

# ***Teaching Numeracy Through the Arts*** ***The Why, Who, What, and How***

**Presenter: Jessica Booth, Fine Arts Program Manager  
Georgia Department of Education**

**Thank you to the following for providing resources and examples:**

Laura LaQualia, Visual Art Director, Cobb County Schools  
Katie Anderson, Fine Arts Director, Paulding County Schools  
Dr. Monika Wiley, Fine Arts Director, Clayton County Schools  
Pamela Walker, Executive Director, ArtsNOW Learning



## *Session Overview*

- \* **WHY** Arts Integration?
- \* **WHO** is doing this in GA?
- \* **WHAT** does it look like?
  - \* **HOW** can I fund arts integration and what supports are there from the GA Department of Education?
- \* **In Practice** = Visualizing Data Activity

# THE WHY?

## The Arts are Essential

“The future belongs to a very different kind of person with a very different kind of mind—creators and empathizers, pattern recognizers and meaning makers. These people—artists, inventors, designers, storytellers, caregivers, consolers, big picture thinkers—will now reap society’s richest rewards and share its greatest joys.”

Daniel Pink, *A Whole New Mind*



# The Arts Increase Achievement in all subjects

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Relationships between the arts and academic and social outcomes are documented.

They include:

1. **VISUAL ARTS** and reading readiness
2. **DRAMATIC ARTS** and conflict resolution skills
3. **DANCE** and nonverbal reasoning
4. **MUSIC** and mathematics proficiency



# A Well Rounded Education

Requires Arts Education – So What is it?



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## 5 CREATIVE SUBJECT AREAS

### MUSIC

- Orchestra
- Band
- Chorus
- Music Tech

### VISUAL ART

- 2D (drawing, painting, printmaking)
- Art History
- 3D (ceramics, jewelry, fashion design, sculpture)

