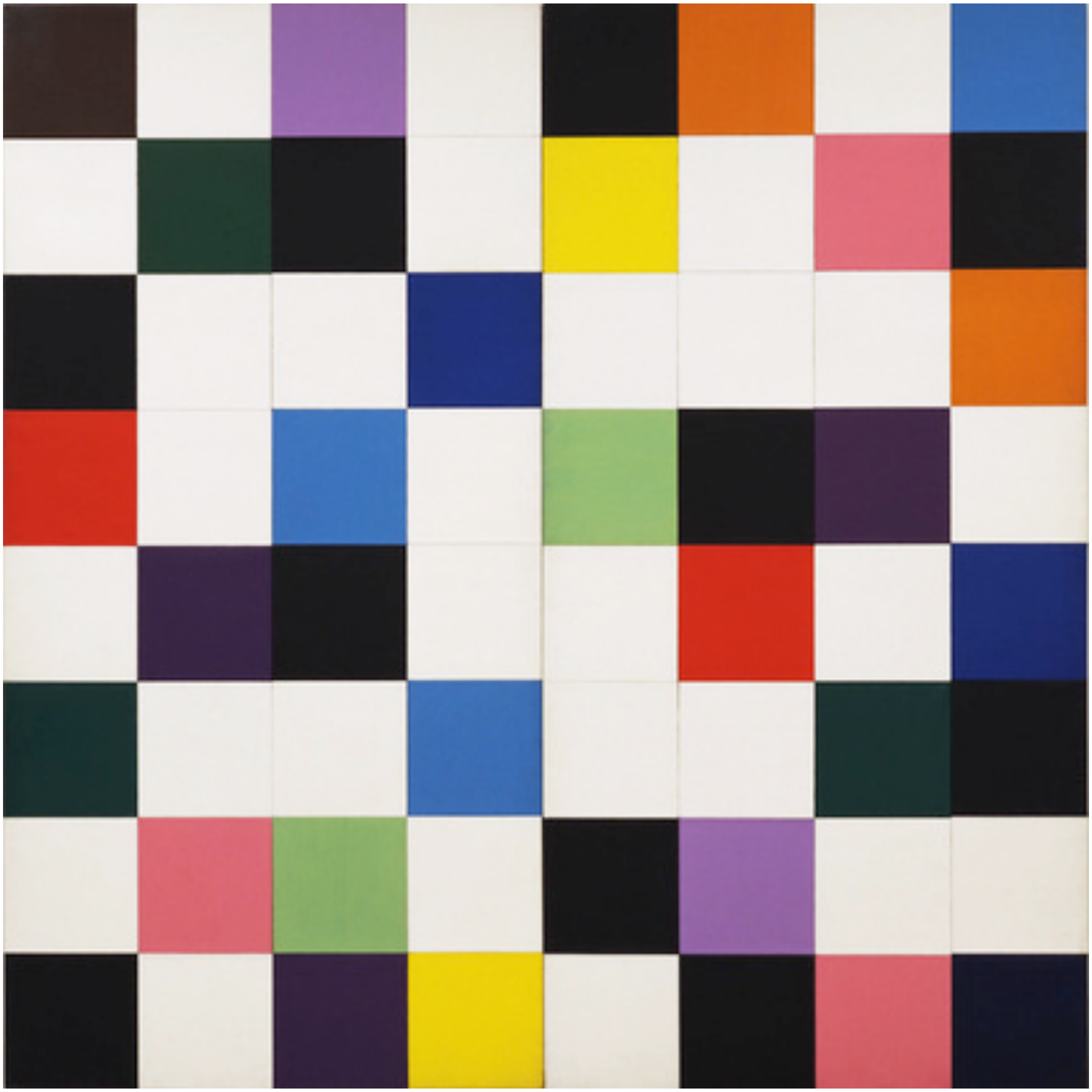
The day after this lesson is finished, review what the students have learned about data collection.

- **Focus Question 3:** How did the art that we just finished (hold up a student's art) help explain or clarify data collection and how we can represent data sets? Explain.

Answers can be brainstormed by the class as a whole and then recorded in art journals with pictures to help clarify students' understanding.

- Ask students to write word problems about their bar graphs. For example, how many more ____ squares are there than _____ squares?

