Math Connections | Enhance Math Skills with Art Professional Development for Educators Tuesday, January 31, 2017



Wassily Kandinsky (Russian, 1866 - 1944), *Sketch for "Several Circles,*" c. 1946, Oil on canvas, Gift of Mrs. Edgar B. Stern, 64.31

Visual art can be used to promote student learning of mathematic skills and concepts. Enhancing math lessons with art enables students to make crosscurricular connections and discoveries related to math domains including geometry, measurement, ratios and proportion, fractions, and base ten. Art projects can help make abstract math concepts visible and may increase student understanding. These educator resources include short descriptions and images of ten works of art from NOMA's permanent collection. The included lessons and activities can be adapted for learners of different ages and abilities.

Educator Resources



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Alexander Calder (American, 1898 - 1976) *Yellow Planet Over the Steeple*, 1965

Alexander Calder came from a Pennsylvania family of artists. His father and grandfather were both sculptors and his mother was a painter. Calder's first interest was in engineering and mechanics. He attended Stevens Institute of Technology and graduated in 1919. After receiving this degree, Calder enrolled in the Art Student's League in New York and worked as a freelance illustrator. He exhibited paintings and sculptures in New York before moving to Paris in 1926. He became known for the *Calder Circus*, a mechanical installation that included wire figures combined with cork and wood. Calder travelled in Europe and America to display the work and set in motion the individual figures and components of the *Circus*.



Inspired by contemporary artists Joan Miró and Piet Mondrian, Calder worked toward a simplification of organic forms. He introduced motion to his sculpture first by adding mechanized parts, but he eventually relied on wind or human touch to set the works in motion. Surrealist artist Marcel Duchamp was the first to call these works "mobiles," a pun derived from the French words "to move" and "motive." These kinetic sculptures were in opposition to the traditional definition of sculpture. Mobiles rely on chance and the interplay of wind and gravity. Using colorful abstract forms and balance, Calder established a unique form of art whose success requires balance, engineering, and mathematics in addition to aesthetically satisfying combinations of color, form, line, and shape.

SUGGESTED ACTIVITES

Creating Balance Fraction Paper Sculpture (LP)



George Dunbar (American, b. 1927) *Coin du Lestin*, 1996

Louisiana artist George Dunbar (b. 1927) studied in Philadelphia, Paris, and New York before returning to Louisiana in the 1950s. Over the course of his 70 year career, Dunbar has continually experimented with new methods and materials for making art. His fascination with earthy materials like metal leaf and clay came in large part from his work as a land developer. The titles for his most famous series of works, *Coin du Lestin*, come from the name of one of his land development projects, the Coin du Lestin subdivision in Slidell.



Dunbar creates the medallion-like etched forms of this series by building up thin layers of colored clay across the whole surface of the composition, then methodically incising the clay with compass-drawn geometric abstractions, then finally coating that ground with metallic leaf. Dunbar experimented with a variety of colors, forms, and finishes in this body of work, ultimately completing over 200 versions of this composition during his career. The stark geometry of the compass-drawn forms play against the subtle imperfections and irregularities of the clay and gilding, an effect Dunbar further cultivates by sandblasting, weathering, and sometimes even shooting these works with buckshot.

SUGGESTED ACTIVITES

What's the Angle? Geometrical Design (LP) Pattern Prints





Wassily Kandinsky (Russian, 1866 - 1944) Sketch for "Several Circles," c. 1946

Pictured page 1

Born in Russia in 1866, Kandinsky was among the first artists to eliminate recognizable objects from his paintings, creating non-figurative works of art with mystical overtones. In 1896 Kandinsky abandoned law studies in Russia and went to Munich to learn painting. In Munich he became a founding member of the German Expressionist group *Der Blau Reiter* (the Blue Rider). This group of artists hoped to explore all things new in art. Like the ancient Greeks and the Europeans of the Renaissance, Kandinsky believed the arts were important for the development of the soul.

To Kandinsky, art was a matter of using rhythmic lines, colors, and shapes, rather than narrative. He likened these elements of painting to the combination of notes and melodies that make up a symphony. *Sketch for "Several Circles"* demonstrates a late period in which the artist began to experiment with simplified geometric forms. The combination of the opaque background with the well-lit circular forms and the transparency of the intersecting circles implies movement of the forms.

