



## *Gardenscope*

**Robert Anderson**

### **Title: Kaleidoscoping Around**

#### **Overview:**

Kaleidoscopes use reflection to generate fascinating designs that change as the kaleidoscope is rotated. Learning about symmetry in design and the use of prisms in reflection, students will build a simple kaleidoscope.

#### **Subjects:**

Science, Visual Arts, Math

#### **Age Group :**

Elementary (Grades K - 5)

#### **Standards:**

##### **21st Century Learning Skills:**

- Critical Thinking and Reasoning
- Self-Direction
- Invention

## Colorado Academic Standards:

### Science

- Analyze the relationship between structure and function

### Visual Arts

- Observe and Learn to Comprehend
- Envision and Critique to Reflect
- Invent and Discover to Create
- Relate and Connect to Transfer

### Math

- Shape, Dimension and Geometric Relationships

## Essential Question(s):

- *How are structure and function related?*
- *What is a kaleidoscope?*
- *What do you see when you look through a kaleidoscope?*
- *What makes the objects in a kaleidoscope appear the way they do?*
- *What is symmetry?*
- *What do you see everyday that has symmetry?*

## Rationale:

Through building a kaleidoscope, students will be able to explore and use reflection and will better understand how prisms and kaleidoscopes work.

## Objectives:

*Students will:*

- learn about the artwork *Gardenscope*, by artist Robert Anderson
- build a kaleidoscope
- create a prism
- discover how the use of light and mirrors causes objects to appear in interesting combinations
- see and comprehend the application of symmetry in design

## Materials:

- Worksheet 1: Kaleidoscope Coloring Page PDF. One for each student.
- *The Art and the Artist* information on *Gardenscope* (found at the end of this lesson plan)
- One color copy of *Gardenscope* for every 3 - 5 students, or the ability to project the image onto a wall or screen
- Optional: internet to view additional kaleidoscopes on the website of artist Robert Anderson (see Additional Resources below)
- 8.5 x 11" mirrored sheets or mirror board (available at craft stores)
  - optional: cardboard cut from cereal boxes
  - aluminum foil
- Cardboard paper towel roll tubes (11" with a diameter of approximately 1 ¾ inches); 1 per student
- Black construction paper, cut in 4 x 4" squares; 1 per student
- Clear plastic report covers or acetate
- Rulers
- Scissors

- ¼ hole punch
- Masking tape
- Transparent tape
- Glue
- Pencils and fine permanent markers/Sharpies
- Assortment of transparent, colorful, small plastic beads, sequins, confetti, dried flower petals, etc.
- Glitter
- Q-tips
- Paper and art supplies to decorate the outside of the kaleidoscope

## Duration:

50 minutes; more as needed.

## Vocabulary:

- *Kaleidoscope*: an instrument containing loose bits of colored material (as glass or plastic) between flat plates and mirrors so placed that changes of position of the bits of material are reflected in an endless variety of patterns
  - *Etymology*: from Greek kalos: "beautiful" and Greek eidos: "form, shape" and English -scope
- *Prism*: a transparent solid body, often having triangular bases, used for reflecting rays of light.
- *Symmetry*: when one shape becomes exactly like another if you flip, slide or turn it.
  - The simplest type of Symmetry is "Reflection" (or "Mirror") Symmetry, as shown in kaleidoscopes.

## Lesson:

### Preparation:

- Collect and divide kaleidoscope supplies, including paper towel rolls, mirror board (or cardboard and aluminum foil), and black construction paper squares for each student.
  - For young students, you may wish to prepare the prism supplies ahead of time: cutting to size either mirror board or cardboard and aluminum foil, construction paper for the peephole and clear heavy plastic for the two lenses (See Lesson Plan).
  - Students may be encouraged to "upcycle," bringing paper towel rolls, used cereal boxes and aluminum foil from home ahead of time.

### 1. Introduce kaleidoscopes.

- Ask students if they know how kaleidoscopes work. Explain that kaleidoscopes use reflection to generate patterns and images.
- Let them know that through building a kaleidoscope of their own, they will better understand the process.

### 2. Hand out the kaleidoscope coloring page, Worksheet #1 PDF

- Ask for a definition of symmetry.
  - *Symmetry*: when one shape becomes exactly like another if you flip, slide or turn it.
    - The simplest type of Symmetry is "Reflection" (or "Mirror") Symmetry, as shown in kaleidoscopes.
- Explain that students will color the kaleidoscope page using symmetrical colors.
  - Have each student fold the page in half, with the image facing out (folding either length or width is fine).
  - Have students color just half of the page, coloring section by section.