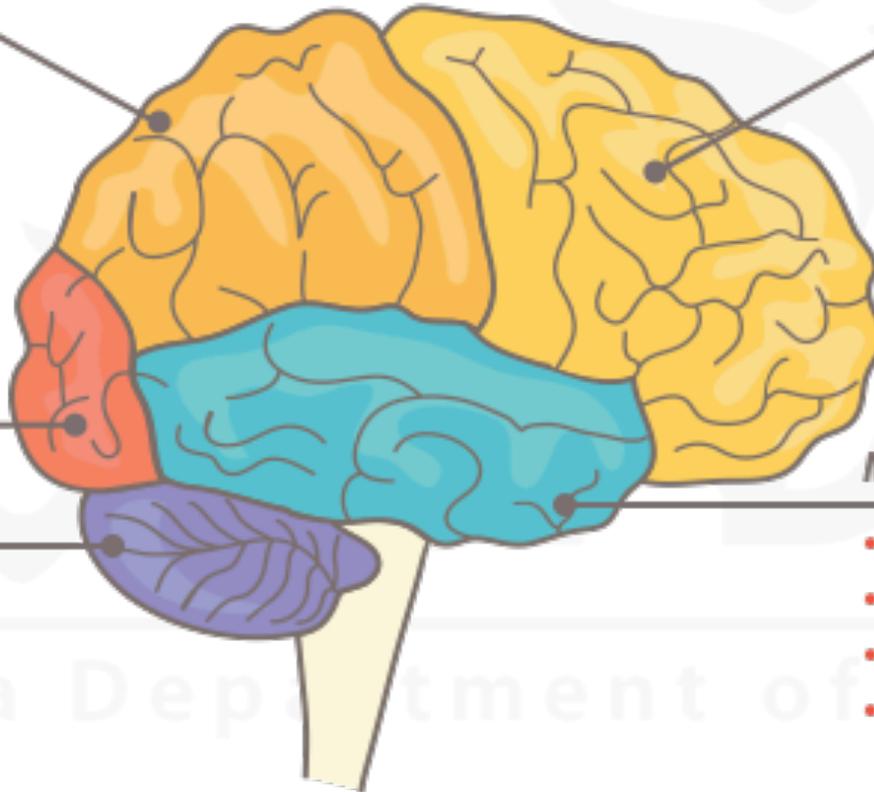
### DANCE

### DRAMATIC ARTS

- Theatre
- Film

### MEDIA ARTS

- Sound Recording
- Animation/Graphics
- Film/Media Graphics
- Lighting Design



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# Types of Arts Learning



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## **Arts Education**

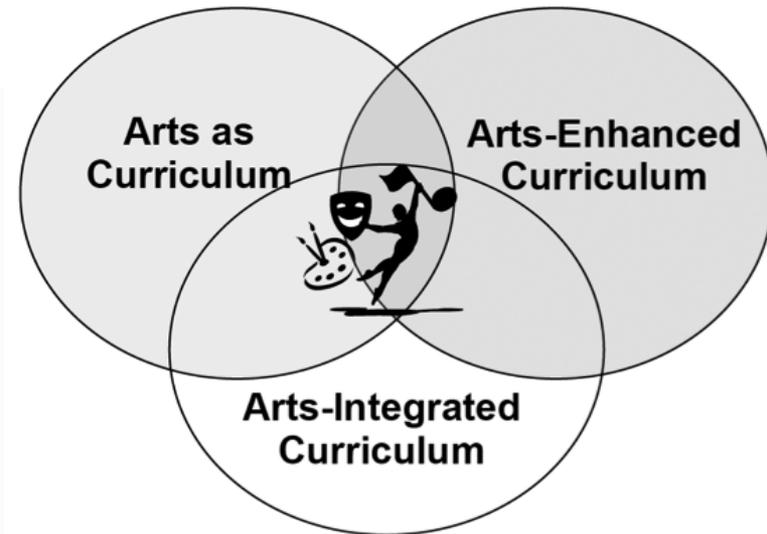
Learning occurs with certified fine arts teachers in designated music, theater/film, dance, visual and media art classes.

## **Arts Enhancement:**

Learning occurs by using the arts to learn another subject.

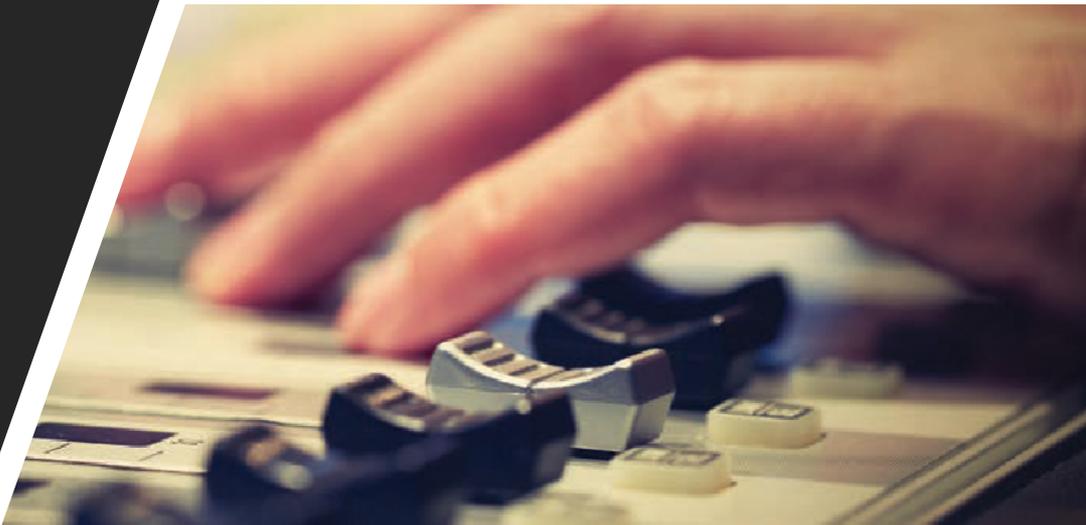
## **Arts Integration:**

Learning occurs when the arts are integrated and are held at the same level of importance as the other standards being used for instruction. Both the arts and the other subject's standards are being taught with **the same level of fidelity**.



# Music has Direct Positive Effect on Math Ability

Second graders who received piano instruction plus practice with a math video game along with math instruction, scored 15 to 41 percent higher on a test of ratios and fractions than second graders who received extra English lessons plus the math video game, and students who received no special lessons in addition to traditional math.





# Visual Art

## Increases Retention

Research shows that when art is used to teach mathematics, it impacts students' understanding and retention of key concepts and vocabulary. Both fields observe, describe, and imitate our natural world.



