Classroom Activity

Shaping Space

Essential Question	How do artists think in two and three dimensions?
Grades	K–2
Time	One to two class periods
Art Concepts	Line, shape, form, color, composition, visual plane, visual balance
Engineering Concepts	Identify a problem; convey possible solutions through visual and physical representations; compare, test, and evaluate solutions
Materials	Drawing paper, construction paper in various colors, pencils, scissors, glue sticks, hole punches, string, and chopsticks. Optional: wooden dowels.
Talking about Art	View and discuss the printed image of *White Panel* (1936). What do you see? Take an inventory of the types of lines that you notice, using words and drawings to document your observations. How and where do these lines combine to create shapes? Describe the shapes that you see, using writing and drawing to support your interpretations. If this artwork came to life in front of you, which lines and shapes would you find in the foreground of the artwork (the space closest to your eye)? Which lines and shapes would you find in the background (the space furthest from your eye)? Which lines and shapes might fall in between, in the middle ground? Discuss your predictions with a thinking partner.
Making Art	Divide students into groups of three. Assign each student to the background, middle ground, or foreground of the artwork. Ask them to use their bodies to describe the lines and shapes in the artwork and how these lines and shapes overlap in space. Have each group present a visual and physical tableau to the class, recreating *White Panel* in space. Ask students to respond to their observations and interpretations by creating their own two- and three-dimensional artworks. First, students should cooperatively choose a color palette for their collaborative artwork, choosing three sheets of colored construction paper that complement each other (i.e., three warm or three cool colors). Next, students should cut a variety of shapes from the paper, such as geometric (angular) or organic (free-form) shapes, and label each shape with an identifying name.

How might students combine these shapes to create a two-dimensional composition? One student can sketch a proposed composition on behalf of the group. Together, they should discuss and edit the sketch until they have reached a balanced composition—visual balance in terms of the arrangement of shapes. Then, students should work together to execute the sketch by layering the shapes on top of each other on a separate sheet of paper. One student can start by laying the background shapes down first, working from background to foreground to create a collage.

How can students work together to translate this collage into three dimensions? Ask students to dissemble the collage, hole punch the top of each shape, and attach each shape to a long piece of string. They can practice layering these shapes by holding each shape from the top of the string and working together to recreate the original sketch in space. Students should try multiple solutions for executing the sketch, including shortening the string to move a shape's position within the composition or adhering additional shapes onto existing shapes to create dimensional forms. When they have reached a desired and agreed upon composition, they should tie the strings to a chopstick or a long wooden dowel.

Reflection

Display the printed image of *White Panel*, students' final artworks, and their original sketches in the classroom. Ask students to reflect on their discussion of the artwork and on the collaborative artmaking process by responding to the following questions as a group:

How did we get our ideas from the artwork *White Panel*?
How did we work together to make our own artwork?
What problems came up when we were making the artwork?
How did we work together to solve the problems?
How does our final artwork compare to our original sketch?
If we could make the final artwork again, what changes would we make?

Curriculum Connection

Integrate math concepts by discussing measurements and appropriate use of tools. Students can estimate lengths of different strings according to where the shapes should fall within the composition. They should use addition and subtraction to adjust their measurements and attend to precision using a ruler. For an extension to the upper grades, students can measure the perimeter and area of their shapes. Then, they can divide their composition into quadrants by establishing an X and Y axis and plot their shapes on the plane.

Classroom Activity

Contour Constructs

Essential Questions

How do artists draw inspiration from the world around them? How do they manipulate representational shapes to create new abstract forms?

Grades

K–5

Time

One class period

Art Concepts

Line, contour, shape, form, positive and negative space, visual and physical balance, representation, abstraction

Engineering Concepts

Identify a problem, specify criteria for developing a solution, explore multiple solutions, improve a solution based on simple test results

Materials

Poster board (cut to 8.5 x 11 in. sheets), tracing paper, pencils, scissors, glue sticks, hole punches, brass fasteners, and images sourced from magazines. Optional: cardboard bases.

Talking about Art

View and discuss the printed image of *Le Grande vitesse* (1969).

What do you notice about this sculpture? Use your finger to draw the outline, or contour, of this sculpture. Pay close attention to the direction of the contour and where it intersects with other lines. Did you use geometric (straight, angular) or organic (curvy) lines to describe the outline? Imagine you are sitting in front of this sculpture, but looking at it from a different perspective around the work. How might the outline change? Use a pencil and paper to predict what the contour might look like from another point of view.