- When they are done with one half of the page, have students unfold the page and color the other half, using the exact same color scheme for each of the sections that they used for the first half.
- Explain that their coloring pages now show symmetry.
- Ask the students what they see everyday that has symmetry.
- Then explain that in a kaleidoscope, reflection — through the use of a prism — causes symmetry.

### 3. Show and discuss *Gardenscope* by artist Robert Anderson.

- Hand out color copies of the artwork and/or display on overhead projector or internet.
- Read and discuss **The Art and the Artist** (see below).
- Optional: show additional kaleidoscopes made by the artist (see webpage under Additional Resources below)

### 4. Build the kaleidoscopes. (Teacher should model the construction)

- Explain that a prism reflects rays of light (see Vocabulary).
- Create the prism.
  - Cut three sections of mirror board (or cardboard and tin foil), measuring each at 1 ½" x 8 ½"
  - Lay the 3 strips side by side with the reflective side facing down, leaving a small gap between them.
  - Tape these mirrors together using masking tape.
  - Form a long triangle with the three mirrors, the reflective side facing in.
  - Use three masking tape strips wrapped around the triangle to carefully secure it.
  - Set the prism aside.
- Create a peephole.
  - Place the end of a paper towel tube on the construction paper square and trace a circle around it. Draw another circle approximately one inch larger around the traced circle. Cut around the larger circle. Mark a point in the center of the circle, and use the hole punch to punch out the point. This is the peephole.
  - Working from outside to in, cut little notches around the circle, stopping at the inside circle.
  - Lay the peephole on your work surface and center the cardboard tube on top of it.
  - Working your way around the tube, gather the notches around the edge of the tube, and tape them to the tube.
- Create the lenses.
  - Using the cardboard tube as a template, trace two circles on your heavy, clear plastic. Draw another circle around each approximately ½" larger. Cut around the larger circles. You will use these to create Lens A and Lens B.
    - Lens A: Using one of the circles, cut notches to the inside of the inner circle so it resembles a "gear."
    - Lens B: With the other circle, cut notches to the outside tracing of the inner circle.
    - Lay your lenses flat against the desk or work table and bend the notches upward.
- Add decorative elements.
  - Slide your triangular prism inside your tube.
  - Take Lens A and place it inside your tube against the edges of the prism, notches facing up.
  - Place your selected beads, sequins, confetti, dried flower petals, etc. on top of Lens A.
  - Cap your tube using Lens B, notches facing down.
  - Secure Lens B to the tube with masking tape.
  - Give it a spin and look through the peephole!
  - If you aren't satisfied with the quantity or the selection of beads that you made, you can go ahead and make changes by untaping the lens and replacing the beads.
- Decorate the tube.
  - Decorate the tube using decorative papers, art supplies, or the kaleidoscope coloring page.

- Fold a piece of ordinary paper in half and pour some glitter into the fold line.
- Use a q-tip to spread glue, coating the outer perimeter of the lens end of the tube, being careful not to get any glue on the lens itself. cover the entirety of the masking tape you used to secure the lens.
- Gently roll your glue-coated tip in glitter until it is fully coated; let it dry.
- Enjoy!!!!

### **Additional Resources:**

*More Gardenscope images on Robert Anderson's website:*

[http://www.rcandersondoorcounty.com/1/index.php?option=com\\_admirorgallery&view=layout&Itemid=118](http://www.rcandersondoorcounty.com/1/index.php?option=com_admirorgallery&view=layout&Itemid=118)

### **The Art and the Artist**



*Gardenscope*  
*Robert Anderson*  
Sculpture

Robert Anderson began working with steel in 1994; sculpting steel is his profession and his passion. Much of his sculptural work is also interactive. His fine garden kaleidoscopes are living sculptures that invite people to stop, engage their senses and share their experience with others.

Robert was inspired to create a sculptural kaleidoscope by his wife's love of them; he calls his creation a "gardenscope." Robert decided to design a kaleidoscope using flowering plants that could be used outdoors in a garden. The garden kaleidoscope design is an original concept; Robert has created these interactive living sculptures since 1997.

Quote from Robert, "Patience is the most important part of the creative process. It takes years of hard work to develop as an artist. Stay true to your beliefs and objective despite other's opinions. Trust your own judgment and filter other's suggestions because they can clutter the vision (kind of like two people trying to drive a car)."

Kaleidoscope Coloring Page