# Theatre & Dance

Technical Theatre requires students to have a functional understanding of ratios associated with scale drawing, geometry, and angles found in blueprints for architecture.

Lighting Design requires an understanding of angles and a careful measuring of instrument intensity in graphs depicting the amounts of particular wavelengths of light that pass through gel filters.

# THE WHO and WHAT: Examples in Georgia Schools and Systems of Using the Arts to Increase Math Achievement

# Cobb County: GA's Arts Integration Pioneers



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Teaching and Learning Across the Curriculum

**Dance and Music:** Use rhythm, singing and dance with multiplication tables.

**Visual Art:** Drawing out word problems with pictures. Use elements of art to visualize data (complimentary colors, textures, pattern, line, and shape). Look at an artwork to fine angles or create equations to solve. Assigning forms to ones, tens, and hundreds. Students make sculptures to visually represent a number.

**Theatre:** Use an improv game to review a math process. Write and perform a play about addition, multiplication. Write and perform a puppet show about a mathematical process.



Musical Fractions



**Cobb County:**  
**Integrating the Arts with Math**

# Cobb County Schools



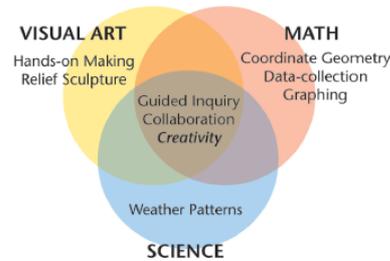
Richard Woods,



## ART THAT INFORMS

Students collaborated on a months-long data-driven project to record and study Marietta's weather. Each vertical row on the multi-media sculpture represents one day's local weather conditions. By organizing and visualizing data, students could see patterns, make connections, and follow up on predictions.

## CROSS-CURRICULAR LEARNING



**KEYS**

SKIES/EVENTS	MOON PHASE
Sunny	Waxing
Cloudy	Waning
Sun/Cloud Mix	Full
Rain	New
Storm/Thunder	Quarter
Snow	

**WIND DIRECTION**

**SAMPLE DAY**

Moon phase  
 High Temp  
 Skies/events  
 Precipitation  
 Low Temp  
 Wind direction

# Cobb County Schools



## **4,000 Thumbprints**

Statistic-Based Sculpture  
Jazmyn Campos  
and Sculpture 1 Class

Teenage texting and driving has had a profound impact on our society. With the constant development of new technology, it's difficult for today's teens to put their devices down, even while behind the wheel.

**An average of eleven teens per day are killed as a result of texting and driving, resulting in approximately 4,000 deaths per year.**

