STEM to STEAM

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Teacher Resource Packet

SANFORD BIGGERS LOTUS TOOL

About the Artist

Sanford Biggers, who was born in 1970, grew up in South Central Los Angeles and was influenced by the prints that his parents had in their home, including images by important American artists like Elizabeth Catlett, Charles White, John Biggers, and Ernie Barnes. Biggers recalls, "It was largely figurative and Afro-centric images which were influential for me as well as the graffiti that I would see on the streets of Los Angeles and in the train yards."* As a teenager, he discovered the Surrealist paintings of René Magritte, Salvador Dalí, and Max Ernst; he also developed an interest in Buddhist philosophy and spirituality. Over the past decade, Biggers has pursued these diverse interests, exploring the concept of cultural syncretism—the attempt to reconcile contrary beliefs, often while melding practices of different schools of thought—by using his art to combine image, sculpture, video, and music.

*Biography courtesy Brooklyn Museum; quotations of the artist are from Arcy Douglass, "East Meets West: An Interview with Sanford Biggers," PORT, May 15, 2009; accessed at http://www.portlandart.net/archives/2009/05/index.html

About STEAM

STEAM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with artistic works and cultural practices as students apply science, technology, engineering, art and mathematics in contexts that make connections between school, community, personal interests, and the global marketplace.

Elements of STEAM

- Science, which deals with and seeks the understanding of the natural world (NRC, 1996, p. 24), is the underpinning of technology. Scientific processes include "inquiry," "discovering what is," "exploring," and using "the scientific method."
- Technology is the modification of the natural world to meet human wants and needs (ITEA/ITEEA, 2000/2002/2007, p. 7). It includes computers, software learning tools, networking systems, hand-held digital devices, digital cameras, and other technologies, including those not yet developed, for accessing, creating, and communicating information.
- Engineering is the area in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind" (ABET, 2002).
- Art is the expression or application of technology, science, math, and engineering skills and imagination through forms based on culture, personal style, and technique. Forms range from the cultural arts, drawing, painting, sculpture, design, music, and video (NAEA, 1994, p. 32).
- Mathematics is the science of patterns and relationships (AAAS, 1993, p. 23). It provides an exact language for technology, science, art, and engineering.

About Codex

Quilts are based on patterns. Traditional African-American quilts from the 19th century often contained symbols that communicated messages, or told stories. Visual symbols are also used in other subjects such as mathematics and science.

In *Codex*, Sanford Biggers repurposes historical quilts that may have been used on the Underground Railroad as signposts, signaling "stations," or safe houses. These works re-imagine cultural-historical artifacts of the past using materials of the present to consider possible futures.

Visual Language

Artists use symbols and images to communicate messages or stories to viewers. The phrase visual language refers to the idea that communication occurs through visual symbols, as opposed to verbal symbols, or words. Just as people can 'verbalize' their thinking, they can 'visualize' it. A diagram, a map, and a painting are all examples of uses of visual language. Its structural units include:

Visual Elements

Line is a mark with greater length than width. Lines can be horizontal, vertical, or diagonal; straight or curved; thick or thin.

Shape is a closed line. Shapes can be geometric, like squares and circles; or organic, like free-form or natural shapes. Shapes are flat and can express length and width.

Forms are three-dimensional shapes expressing length, width, and depth. Balls, cylinders, boxes, and pyramids are forms.

Space is the area between and around objects. The space around objects is often called negative space; negative space has shape. Space can also refer to the feeling of depth.

Color is light reflected off of objects. Color has three main characteristics: hue (the name of the color, such as red, green, blue, etc.), value how light or dark it is), and intensity (how bright or dull it is).

Design Principles (Motifs)

A visual element is usually a simple shape such as circle, square, diamond, etc. Repeating elements in regular or cyclical fashion can create interest, movement, and/or harmony and unity. Visual elements are usually repeated using one of the geometry transforms:

- Rotation: turning a visual element around a fixed point.
- Translation: moving a visual element as if you were sliding it on a surface.
- Reflection: flipping a visual element as if reflected in a mirror.
- Dilation: scaling the element larger or smaller

How Visual Elements & Design Principles Relate to STEM

The color systems used by scientists and artists are entirely different. An artist will mix blue and yellow **paint** to get a shade of green; a scientist will mix green and red **light** to create yellow. The printed page in a magazine is yet another system.

The repetition of visual elements creates patterns in mosaics, lattices, spirals, waves, stars, fractals, etc. Rhythms in a pattern can be random, regular, alternating, flowing, and progressive.

Many quilt designs are based on the Cartesian coordinate system in mathematics such as making half-square (equilateral) triangles. Biggers' quilts incorporate geometric diagrams and organic shapes in the existing quilts. The merging of the geometric designs, natural forms, and the grid has an indirect connection to STEAM education.

Clockwise from the top right: Gallery view Ringling Museum of Art, "Quilt #30, Nimbus," 2013. Courtesy the artist and Eric Firestone Gallery; "Sugar, Pork & Bourbon," 2013. Courtesy the artist and Massimo De Carlo.

Sanford Biggers' Lotus includes a well-known diagram of a slave ship, repeated in an overlapping circular pattern to create a lotus flower that represents enlightenment, beauty and non-attachment in Buddhism and Hinduism. Biggers explores where stories and symbols from cultural traditions and mythologies overlap.

Questions for Viewing

Engaging with a work of art is a meaningful and lasting experience. The following four-step process encourages close looking and careful thinking with any work of art that you view with your students, either in your classroom or in an exhibition.