SUGGESTED ACTIVITES

Geometrical Design (LP)

Overlapping Shapes

Pattern Prints





Joan Miró (Spain, 1893-1983) Portrait of a Young Girl, 1935

Joan Miró drew on memory, fantasy, and the irrational to create works of art that are visual analogues of Surrealist poetry. Forms are painted in a limited range of bright colors, especially blue, red, yellow, green, and black. *Portrait of a Young Girl* is representative of the artist's gradual move from works of complete organic abstraction in 1925 and 1926 toward a more recognizable surreal fantasy. In the 1930s, he began using harsh colors, disfigured human forms, and readymade elements that upended the common wisdom that good art ought to be visually harmonious and aesthetically pleasing. Miró's self-proclaimed goal as an artist was nothing less than to "assassinate painting."

In *Portrait of a Young Girl,* Miró applied paint mixed with sand on cardboard, and in other works of the same period, he painted grotesque figures on paper prepared with tar. Through these processes, he produced startlingly abstract compositions that possessed a new kind of visual force through the play of color and shape. Miró reduces a portrait of a young girl to a few biomorphic shapes. It is a fleeting memory of a young girl. Her form is monumental and the distinctive features are exaggerated. Perhaps she is wears a large

feathered hat and has accentuated eyelashes. "I feel the need of attaining the maximum of intensity with the minimum of means," Miró wrote.



SUGGESTED ACTIVITES

Shape Portrait

Overlapping Shapes



Odili Donald Odita (Nigerian, born 1966) Forever, 2011

Philadelphia-based, Nigerian-born artist Odili Donald Odita was commissioned to create the wall painting Forever to commemorate the centennial of the New Orleans Museum of Art. Extending along the wall of the first floor McDermott Lobby, *Forever* consists of three zones separated by gallery doors. On the southern end, bright tones streak in like rays of morning light, conveying the impression of beginning. On the center wall, two planes of color converge at a centerfold, in a butterfly or mask-like pattern. The third section, on the northern end, consists of vertical vectors emanating from the ground reminiscent of vegetation or city lights. The artist describes the work as representing a "crossroad of class, race, culture, and space."



Odita is well known for his hard-edged abstract paintings and murals in bright hues, reminiscent of African textiles. Shards of color streak across canvas and walls in carefully selected colors. Odita is inspired by an array of sources, including contemporary media-centered culture and the duality of growing up under both Nigerian and traditional American influences. His site-specific works are designed to enliven and enhance the space in which they exist. "I like to get a feeling for a space," Odita explains, "and then try to capture the dynamics of the space. This means not only what the space looks like, but also how it is used, how people travel and walk through it." The selection of colors is essential to his work. Odita believes that "Color in itself has the possibility of mirroring the complexity of the world as much as it has the potential for being distinct." *Forever* includes eighty-seven hues which celebrate the vitality and diversity of New Orleans.

SUGGESTED ACTIVITES

What's the Angle?

Overlapping Shapes



Claes Oldenburg (American, born Sweden 1929) and Coosje van Bruggen (American, born Netherlands 1942) *Corridor Pin, Blue*, 1999, Stainless steel

Claes Oldenburg and Coosje van Bruggen's artistic practice is inspired by popular culture and mass marketing. The husband and wife artistic team are famous for monumentalizing ordinary objects such as clothespins, typewriter erasers, safety pins and shuttlecocks. Born in Stockholm, Sweden, Oldenburg arrived in Chicago in 1937. He attended Yale University studying art and literature and then took night classes at the Art Institute of Chicago. By 1956, Oldenburg moved to New York City.

In 1960 Oldenburg established *The Store*, an installation piece in which he filled a vacant shop with sculpted parodies of consumer goods including pastries, ice cream sundaes, and articles of clothing made from painted, plaster-dipped burlap. When the exhibit closed in 1961, the shop became his studio. Oldenburg began creating large-scale, soft, collapsible sculptures of common objects made from vinyl and canvas. In the 1970s, Oldenburg and van Bruggen translated these giant soft sculptures into solid forms using fiberglass and bronze to create largescale outdoor sculptures.

Van Bruggen was born in the Netherlands and studied art history. When she met Oldenburg in 1970 they began to work as a team. They conceived of the projects together, and Oldenburg drew the models while van Bruggen selected the colors and materials. Their inputs become so integrated that no matter what the sculpture may depict, the most important aspect of their work was their partnership.

The couple's radically large-scale objects such as *Corridor Pin, Blue* cause viewers to rethink their relationship to everyday commodities. NOMA's sculpture extends 21 feet above the garden path as visitors to the Syndey and Walda Besthoff Sculpture Garden walk underneath the outstretched arm of the pin. Oldenburg and van Bruggen's work intrigues viewers who recognize the familiar form, yet become awe-struck by its excessive size.