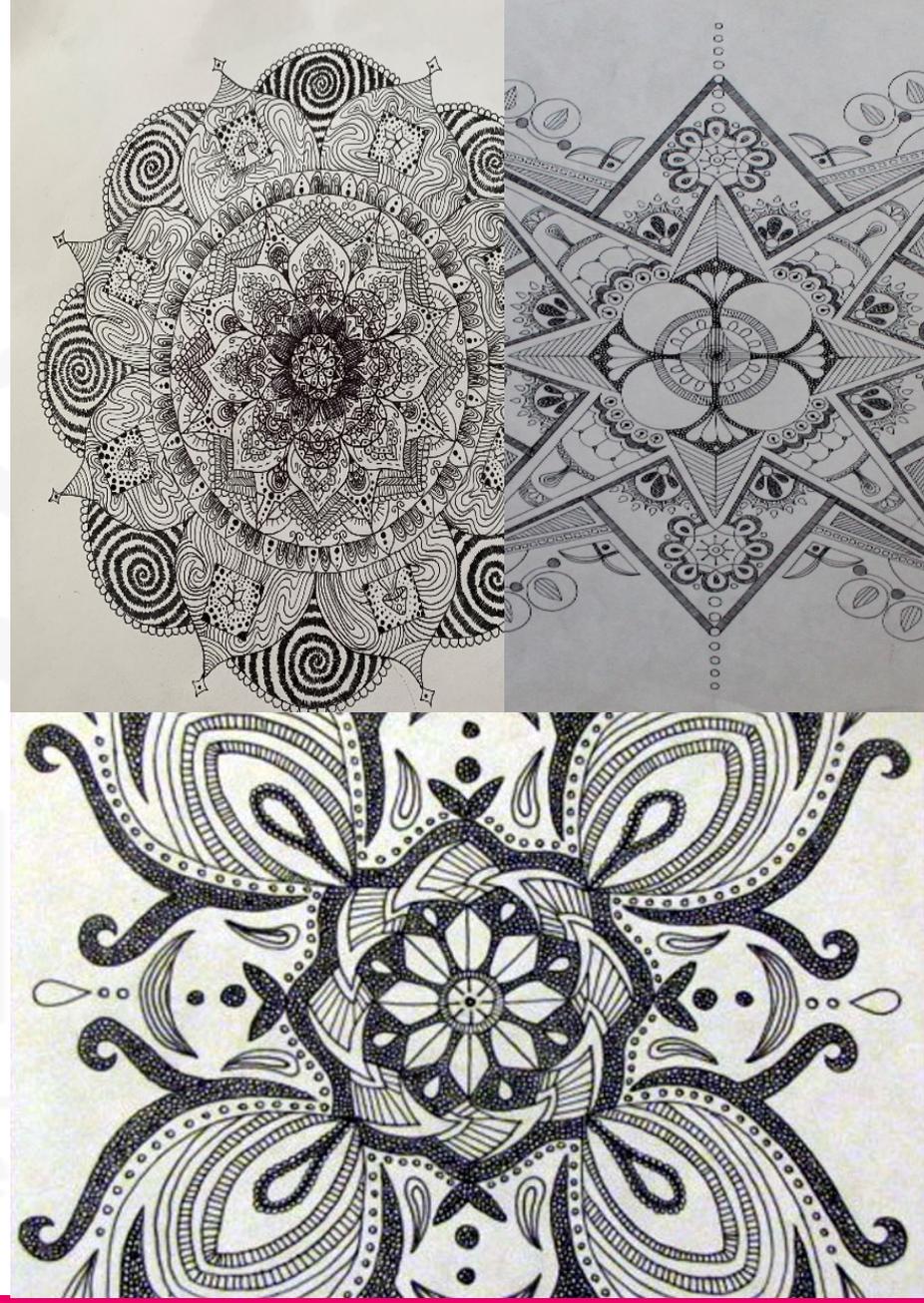
To visually represent the enormity of this problem, each student in our Sculpture class left 200 fingerprints on a car's bumper, resulting in 4,000 fingerprints total. The effect of the car bursting through the wall was created using a variety of found and repurposed materials. The idea behind data-driven artwork is that statistics can be effectively represented in dramatic visual form for greater impact. The purpose of this project was to raise awareness of the dangers of texting and driving through impactful artwork. We hope that we have literally "left an impression" on our peers in hopes of changing mindsets and saving lives.

# Paulding County Schools

## One Teacher Model

### HS Visual Art Mandalas

- Students use compasses, protractors, and rulers to create radially balanced Mandalas. The students first find the center of their paper using a ruler. Then they use a protractor to measure equally spaced angles around the center—their choice of measurement. Then they use compasses to draw circles, curves, and other shapes created by the overlapping and bisection of circles.





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# Paulding County Schools

## HS Visual Art

### Optical Illusions

Students draw a grid over the substrate they will create the drawing on using either a 1:1, 1:2, or 1:4 ratio. Students then look at each box on the original image and draw only what they see in that box on their substrate. Measurements must be exact to replicate the image, or in the case of anamorphic drawings, to help create the 3D illusion.





# Paulding County Schools

# Paulding County Schools

## Printmaking and Ceramics: Tessellations

Students create master tiles from polygons that fit together seamlessly like a puzzle. Depending on how they constructed their master tile, they will rotate and flip the tile to create the tessellation.

Students are introduced to mathematician and artist, M.C. Escher. This is done both in printmaking and in ceramics.



