

MATERIALS

- ¼ " graph/grid paper or larger, depending on age of students (8.5 x 11.75")
- colored pencils
- rulers
- peg boards for Perler beads
- Perler beads
- ironing paper
- boxes with lids (3.5 x 3.5 x 1")
- hot glue gun
- iron & ironing board/cloth.

RESOURCES

- Santa Fe Botanical Garden - Explore Nature <https://santafebotanicalgarden.org/explore-nature/>
- Museum of International Folk Art - Online Collection <http://collection.internationalfolkart.org/collections>

Crosscutting Concepts (CCC): Patterns; Scale, Proportion & Quantity

Math & Science concepts Science / Engineering Practices (SEP): Asking Questions and Defining Problems; Developing and Using Models; Using Mathematical and Computational Thinking; Constructing Explanations and Design Solutions; Obtaining, Evaluating and Communicating Information.

NATIONAL VISUAL ARTS STANDARDS

- **Creating:** Conceiving and developing new artistic ideas and work.
- **Presenting:** Interpreting and sharing artistic work.
- **Responding:** Understanding and evaluating how the arts convey meaning.
- **Connecting:** Relating artistic ideas and work with personal meaning and external context.



Baby Carrier Panel. Kenyah peoples, Borneo, Indonesia, ca. 1950. Gift of Diane and Sandy Bessar, MOIFA. Photograph by Blair Clark.

BEADS & SEEDS S.T.E.A.M.

(Science, Technology, Engineering, Arts and Math)

Grid Design Challenge

INTRODUCTION

Explore creative connections between patterns, sequence, numbers and colors found in beadwork, and in nature. Students will use observation skills and sketches to problem-solve, design and create a grid for a pixel-inspired project to hold seeds.

OBJECTIVES

- Understand how nature has inspired artists, scientists and engineers throughout the ages (historical and cultural understanding).
- Observe pattern, symmetry, structure, shape, form and function, students will be able to make connections between art and botany (perceiving, analyzing and responding).
- Create a grid design inspired by art and nature to transfer to a pixel-inspired bead pattern for placement on seed box storage container (creating and performing).

Beads & Seeds, Grid Design Challenge

Create a bead design inspired by observations of art and nature to decorate a seed box storage container. (Observations sheet is available on page 4.)

Use what you observed about:

- Pattern
- Radial Symmetry
- Color
- Form
- Shape
- Structure
- Function
- Aesthetics

Limitations

- Maximum three (3) colors of beads
- Graph out design on Grid Paper
- Design must present radial symmetry or a pattern
- Size of design, no bigger than 3" x 3"
- All squares have to be filled in

Procedure

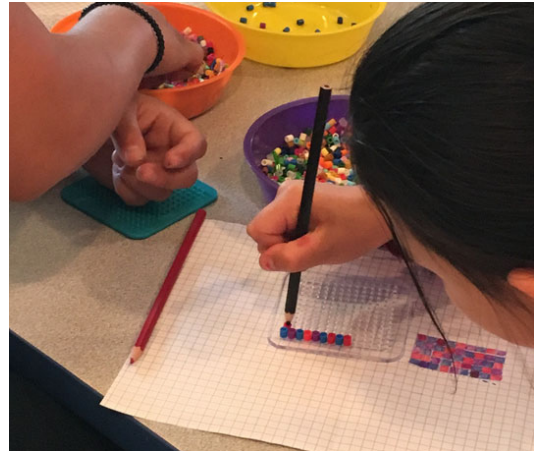
1. Students measure a 3" x 3" grid on graph paper. Draw a square, and then make a design inside that shows a pattern and/or radial symmetry.

Note: Graph/grid paper (8.5 x 11.75"), colored pencils, rulers will be preset on each group table so students can measure their work.

2. Before proceeding, students double check that design demonstrates a pattern, or shows radial symmetry.
3. Students select plastic peg board, container of Perler beads and then transfer their designs from grid paper to peg board by placing colored beads in the corresponding spot.