SUGGESTED ACTIVITES

Large Scale (LP)







Jaume Plensa (Spanish, born 1955) *Overflow,* 2005

Jaume Plensa was born in Barcelona, Spain to a family of musicians in a home filled with music and books. Plensa claims that he chose to become an artist so that he would have flexibility to incorporate his many interests. Throughout his career, Plensa has explored the private life of an individual and how it relates to the larger human condition. He often incorporates text and letters in his works to create dialogue. In works such as *Twentynine Palms* of 2007, Plensa included bits of texts in the native language of poets including Baudelaire, Shakespeare, and Emily Dickenson. He presented the text together in one long, stainless steel curtain to stress the importance of collective memory and diversity. Other works, like *Overflow*, include letters but not words.

Plensa has said that life's experiences are tattooed onto our skins, an idea that is overtly represented in *Overflow* of 2005. This stainless steel sculpture represents an oversized man seated in fetal position. Form is created through letters which continue to spill over on the granite base. The piece is both monumental and fragile, as the letters form a lace-like pattern over the invisible skin of the larger than life size figure. The fetal position is symbolic of thoughtful reflection and also references birth. It is a position for thinking, not doing. The delicate steel letters that comprise the work do not spell anything, but represent how life's experiences are forever with us and apart of us.



SUGGESTED ACTIVITES

Human Scale (LP)

Large Scale (LP)

Place Value Pictures



Educator Resources

Frank Stella (American, born 1936) Scramble: Ascending Yellow Values, Descending Spectrum, 1978

Frank Stella, who famously said "What you see is what you see," insists on the painting as a self-sufficient object. "All I want anyone to get out of my paintings, and all I ever get out of them," Stella said, "is the fact that you can see the whole idea without any confusion." His geometric studies in color and form intentionally broke from the story-telling tradition of easel paintings and are indicative of the Hard Edge art style which developed on the heels of Abstract Expressionism. The tools of the Hard Edge painters included quick drying acrylic paint, masking tape, rulers and T-squares. *Scramble: Ascending Yellow Values, Descending Spectrum* is an example of Stella's formal approach as line, color, and shape have become the subject of the painting achieving the 20th century mantra of "Art for Art's Sake."



This painting takes its title from Stella's 1967 collaboration with modern dancer and choreographer Merce Cunningham, for whom he designed stage sets. The painting's rhythmic ascending and descending planes of color reflect the influence of music and dance, animating Stella's otherwise minimal squares of color with motion and dynamism. Although he began his career as a minimalist, creating flat, monochromatic paintings using industrial house paint, by the 1970s he had begun creating vibrantly colored abstractions that possess a vivid three-dimensionality. Although Stella rejected the loaded, emotionally fraught nature of abstract expressionism, his works were not without meaning, incorporating the body and all of the senses into a new form of art encounter.

SUGGESTED ACTIVITES

Place Value Pictures

Graphing a Design





Do-Ho Suh (Korean, born 1962) *Karma*, 2011

Born in Seoul, South Korea, Do-Ho Suh grew up in a creative environment surrounded by art. His father, Se-Ok-Suh is a celebrated Korean ink painter and scholar known for large scale works that marry modern brush painting with traditional Korean calligraphy. This encouraged Do-Ho Suh to pursue a life in the arts as well, and he studied painting at Seoul National University. Suh then determined to pursue his career overseas, perhaps, he later admitted, to escape his father's fame. He continued his studies in painting at the Rhode Island School of Design where he took a sculpting class as an elective, which forever changed his direction. "Every assignment just resonated with me," he said about this class. He completed an M.F.A. in sculpture from Yale University in 1997.

Many of Suh's sculptures blend art and architecture. In *Karma*, a man stands firmly on the ground as another man crouches on his back covering the eyes of the standing man. Other men who get progressively smaller crouch on each others' backs forming a tower that reaches a height of twenty-three feet and curves backwards like a spine. Balance is a crucial concept in this piece because of the men's tedious position on top of each other. The group must rely on the individual and trust that each one will not falter. The title, *Karma*, implies that the figures allow destiny to take its course recognizing that the actions of one determine the fate of the group.





SUGGESTED ACTIVITES

Human Scale (LP)

Large Scale (LP)



Yoruba Peoples, Kingdom of Owo, Nigeria *King's Tunic*, late 19th century

The Yoruba People have lived on lands that are now included in the countries of Benin and Nigeria in West Africa since around 800 CE. The region encompasses people who speak the same language and share common belief systems, yet are divided geographically into several kingdoms. Yoruba were historically farmers. The centralization of wealth in cities allowed for the development of a complex market economy. Differences exist among the Yoruba kingdoms; however, art is one force which binds the groups to each other despite time, inter-tribal warfare, and distance.