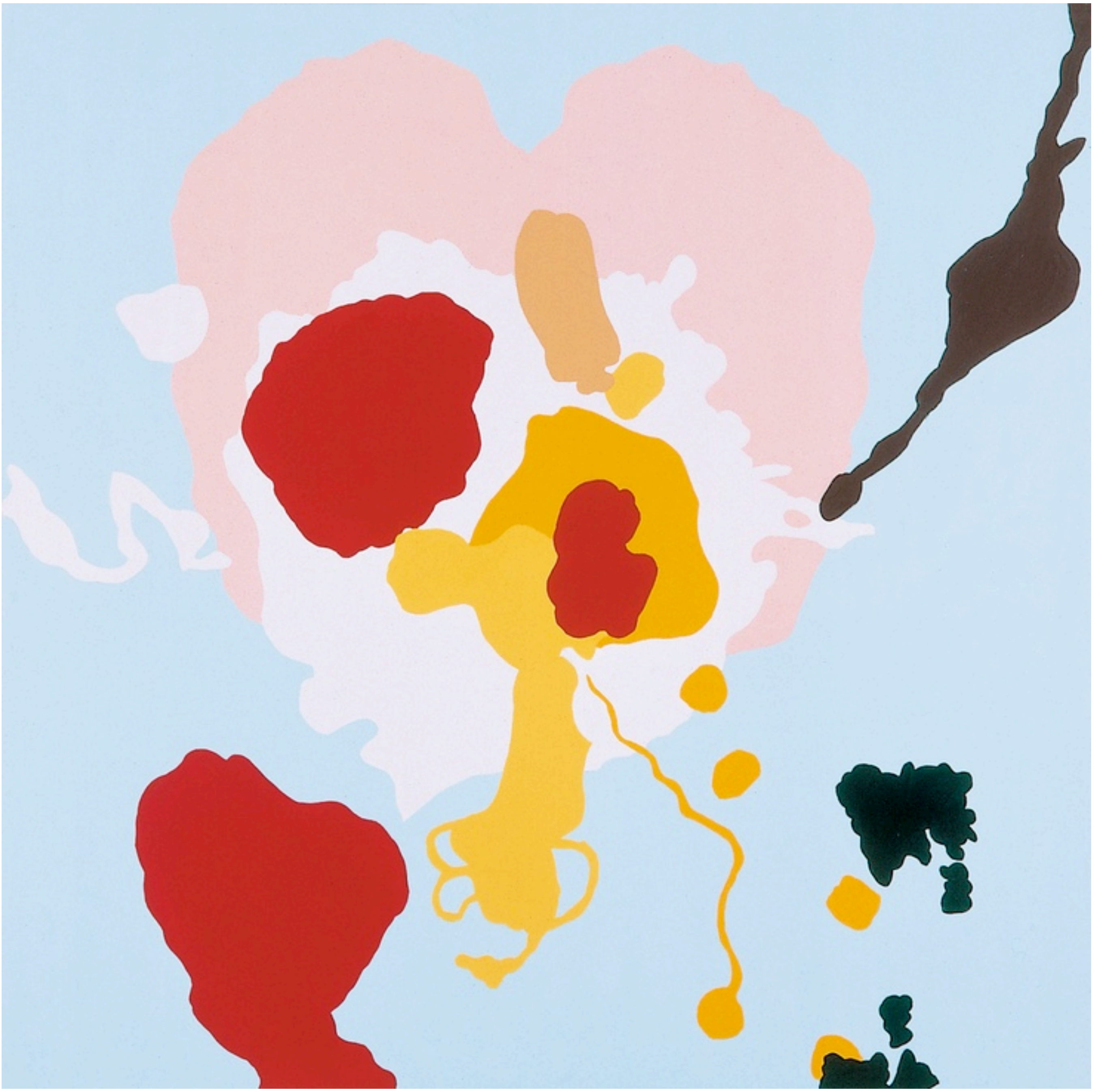
- Also have students think about changing the units on the bar graph. For example, how would the numbers change if each unit on the graph represented 5 squares (instead of 1)?



Colors for a Large Wall, Ellsworth Kelly, 1951.
Oil on canvas
sixty-four panels 7' 10 1/2" x 7' 10 1/2" (240 x 240 cm)

Echo, Bridget Riley, 1998

Screen print.



Ingrid Calame, 1994.
Enamel paint on aluminum

Ellsworth Kelly

Kelly arranged the sixty–four square panels of the grid in an arbitrary sequence, likening his method to the "the work of a bricklayer." Using squares of commercial colored paper left over from a previous series of collages, he first made a study for *Colors for a Large Wall*. Then he precisely matched the hues of the papers with oil paint, and arranged the final, full–size panels in strict adherence to the paper study. (selection from www.moca.org)

Kelly abstracts the forms in his paintings from observations of the real world, such as shadows cast by trees or the spaces between architectural elements. In 1950, Kelly met Jean Arp and that same year began to make shaped-wood reliefs and collages in which elements were arranged according to the laws of chance.

Ellsworth Kelly was born in 1923 in Newburgh, New York. He studied at Pratt Institute, Brooklyn, from 1941 to 1943. After military service from 1943 to 1945, he attended the School of the Museum of Fine Arts, Boston, from 1946 to 1948. The following year, Kelly went to France and enrolled at the École des Beaux-Arts in Paris under the GI Bill, although he attended classes infrequently. He was also introduced to Surrealism and Neo-Plasticism, which led him to experiment with automatic drawing and geometric abstraction.