Does the form (three-dimensional shape) of this sculpture remind you of something that you have seen in nature? Where in nature might the artist have drawn his inspiration? Share your observations, interpretations, and inferences with a thinking partner.

Making Art

Discover the artistic process of abstraction by creating your own sculpture inspired by natural forms. First, choose a large image from a magazine. Make sure the image is large enough to easily identify details and parts. Place a sheet of tracing paper on top of the magazine sheet and use a pencil to outline the contour of the image. Keep in mind that you are not trying to copy the image; you are using it as a guide to discover interesting lines and shapes. Draw the shapes as large as you can, simplifying the shapes if needed. Allow some lines to touch the edges of the tracing paper.

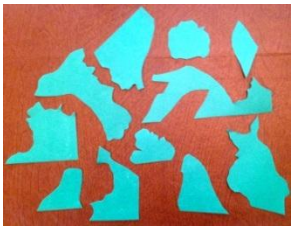
Next, carefully glue the tracing paper onto a sheet of poster board. Be sure to use just a little bit of glue, as you will eventually remove the tracing paper later. Cut the paper by following your contour lines with scissors. This should leave with you an assortment of shapes of different sizes, almost like puzzle pieces. As you look at the loose pieces, can you find evidence of your original image in these simplified shapes? This process is called abstraction—when an artist takes the essence of something representational and identifiable, like a plant or an animal, and turns it into something completely new that is much more difficult to recognize.

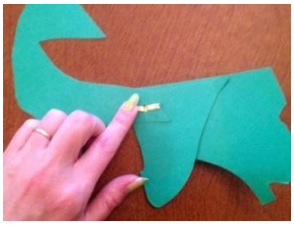
Next, brainstorm how you will arrange your pieces to create a sculpture. Will your sculpture incorporate organic lines or geometric lines? Remove the layer of tracing paper then manipulate your pieces using paper folding techniques, such as bending, curling, or rolling, to create organic or geometric contours.

How will you transform these two-dimensional pieces into a three-dimensional sculpture? Which pieces would make a good foundation and why? Which pieces are smaller, more nimble, and better suited for building up? Place the foundation pieces first then try arranging smaller pieces in space. Use your hands to think through possible arrangements that ensure structural stability and visual and physical balance.

After testing out multiple solutions, think about how you will adhere your pieces. Try layering two pieces on top of each other and hole punch where you intend to adhere them together. Use a fastener to link two pieces, then try moving the pieces in space to create different forms. Try linking two, three, or four pieces together to discover how a form can grow. Once you have secured your base, start building up and out. Adhere along the way.

As you build, consider the negative space created by joining positive pieces together. These windows of space will provide opportunities to see inside and through your sculpture from different angles. Remember to turn your sculpture 360 degrees as you go, so that you can view it and make needed changes from all sides. Try to use all of your pieces; leave no scrap behind. Continue to change the sculpture's form by bending, folding, and rolling the pieces. When finished, you may adhere your sculpture to a cardboard base.





Reflection

Display the sculptures in the classroom and facilitate a gallery walk. Ask students to reflect on the artmaking experience by responding to the following questions:

Does your sculpture resemble the original image?
What visual changes did you make along the way?
What structural changes did you make to ensure stability?
How does the final sculpture compare to your original idea?
If you could take this sculpture to scale and place the larger version in a natural site, where would you put it and why?

Curriculum Connection

Integrate concepts from science by choosing magazine images of plants, animals, and habitats. Compare scientific depictions of nature with those created by artists, including representational and abstract artworks.

Classroom Activity

Paper Sculptures

Essential Question What is a sculpture?

Grades SPED K–5

Time One class period

Art Concepts Line, shape, color, physical balance, composition

Engineering Concepts Identify a problem, utilize multiple solutions, compare solutions

Materials Tag board (3 x 5 in. pre-cut rectangles), colored construction paper (small pre-cut circles, squares, and rectangles), soft wire (such as Twisteez © wire), scissors, and hole punches. Optional: cardboard bases and hot glue guns.

Talking about Art View and discuss the printed image of *Three Quintains* (*Hello Girls*) (1964).