Tips: Start from the inside out with bead placement. Pencils are helpful to use when picking up beads.

4. Once entire peg board is filled with beaded 3-color design, students take to adult supervised ironing station to melt beads using ironing paper.
5. Next, students select seed box and attach pixel bead design to box using hot glue.
6. Lastly, students are given Sunflower seeds to place in seed box container for safe keeping until planting season.



EVALUATION

- Have students share their work and reflect on the patterns and radial symmetry that were created. They can discuss challenges and lessons learned while designing their pixel bead seed box. What additional designs could they create? What additional tools or materials would have been helpful to use in the process? Having had this experience, how would students approach this problem differently?

EXTENSIONS & CONNECTIONS

- Students can begin to look at connections between botany and art in their everyday life and keep a journal for writing and sketching, noticing patterns, symbols, form, function, structure and radial symmetry in art and nature.
- Think about, research and discuss in a group what professions use science, technology, engineering, art, math (S.T.E.A.M.).

VOCABULARY

1. **Aesthetics** - the branch of philosophy dealing with such notions as the beautiful, the ugly, the sublime, the comic, etc., as applicable to the fine arts, with a view to establishing the meaning and validity of critical judgments concerning works of art, and the principles underlying or justifying such judgments.
2. **Bilateral Symmetry** - a basic body plan in which the left and right sides of the organism can be divided into approximate mirror images of each other along the midline.
3. **Design Thinking** - refers to creative strategies designers use during the process of designing.
4. **Fibonacci** - sequence/numbers, the sequence of numbers -1, 1, 2, 3, 5, 8, 13, 21... In which each successive number is equal to the sum of the two preceding numbers.
5. **Form** - external appearance of a clearly defined area, as distinguished from color or material; configuration: a triangular form.
6. **Function** - the kind of action or activity proper to a person, thing, or institution; the purpose for which something is designed or exists; role.
7. **Inspiration** - an inspiring or animating action or influence; something inspired, as an idea; a result of inspired activity.
8. **Pattern** - a repeated design, an arrangement of lines or shapes where the same shape is repeated at regular intervals. A geometric pattern is a pattern formed of geometric shapes which are repeated.
9. **Pixel** - the smallest image forming unit of a computer or digital display screen.
10. **Radial Symmetry** - a basic body plan in which the organism can be divided into similar halves by passing a plane at any angle along a central axis, characteristic of sessile and bottom dwelling animals, as the sea anemone and starfish.
11. **Sequence** - a series of symbols or projects that follow one after another in a set order.
12. **Shape** - the quality of a distinct object or body in having an external surface or outline of specific form or figure; quality as found in some individual object or body form; something seen in outline, as in silhouette.
13. **Spiral** - the path of a point moving around a fixed center at an increasing or decreasing distance. A spiral is a coil or curl, like the shape of a piece of hair wound around your finger.
14. **Structure** - mode of building, construction, or organization; arrangement of parts, elements, or constituents; something built or constructed, as a building, bridge, or dam.
15. **Symbol** - something that is used to represent something else. In some cultures animals, flowers and insects can be symbols for feelings and ideas. For example, a butterfly can be a symbol for joy, freedom, and rebirth or even immigration o some cultures.



PATTERNS IN NATURE AND ART

Explore the Art & Nature around you and see if you can find...

CAN YOU FIND.....	IN ART IT LOOKS LIKE...	IN NATURE IT LOOKS LIKE...
A Spiral		
A Symmetrical Shape		
Branching Patterns		
Flowers or Floral Shapes		
Patterns with 3, 5 or 8		
A pattern you think is interesting		

Explore the Santa Fe Botanical Garden plant database and the Museum of International Folk Art online collection.

BEADWORK ADORNS THE WORLD

Background

Imagine a small glass bead from the island of Murano (Venice, Italy) or the mountains of Bohemia (Czech Republic) travelling around the world, entering into the cultural lives of people far away.

What happens to these beads when they arrive at their final destination, whether it is Ghana, India, North America, or Mexico? How are beads used in different cultures and what is their meaning? Who wears beaded garments or uses beaded objects and why?