Kelly returned to the United States in 1954. Kelly continued to develop and expand the vocabulary of painting, exploring issues of form and ground with his flatly painted canvases. In 1958, he also began to make freestanding sculptures. He moved out of Manhattan in 1970, set up a studio in Chatham, and a home in nearby Spencertown, New York, where he currently lives and works. (selection from www.guggenheim.org)

Ingrid Calame

Since the early 90s, I have been working with tracing. I go to specific locations to trace marks, stains and cracks on the ground on to architectural Mylar [polyester-based tracing film]. From these tracings I make drawings and paintings. I clean the original tracings and layer them on top of each other. Once I've piled up the tracings, I place several rectangles of drafting Mylar on top of them. This determines the size of the drawings I will eventually make. I then start to trace the layers of rubbings that are beneath the rectangles, with a different colour pencil for each layer, peeling back the layers one by one until I reach the bottom of the pile. The final drawings are always a surprise.

I was recently invited to do a residency at the Albright-Knox art gallery in Buffalo, New York. I traced for three weeks with nine assistants, for five days a week. We took tracings from a storage hall at the Arcelor Mittal steel plant, from a wading pool, a parking lot ... This working process is important - going out into the world.

My journey through tracing different sites, working with and meeting people and seeing their reactions to the work - all this has changed my understanding of representation and abstraction.

• Ingrid Calame was born in 1965 in the Bronx, New York.

http://www.theguardian.com/artanddesign/2009/sep/19/ingrid-calame-on-drawing-tracing

Bridget Riley

Bridget Riley was born in Norwood, South London in 1931. Her father, John Fisher Riley, originally from Yorkshire, was a printer, as was his father before him. The family were not to spend long in Lincolnshire. In 1939, when war broke out her father was drafted into the armed services. Bridget, along with her sister, mother and aunt went to live in Cornwall away from the dangers of the blitz.

In Cornwall, Riley had great freedom as a child and spent a lot of her time playing on the cliffs and beaches near Padstow where she lived. She spent hours watching the changing light, colour and cloud formations and stored away what she saw in memory. She has later said that these early memories have had a big impact on her visual awareness throughout her life.

Drawing and painting became the centre of Bridget Riley's life from an early age and, after her school years at Cheltenham Ladies College (1946-49) she studied at Goldsmiths College, London (1949-52) and later at the Royal College of Art (1952-55). Riley's time at the Royal College was confusing and difficult and she found the teaching and direction unrewarding. She was reaching the point where she wanted to establish her own style and express herself in her own way but found herself unable to do so in an institutional framework.

Riley moved into teaching and from 1957-1958 she taught art to girls aged 8-18 at the Convent of the Sacred Heart, Harrow, introducing them to the sequences of shape, line and groups of colour, hoping to release their truly creative impulses and to discourage blind copying of the real world.