What do you see? What types of lines and shapes do you notice? Identify straight lines and shapes, then curvy lines and shapes. What colors did the artist use to paint these shapes? He used red, yellow, and blue, which are primary colors. You can mix primary colors to make many different colors.

How did the artist put these lines and shapes together? Identify one detail that tells us how the artist made this artwork. Which parts of the artwork look heavy and difficult to attach? Which parts look light and much easier to attach? How are the heavy pieces and the light pieces of the artwork working together? Use your body to describe how this artwork stands on its own.

If you could walk around this artwork, what more would you find? An artwork that you can walk around is called a sculpture. How are sculptures different from paintings or drawings? Paintings and drawings are two-dimensional, while sculptures are three-dimensional and, most of the time, they can stand on their own. When looking at a painting or a drawing, it is easy to see details if you look closely enough. When looking at a sculpture, it is important to walk around it so you can discover all of its sides. You will find new details the more ways you look.

Making Art Create your own standing sculpture using paper shapes and folding techniques. First, what do you need to do in order to make a two-dimensional rectangular stand in three dimensions? Fold the rectangle in half to create a standing base. Your base can stand vertically or it can sit horizontally. Try both configurations and decide which one you like best.

Next, refold the rectangle and use scissors to cut a small slit. Then, place a shape, such as a small rectangle or triangle, into the cut. Does the shape balance with the base on its own? Try cutting two slits and attaching another shape, such as a circle. Is it more or less balanced? What would happen if you tried attaching a shape with three slits?

Now that you have tried folding shapes and attaching shapes without glue or tape, start with a horizontal or vertical base then continue to build up and out. After attaching shapes, you may hole punch the shapes to attach arms. Bend pieces of wire to create curvy lines. Twist pieces of wire around a pencil to create swirly and zigzag lines. Loop the wire into the hole punch to attach to your shapes and base. As you build, make sure that all of your pieces are working together and can stand on their own.

Reflection

Display students' sculptures in the classroom and facilitate a gallery walk. Discuss the problems that students faced while making their sculptures and how they utilized and compared different solutions.

Does your sculpture stand independently?

What folds and cuts did you make to make the sculpture stand on its own?

If you could create your sculpture again, what would you do differently and why?

Curriculum Connection

Incorporate math concepts into the lesson, using the human form and students' artworks as an opportunity to define and reinforce symmetry.

If your body were a sculpture, what parts would it have?

Which parts of the body are symmetrical, or almost the same on either side? Use your arms and legs to display symmetry.

What parts of your sculpture are symmetrical, too? Does it have arms or legs that look the same on either side?

If your composition is not symmetrical (asymmetrical), how could you change the individual parts of your sculpture to make it symmetrical?

Classroom Activity

Monumental Artworks

Three Quintains (*Hello Girls*) (maquette), 1964, sheet metal and paint, 10 ¼ x 17 ½ x 13 ½ inches, Los Angeles County Museum of Art, gift of Alexander Calder, M.66.93, © 2014 Calder Foundation, New York/Artists Rights Society (ARS), New York, photo © 2014 Museum Associates/LACMA

Essential Question	How do artists plan and build large-scale sculptures?
Grades	6—12
Time	One class period
Art Concepts	Shape, form, scale
Engineering Concepts	Attend to precision of criteria, consider constraints likely to limit possible solutions, combine parts of different solutions to create new solutions
Materials	Pencil, cardstock, and paper.
Talking about Art	View and discuss the printed image of *Three Quintains* (*Hello Girls*) (1964). What do you see? What materials do you think the artist might have used to create this sculpture? What clues can help you identify these materials?

Describe the scale or size of this sculpture. How might it compare to the size of a person or a building? How would you measure its individual parts, including the height of the triangular bases, the width of the metal arms, and the area of the circular shapes? Which mathematical formulas would you use to calculate these measurements?

How do you think the artist might have constructed this sculpture? What measurements might have helped him plan this work? What steps did he take to build the work? How did he revise or refine his plans along the way? What details do you see to support your inferences?

Compare and contrast the image of *Three Quintains* (*Hello Girls*) with the image of the maquette (or model) featured on the reverse. This is the model that Alexander Calder created to document his plans for the final work. What was his purpose in creating the maquette? Why was it important for Calder to plan his ideas first before creating the final work?