# Clayton County Schools and

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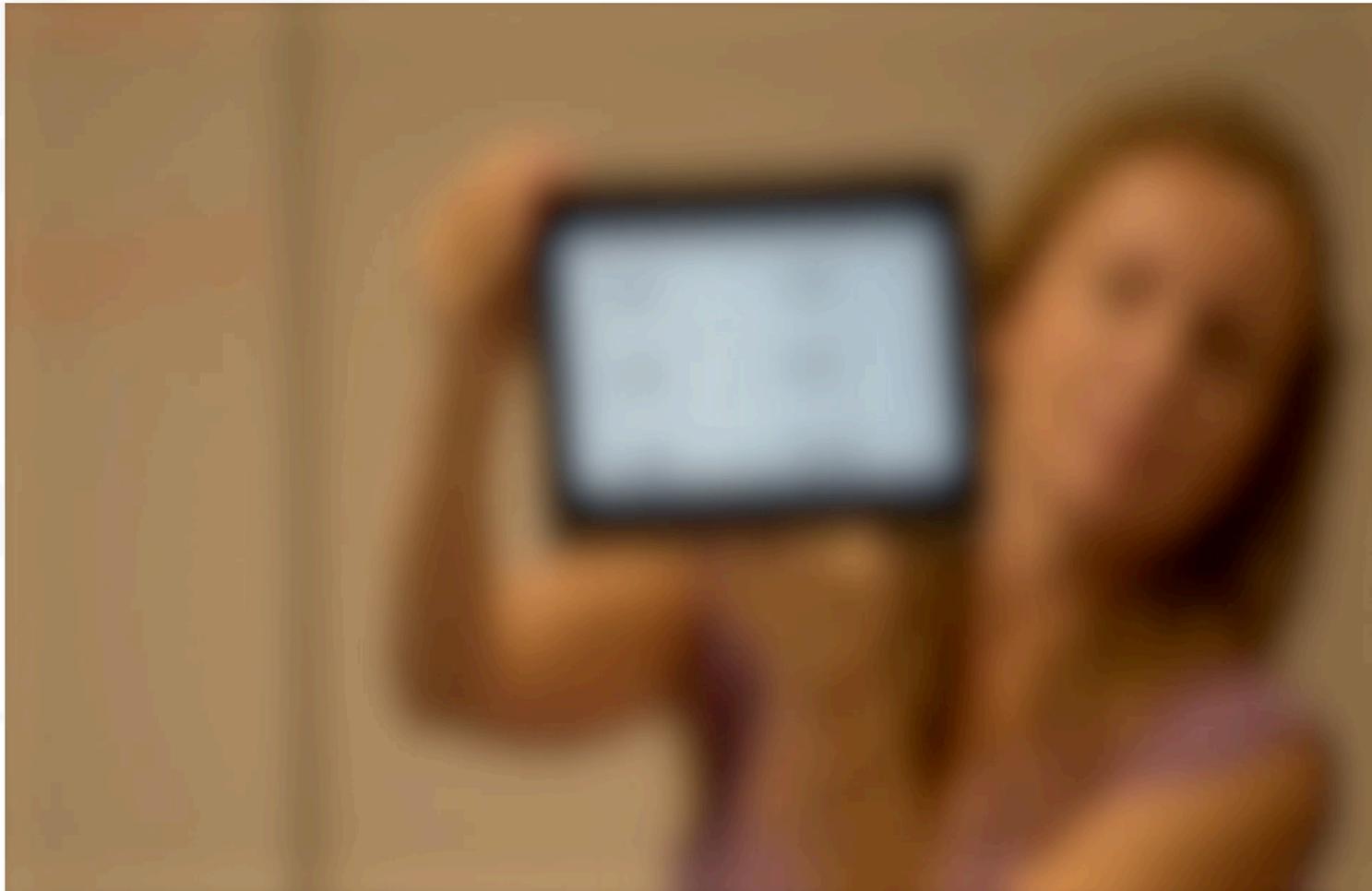
- Ten year arts integration journey that has been funded by Federal Arts Model grants, GOSA Innovation grants, and local funds.
- Schools involved have seen gains in student, teacher, and parent climate surveys and math gains across the board.
- Economically disadvantaged students scored 32% more than peers in “exceeds” category in math; 36% in “exceeds” category in reading; and were twice as likely to “exceed” in Social Studies



# Clayton County Schools and *ArtsNow*® Teaching and Learning Across the Curriculum



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# The HOW: Support from ESSA, GaDOE, and Title I, II, III, and IV A Funding

# The Arts are Integral to a Well – Rounded Education

## Title VIII, Section 8002 - Definitions

“(52) WELL-ROUNDED EDUCATION.—The term ‘well-rounded education’ means courses, activities, and programming in subjects such as English, reading or language arts, writing, science, technology, engineering, mathematics, foreign languages, civics and government, economics, **arts**, history, geography, computer science, **music**, career and technical education, health, physical education, and any other subject, as determined by the State or local educational agency, with the purpose of **providing all students access** to an enriched curriculum and educational experience.”