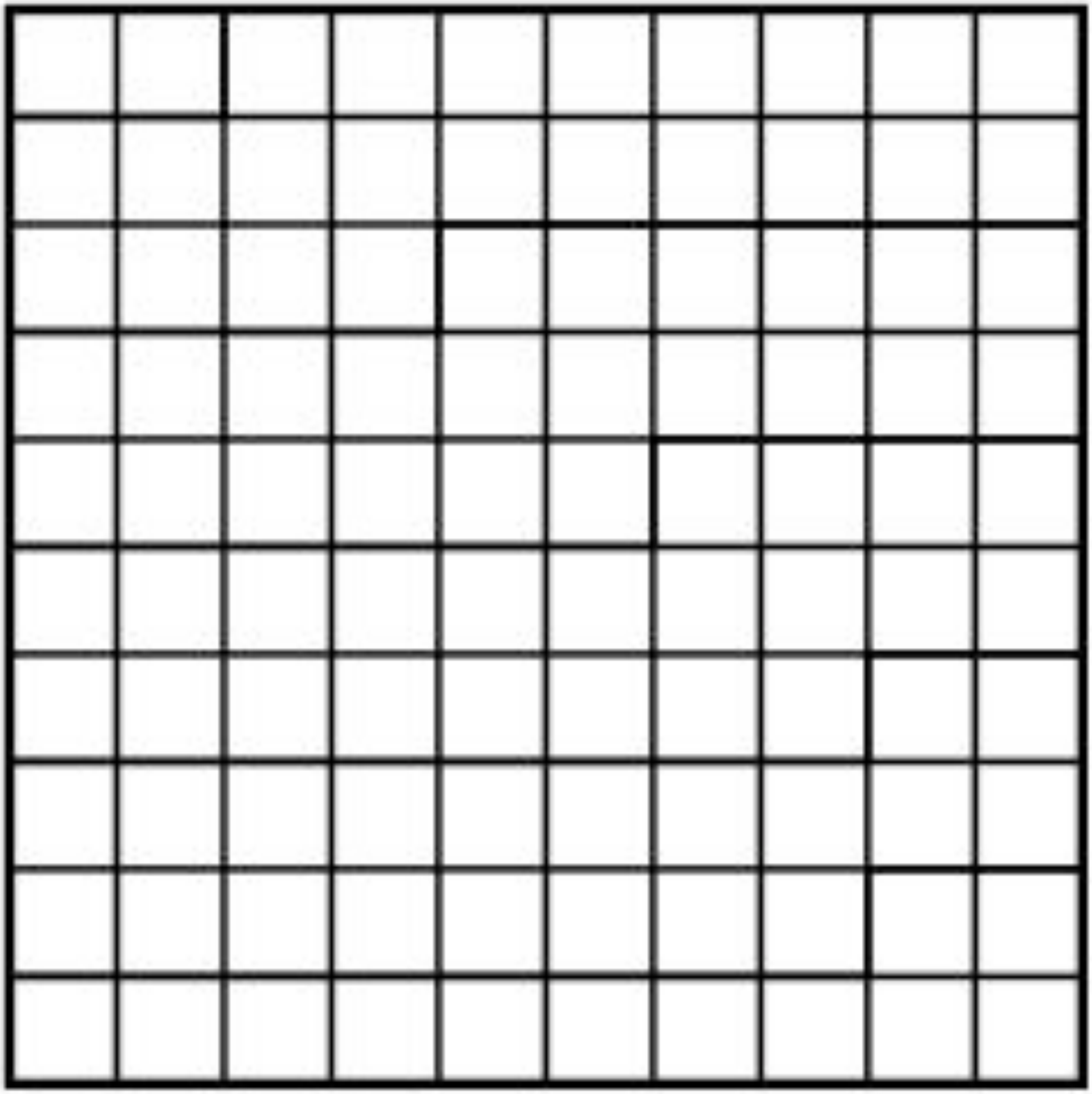
Bridget started to paint again during this period in a more exploratory style – the main influences being Matisse and Bonnard and she started to visit exhibitions again and renew contact with the art world.

Teaching at another school, Hornsey, Riley began her first Op Art paintings, working only in black and white and using simple geometric shapes – squares, lines and ovals. Although she investigated many areas of perception, her work, with its emphasis on optical effects was never intended to be an end in itself. It was instinctive, not based on theory but guided by what she saw with her own eyes.

Op Art captured the imagination of the public and became part of the swinging sixties. The fashion, design and advertising industries fell in love with its graphic, sign-like patterns and decorative value. Op Art was cool, and Bridget Riley became Great Britain's number one art celebrity.

The basis of the Op Art movement was a form of geometric abstraction, which was in a way impersonal and not obviously related to the real world. *"I couldn't get near what I wanted through seeing, recognizing and recreating, so I stood the problem on its head. I started studying squares, rectangles, triangles and the sensations they give rise to… It is untrue that my work depends on any literary impulse or has any illustrative intention. The marks on the canvas are sole and essential agents in a series of relationships which form the structure of the painting."* (Bridget Riley)

Selection from: http://www.op-art.co.uk/bridget-riley/



Bar Graph Abstract Painting Rubric

	1 Does not meet Expectations	**2** Approaching Expectations	**3** Meets Expectations	4 Exceeds Expectations	Total Score
A. Artwork demonstrates beginning skill in using tempera paint.	Only one or two distinct colors can be identified.	Three or four colors can be identified, some are mixed together.	At least six colors can be identified.	Six colors can be seen distinctly and colors are fully saturated.	
B. Painting demonstrates an ability to represent data.	Painting does not accurately represent amounts of each color in the bar graph.	Parts of painting accurately represent different amounts of each color in the bar graph.	Painting accurately represents different amounts of each color in the bar graph.	Painting accurately represents different amounts of each color in the bar graph and color is broken up and distributed throughout composition.	
C. Bar graph demonstrates an ability to mathematically represent data.	Bar graph does not accurately depict the amount of any of the colored squares in the grid.	Bar graph depicts the correct amount of some colored squares in the grid.	Bar graph accurately depicts amount of all colored squares in grid.	Bar graph accurately depicts amount of colored squares in grid and is labeled appropriately.	
D. Artwork demonstrates ability to mix secondary colors. (optional)	Colors on abstract painting do not match colors on grid.	Some colors on abstract painting match colors on grid.	At least three colors on the abstract painting match those on the bar graph or the grid.	Colors can be identified throughout all three works.	