LOOK
Take time to look at the work of art.
•   Describe what you see in the artwork. Think about line, color, texture, pattern, and shape. Can you figure out what it is made of, or how it was made?

DESCRIBE
Talk about what you see in the work of art.
•   Write down words or sketch things that come to your mind when you look at the art. Why do the artworks make you think about those words/things?

THINK
Interpret and assign meaning to the work of art.
•   What do you think the artist was trying to communicate through the creation of this work of art?
•   What questions would you like to ask about this artwork? Can you guess at the answers to any of them?

CONNECT
Relate what you see to your own life, or to other works of art or images you have seen.
•   Compare this work of art to other images/objects that you have seen, either in a museum or in your everyday life. How are they similar? How are they different?
•   In one sentence, describe the most interesting thing about this artwork?
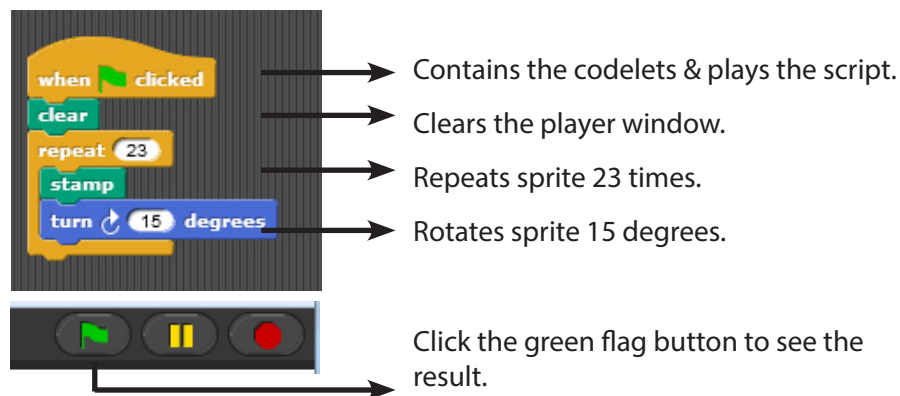
Using the Culturally Situated Design Tool (CSDT)

Codelets are stackable blocks that are used to create designs in the CSDT. A collection of codelets is a "script". Codelets connect to each other, where each transformation has its own block and a slot for the block to be inserted into. A sprite is a shape or symbol. First, launch the software. Next, click "Load Demo" to select a sprite (ex. lotus, rockstar_quilt).

Load Demo button.
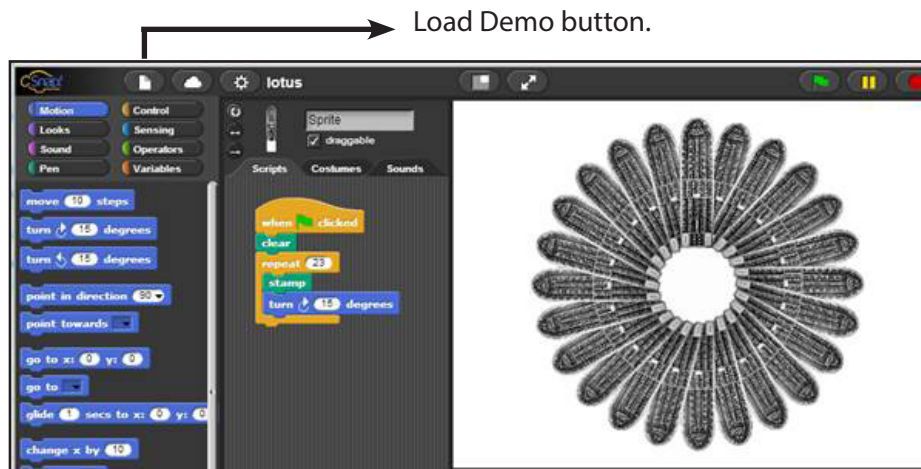
On the far left are blue (codelet) blocks that can be used to simulate the artist's design. Drag and stack the blue blocks in the center area, inside of the "When Clicked" (main) yellow block. You can change the parameters of each block by clicking inside of the white box (field) next to the corresponding label.

Contains the codelets & plays the script.

Clears the player window.

Repeats sprite 23 times.

Rotates sprite 15 degrees.

Click the green flag button to see the result.

Students/users can change blocks and try different transformations or parameters until they create the design they want to save. They can also import their own symbols/shapes and sounds.

Getting Started

Here are the recommended steps to get students started with their projects:

1. Talk about the key concepts (e.g. math, science, visual elements, design).
2. Direct students to look closely at the artwork; use "Questions for Viewing."
3. Give students time to do research about the artwork; or talk about the cultural and historical elements of the artwork.
4. Show students how the CSDT works; give them time to explore the tool.
5. Direct them to create their own designs, save/print or use in group projects such as murals, hanging wall and floor art.

About the Researcher

Nettrice Gaskins is a Ph.D. candidate and researcher in Georgia Tech's Digital Media Program and Experimental Game Lab. Her work investigates culturally situated arts-based learning and new media, their invention, and use in underrepresented, creative communities of practice. This includes the use of new media tools and platforms, and existing cultural art forms. She is a writer/columnist for Art21, the producer of the Peabody award-winning PBS series, Art in the Twenty-First Century. She has other works published online and in Meet Me at the Fair: A World's Fair Reader, scheduled to be published by Carnegie Mellon University's ETC Press. Nettrice's email: **nettrice@gmail.com**

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