(I) programs and activities that support educational programs that integrate multiple disciplines, such as programs that combine arts and mathematics; or

(J) other activities and programs to support student access to, and success in, a variety of well-rounded education experiences.

## Inclusion of Arts Integration in ESSA

# GA Strategic Plan



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## Ready to Learn, Live, and Lead



**Ready to Live:** Georgia has the opportunity to expand the definition of readiness to include a more **holistic approach to public education – one that provides fine arts opportunities**, ensures safe and healthy learning environments, prioritizes relevant coursework, and allows stakeholders to become fully engaged.

# How Can ESSA Fund Arts Education and Integration?

## FEDERAL TITLE FUNDS

- **Title I** - Arts Integration can be used as a whole school turn around model.
- **Title II** - funds can provide subject specific training to arts teachers.
- **Title III** - can be used to provide arts resources that increase language acquisition
- **Title IV** - specifically lists funding music and “the arts” – (includes visual and performing arts) as a potential area that can help districts and schools.
- Integrating the arts into other learning programs is also a specified area of support for **Title IV Part A** .
- **Title IV, Part B** also supports enrichment opportunities in music and arts.
- **Title V, Part B** rural education initiative can be used to increase arts education.



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# TITLE IV a CAN BE USED FOR...

- **Staff Positions** to ensure a well rounded education in fine arts. At GaDOE, we added a second Specialist to increase training opportunities through IV Part A.
- **Arts Integration PD** for all academic and arts instructors can be funded through Title I, Title II, and Title IV part A
- **Subject Specific PD for Fine Arts teachers** (includes money for conferences, training, and membership dues to arts education organizations that provide training)
- **Instructional Resources for the Arts** Funded from Title IV Part A by the Georgia Department of Education in the TRL
- **Instruments** for music programs
- **Equipment and Art Supplies for Visual Art** including kilns/venting systems, slab rollers, paper cutters, printing presses, computers carts for graphics, and consumable supplies.
- **Technology** equipment for media arts, film, and theatre
- **Advanced Placement Test Fees in fine arts subjects and teacher training**, to include International Baccalaureate® and the Cambridge International Examinations®

# Examples of Georgia Support for Arts Learning

## Standards updated for more than 460 courses

- Courses were aligned to current careers in our state

## Third Fine Arts Staff Member

- GaDOE has hired a second Fine Arts staff member to create more staff development opportunities across the state. A third is coming.

## Instructional Resources for Arts teachers

- Instructional support for dance, music, theatre & film, visual art, and media arts teachers in the Teacher Resource Link.

## Dramatic Writing I

- First Fine Arts course to count as a required ELA 4<sup>th</sup> course



# Instructional Resources for Teachers



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- **Visual Art:** K-8 Art, Ceramics I, Photography I, Visual Art Comprehensive I, Art History I, Graphics I, Jewelry I, Drawing and Painting I, Sculpture I, Printmaking I.
- **Media Arts:** I (HS)
- **Theatre & Film:** MS 6-8, Acting I, Fundamentals of Theatre I, Advanced Drama I, Theatre 6-8, Tech Theatre I, Musical Theatre I, Acting and Production in Film I, Dramatic Writing I (for Film, Television, and Theatre)
- **Music:** K- 8 General Music, Band I, Orchestra I, Chorus I, Music Technology.
- **Dance:** HS- Modern Dance I, Classical and Contemporary Partnering I, Dance I, Dance for Theatre I, and World Dance I.