In different communities, beads are often used at important moments in life and can represent:

- Life stages and passages such as birth, becoming an adult, marriage, and death
- Power, position, or status in the community
- The high meaning of the occasion - as seen in fine dress, house and animal decoration

Each cultural tradition has color preferences and its own designs and beading techniques. We can, for example, tell the difference between Crow Indian beadwork of the American Plains and Ndebele beadwork of South Africa. Beadwork adornment can convey culturally specific messages, but also show us many parallel uses among various bead working societies around the world.

LIFE BEGINS

Lakota Children and the Beaded Baby Cradle

Traditionally among the Lakota people of the central Plains of the United States, a baby began life swaddled in a lovingly decorated soft cradle. This cradle provided more than a warm, cozy bodily protection. It wrapped the newborn into his/her network of social relationships that would become a central part of a child's life. The paternal aunt, sister of the baby's father, was usually responsible for providing the beaded cradle. In making this cradle, the aunt was conferring honor upon the baby and indirectly upon her brother.

A cradle revealed a child's place in society. The baby's relatives could confer a special status on the infant by giving more than one cradle, ranging in size as the child grew. Making a fully beaded cradle required a major commitment of time and expense on the part of the beadworker. One greatly-honored baby reportedly received twenty-two cradles.



Beaded Cradle, Lakota Nation, South Dakota, North America, 1885 - 1890. Gift of the Art Institute of Chicago, Museum of International Folk Art.

BEADWORK ADORNS THE WORLD

The portable baby cradle form was well-adapted to the seminomadic lifestyle of the Plains people. The cradle could be propped against the tipi wall, so that the child could watch the family's interactions; held and comforted in the mother's arms; carried on the back of the baby's mother or sister while they were working; or hung from the saddle of the horse whenever the tipi camp was on the move.

Childhood death, always a concern, prompted bead workers to apply protective designs to cradles as a prayer for an infant's good health and long life. Often the meaning of those designs were known only to the maker, but in the Lakota case, the cradle design above the head was intended to represent a turtle. Why a turtle? A turtle's ability to operate in more than one world, in water and on land, and to transform itself by withdrawing into its shell, makes it a likely candidate for supernatural association. Its perceived attributes are linked to longevity.

SYMBOLS OF LEADERSHIP

Cameroon Royalty and the Beaded Elephant Mask with Leopard Crown

The Grasslands region of the Republic of Cameroon is generally headed by a king, or fon. Each fon is both the political leader and the chief religious leader of his kingdom, and has various rights and powers. One right is to use the pelts, ivory, teeth, and horns from large game in his kingdom, as well as luxury trade goods—including beads—for his royal regalia.



Elephant mask. Bamileke peoples, Grasslands, Cameroon, 19th century. The Field Museum. Photograph by John Weinstein.

Cameroon Grasslands royal art centers on three-dimensional human and animal representations. The leopard is first among the royal animals, a symbol of the Fon's power and leadership, and his spirit animal. In praise songs, the king is referred to as the "leopard", and he is believed to possess the ability to transform himself into a leopard and vice versa, taking on the special capabilities and attributes of this powerful animal of the wild.

The elephant is also a symbol of regal strength. A beaded elephant mask is used among the royal houses of the Bamileke kingdoms. Two high ranking men's societies (social and ceremonial organizations) whose members include royalty and top warriors, wear the cloth mask with its big floppy ears and long trunk like panels, as their main ceremonial regalia. The imposing human facial features on these masks are meant to show the strength of the fon and the power that he draws from the elephant.

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WEBSITES

Santa Fe Botanical Garden - Explore Nature
<https://santafebotanicalgarden.org/explore-nature/>

Museum of International Folk Art - Online Collection
<http://collection.internationalfolkart.org/collections>

Mensa For Kids - Fabulous Fibonacci, 4th grade Lesson
<https://www.mensaforkids.org/teach/lesson/plans/fabulous-fibonacci/>