Discuss similarities and differences between the maquette and the final sculpture. What is the ratio between the scale of the maquette and the scale of the sculpture? What questions did Calder consider when taking the maquette to monumental scale? How might he have sourced his materials? How did he determine the quantity of materials needed?

Math Activity

Using the dimensions provided underneath the image of *Three Quintains* (*Hello Girls*), calculate the height and width of this sculpture. Assuming that the height represents the length from the bottom of one standing, triangular base to the top of one of the arms at its peak, use ratio and proportion to estimate the height of the bases and length of the arms. Estimate the area of the attached shapes.

Note the materials used to create this artwork and research the cost of a square foot of sheet metal. Estimate the area needed to produce one standing base with arms and shapes. What quantity of sheet metal would be required to execute the entire work?

Create your own small-scale maquette using cardstock, scissors, and paper-folding techniques. Determine the quantity of resources needed to take your maquette to monumental scale, considering the dimensions for each part of the sculpture. What materials will you use? What is the ratio of the maquette to the final sculpture? Identify the quantity of materials needed, using research to support your calculations. Then, research the cost of an alternative material. How would the total cost change if you were to choose a less or more expensive material? If you were to paint the entire surface area, how many gallons of paint would you need?

Reflection

Ask students to present their work to the class, detailing the dimensions of their maquettes and the cost of taking the maquettes to scale in various materials. They should describe their plans for the monumental work, including a site-specific location (i.e., a park, front yard, school, or garden). In culmination, students may evaluate each other's work according to cost and feasibility, then vote on a winning proposal.

Classroom Activity

Motion Machines

Essential Question	How do sculptors engage in artistic and engineering practices?
Grades	9–12
Time	One to two class periods
Art Concepts	Line, shape, texture, materiality, visual and physical balance, composition
Engineering Concepts	Attend to a range of considerations in criteria and constraints, break a major problem into smaller problems that can be solved separately, prioritize criteria and consider trade-offs as a solution is tested and refined
Materials	Paper, pencil, steel wire (22-gauge), string, scissors, and an assortment of two-dimensional materials of various weights, including cotton balls, cardboard, chipboard, cardstock, foam sheets, and foil sheets.
Talking about Art	View and discuss the printed image of *Little Face* (1962). What's going on in this artwork? Describe the artist's use of line and shape. How does the direction of the line change as your eye travels through the work? How do the shapes contract, expand, and transform? What material might the artist have used to create this sculpture? Describe the quality of the material, including its texture, weight, and density. If you were to hang this work, how would gravity act upon the material? What force could propel the arms and shapes through space? How would the composition, or arrangement of visual elements, change as the arms and shapes travel? Sketch a prediction of how this sculpture might move, from the multiple points of view.
Making Art	Create your own moving sculpture inspired by Alexander Calder's mastery of material. First, cut a piece of steel wire, hold it horizontally, and spin the wire 360 degrees. Take a quick sketch of the wire's pathway, or trajectory through space, comparing its horizontal and vertical movement. If you were to attach materials to either end of the wire, how would its trajectory change? Attach cotton balls to one end and a small piece of cardboard to the other then, with a partner, discuss how the wire's trajectory through space might change. Record your prediction in drawing, test your prediction, then revise the quantity of material needed in order to ensure equilibrium. Continue testing with different types of materials, such as cardstock against foam or chipboard against foil, creating a system of weighing a lighter material against a heavier material. Before each test, document your predictions. After each test, record your results.

How can you combine your experiments to create a larger wire sculpture that moves through space? First, think through ways to adhere two wire arms together, leaving the weighted materials (cotton balls, cardboard, etc.) intact, but still ensuring physical balance. Where is the point of balance? As you attach more arms together and as the sculpture begins to grow, how does its interaction with gravity change? Where are the new points of balance?

Continue adhering arms and weighted materials together until you have reached physical and visual balance. As long as there is physical balance between the weighted materials, you can ensure visual balance by creating an overall symmetrical or off-kilter composition.

Reflection

Ask students to install their sculptures in the classroom. They can hang their sculptures from the ceiling using string. Others can balance their sculptures on a tabletop. Facilitate a gallery walk then ask students to reflect on the artistic and engineering processes by answering the following questions with their partners:

What problem did you work through when creating your sculpture?
What constraints affected the development of a solution to this problem?
How did the results of your balance tests help you refine your solution?
What considerations did you make when ensuring both physical and visual balance?