# Lesson Plans

Ceramics I: Example Lesson Plan



Ceramics I: Example Lesson Plan

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Course: Ceramics 1		GRADE: High School	UNIT: 3	Lesson Plan: 1
<b>LESSON TITLE: Combined Pinch Pot Lidded Form</b>				
<b>ENDURING UNDERSTANDING:</b> The influence of artists' culture, environment, and personal experiences is evident in the earliest examples of pinch ceramics.		Sample(s) (Right click image to add pictures of student and teacher samples)		
<b>TECHNICAL FOCUS:</b> Students will gain an understanding of the pinch technique with focus on correct wall thickness, control of form silhouette, and stages of dryness through the construction of a functional ceramic lidded form that demonstrates a design that is unified through surface, opening/lid, and handle.				
<b>VISUAL ARTS GSE TO ADDRESS IN UNIT:</b>				
<b>CREATING</b>				
VAHSCR.CR.1 Visualize and generate ideas for creating works of art. ( <i>elements</i> )				
VAHSCR.CR.2 Choose from a range of materials and methods of traditional and contemporary artistic practices to plan and create works of art.				
VAHSCR.CR.3 Engage in an array of processes, media, techniques, and technology through experimentation, practice, and persistence.				
VAHSCR.CR.4 Incorporate formal and informal components to create works of art.				
VAHSCR.CR.5 Reflect on, revise, and refine works of art considering relevant traditional and contemporary practices as well as artistic ideation.				
VAHSCR.CR.6 Keep an ongoing visual and verbal record to explore and develop works of art.				
<b>RESPONDING</b>				
VAHSCR.RE.2 Critique personal works of art and the artwork of others, individually and collaboratively, using a variety of approaches.				
VAHSCR.RE.3 Engage in the process of art criticism to make meaning and increase visual literacy.				
<b>CONNECTING</b>				
VAHSCR.CN.1 Develop personal artistic voice through connecting uses of art within a variety of cultural, historical, and contemporary contexts.				
VAHSCR.CN.2 Develop life skills through the study and production of art (e.g. collaboration, creativity, critical thinking, communication).				
VAHSCR.CN.3 Utilize a variety of resources to understand how artistic learning extends beyond the walls of the classroom.				
<b>ASSESSMENTS:</b> Link to each document with assessment examples with explanations				
<b>DIAGNOSTIC</b>		<b>FORMATIVE</b>		<b>SUMMATIVE</b>
Gauge where students are in their learning prior to beginning the lesson.		Gauge student progress/growth through ongoing and periodic observation and/or checks for understanding.		Gauge student mastery of standards.
<ul style="list-style-type: none"> <li>One-on-one or group in-process critiques.</li> <li>Quizzes or other data-collecting strategies for immediate feedback (Quizlet, Kahoot, etc.).</li> </ul>		<ul style="list-style-type: none"> <li>Critique of student work</li> <li>Visual checks for comprehension</li> </ul>		<ul style="list-style-type: none"> <li>U3LP1 Rubric</li> <li>Student Reflection</li> </ul>

## MAJOR UNIT CONCEPTS AND VOCABULARY

### FOUNDATIONAL INFORMATION:

Basic clay preparation and storage, safe and proper tool/material use, and basic understanding of the stages of dryness of clay for specific purposes.

### CONCEPTS:

- Correct pinch construction technique focusing on wall thickness, form silhouette, scoring/slipping, and intentional surface.
- Beginning understanding of the stages of dryness of clay for specific purposes including joining forms, smoothing, cutting a lid, and attaching a handle.
- Creating visual interest within a unified form.
- Form and function.

### SURFACE TECHNIQUES:

Saggar fire.

### VOCABULARY:

Pinch, plasticity, leather hard, bone dry, green ware, kiln, bisque (ware), score, slip, applique, paddling, and saggar.

### LINKS

CU3L1 Assessments

CU3L1 Pinch Pots PPT

CU3L1 Student Instructions

Demonstration Video <https://youtu.be/YoMyC5Cr7QQ>

### DIFFERENTIATED LEARNING

#### INCREASED RIGOR:

Students needing an extra technical challenge can combine more than 2 pinch pots within a single form or make multiple combined forms. Those students needing a conceptual challenge can create multiples that interact or show a progression.

#### ADAPTED ASSIGNMENT:

Students requiring a simplification can focus on completing and refining a single pinch form or 2 refined pinch forms that are not joined and remain open. For an additional challenge, students can focus on both forms having a unified design (rim shape, attached foot).