Tribal royal kingdoms in sub-Saharan Africa utilize magnificent objects associated with positions of power and prestige. In the Yoruba culture, possessions of royalty including vestments, canes, thrones, fans and staffs are distinguished by their lavish beadwork. The excellent condition of this beaded tunic indicates that it was worn only for special occasions and ceremonies. Covered in multicolored beads in geometric decorations of alternating vertical panels of interwoven bands and chevron design. The complex patterns attest to the ability of the oba (king) to solve difficult problems. Three-dimensional birds run down the seams under the arms and along the front and back panel. Birds are symbolic of the oba and were believed to help him keep an eye on his kingdom by flying throughout the lands and then reporting back to their master. They also indicate his connection to the spiritual realm. A delicate beaded fringe extends along the garment's hem. Great care and respect were given in the creation of the piece as well as in maintaining it, denoting the importance of the chosen wearer.

SUGGESTED ACTIVITES

www.noma.org/learn

Pattern Prints

Tesselation Arrays







CLASSROOM ACTIVITIES

Graphing a Design

Working individually or in small groups, students will use graph paper to map a multicolored design is also a multiplication array. The design will be square or rectangular. After the design is planned on paper, ask students to write the equation for the array. Next, students will determine area and perimeter of their design. Then, they will figure out the fraction for each color used in the design. When the design and the math are complete, students will construct their design on a wall or desk using Post-it Notes. Math domains: Fractions, Measurement, Number and Operations – Fractions

Place Value Pictures

Students use base-ten paper models to construct an original design. Create an animal, plant or an object and then figure out the number. Use paper base-ten blocks or build scultures from wooden or plastic manipulatives. Math domains: Number Operations – Base Ten.

Shape Portrait

Students will work in pairs to create portraits of a partner. Provide cut out shapes or students will cut shapes from construction paper using templates or free-hand. Each student will need a large sheet of construction paper for the background. Students should lay out all shapes before gluing any paper to the base. Remind students that people are symmetrical. Math domains: Geometry, Ratios and Proportion, Measurement and Data.

What's the angle?

Print color copies of works of art from NOMA's collection or other examples. Ask students to use rulers and compasses to measure shapes and angles within the work. Students then calculate the area and volume for certain shapes. Extend the activity by asking students to use the measurement tools to create their own designs. Math domains: Geometry, Measurement and Data.







Educator Resources



Creating Balance Build mobiles from found objects or foam shapes and wire. Use the Law of Levers to determine the weight and distance required to achieve balance. Younger students may establish balance by trial and error and then measure lengths and distances. Math domains: Measurement, Expressions and Equations.

Pattern Prints Use found objects in geometrical shapes to print on paper or canvas. Jar lids and box tops can be dipped in paint or ink. Cut shapes from sponges or potatoes to add more variety. When the paint is dry students can turn their geometric prints into creatures using googly eyes or markers. Math domains: Geometry, Ratios and Proportional Relationships.

Tessellation Arrays

Using one inch graph paper, students write a multiplication problem with two single digits and two digit answer. Encourage students to choose a problem that they find difficult to remember. Students will write the problem seven times, filling the entire square with the number, the multiplication sign, or the equal sign (this should take six squares). When writing the problem, slide over one square each for the first four problems, and then slide back one square for the remaining three. This will create interlocking tessellation shapes when cut out. Students should write in pencil and then outline the numbers in marker. Next, students will color in the space using crayons or colored pencils finding patterns within the shapes. Math domains: Geometry, Ratios and Proportion, Number Operations.

Overlapping Shapes

Students begin with a half sheet of 8.5" x 11" printing paper. Fold the paper three different times, the folds do not need to be equal. Crease the folds so that they are visible when the paper is unfolded. Use a dark marker to draw over the folds. Color each of the shapes using crayons or markers. The shapes can be solid colors or students can add decorations or patterns. Cut the shapes out of the white paper. On a separate half-sheet of colored paper, students will trace the outline of a circle, oval, or quadrilateral. Then place the cut-out shapes inside of the drawn shape. Shapes will have to overlap in order to fit inside. Math domains: Geometry, Measurement and Data.

Educator Resources









Online Resources

http://artsedge.kennedy-center.org/educators.aspx

http://www.maths2art.co.uk/

http://smithcurriculumconsulting.com/math-in-art/

http://futurescholars.rutgers.edu/FutureScholars/Images/Algebra%20& %20Art.pdf