### MATERIALS

#### STUDENT SUPPLIES:

- Pencil/Eraser/Journal
- Tools: rib/scrapper, knife, paddle
- Clay/slip/water with brush
- Plastic bag
- Saggar materials-combustible organic materials, aluminum foil

#### TEACHER SUPPLIES:

- Handouts, PowerPoints and Video Presentations
- Journal sample
- Instructor generated project sample.
- Actual or photographed student exemplars showing a range from emerging to mastery

# Rubric Examples



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COURSE: CERAMICS 1			
UNIT 3: PINCH TECHNIQUE		LESSON 1: COMBINED PINCH POT LIDDED FORM	
SUMMATIVE ASSESSMENT RUBRIC			
Criteria	Proficient to Advanced Complexity Level 3-4	Emerging to Proficient Complexity Level 2-3	Unsatisfactory to Emerging Complexity Level 1-2
Planning _____/10	Planning is evidence of real thought and effort. Work is well organized and complete (3 sketches). <b>VAHSCR.CR.1(a), .2, .6(a)</b> <b>VAHSCR.CN.2(b,c)</b>  7-10 Points	Planning is evidence of some thought and effort. Work is somewhat organized and complete.  4-6 Points	Planning shows no evidence of real thought or effort. Work is not well organized and incomplete.  0-3 Points
Construction _____/30	Ceramic form is correctly constructed. Walls are even and correct thickness with no breaking or cracking. Lid works and functions properly. Form and lid are correct size. Form is stable. Basic awareness of stages of dryness is evident. <b>VAHSCR.CR.3(a,b), .4 (b)</b> <b>VAHSCR.CN.1(e)</b>  25-30 points	Form is correctly constructed. Walls are mostly even and correct thickness with little breaking or cracking. Lid is somewhat functional. Form and lid are nearly the correct size. Form is stable.  15-24 points	Form is not correctly constructed. Walls are not even or correct thickness with extensive breaking or cracking. Lid is not functional. Form and lid are not the correct size. Form is not stable  0-14 points
Design _____/30	Form is visually interesting with variation in surface. Design is unique and well executed. Successful application of elements and principles is evident. Form shows evidence of creative problem solving. Form is functional. <b>VAHSCR.CR.3(c,d), .4(a,c)</b> <b>VAHSCR.CN.2(d)</b>  25-30 points	Form is somewhat interesting with some variation in surface. Somewhat successful application of Elements and Principles. Design is somewhat unique and well executed. Form has some evidence of creative problem solving. Form is functional.  15-24 points	Form is not visually interesting with little variation in surface. Elements and Principles have not been successfully applied. Design is not unique or well executed. No evidence of creative problem solving. Form does not function.  0-14 points
Craftsmanship _____/30	Form is well crafted. Surface is intentional. No evidence of nicks, scratches, lumps or dents. The artwork is outstanding and demonstrates a unique level of patience and focus. Surface treatment has been applied correctly and cleanly. <b>VAHSCR.PR.1 (b)</b>  25-30 points	Form is somewhat well crafted. Surface is mostly intentional. Some evidence of nicks, scratches, lumps or dents. Demonstrates some level of patience and focus. Surface treatment has been applied somewhat correctly and cleanly.  15-24 points	Form is not well crafted. Surface is not intentional. Extensive evidence of nicks, scratches, lumps or dents. Demonstrates no evidence of patience and focus. Surface treatment was not applied correctly or cleanly.  0-14 points

## Diagnostic Assessment

COURSE: CERAMICS 1			
UNIT 3: PINCH TECHNIQUE		LESSON 1: COMBINED PINCH POT LIDDED FORM	
DIAGNOSTIC ASSESSMENT			
<b>COMBINED PINCH POT LIDDED FORM CRITIQUE</b>			
Divide class into groups of 4-8 students. Give each group an example of the project. If actual examples aren't available, use images. Examples should demonstrate a range from emerging to mastery.			
			
What is the object? What are the most prominent elements evident in the work (line, color, shape, form, space, texture, value)? List at least 2 and describe how they are used. Example-geometric shape, curved line			
How has the artist demonstrated the principles of design (movement, rhythm, emphasis, proportion, balance, unity, variety, pattern)? List at least 3 and describe how they are used. Example-negative space to create emphasis			
What was the artist trying to achieve? What's the story? What was the artist inspired by? What was he/she trying to communicate?			
Is this form successful? Explain. Consider construction, visual interest, craftsmanship, and functionality.			

\_\_\_\_\_/100



All over the world and throughout history, people have created art as a form of cultural expression associated with celebrations, festivals, and holidays.



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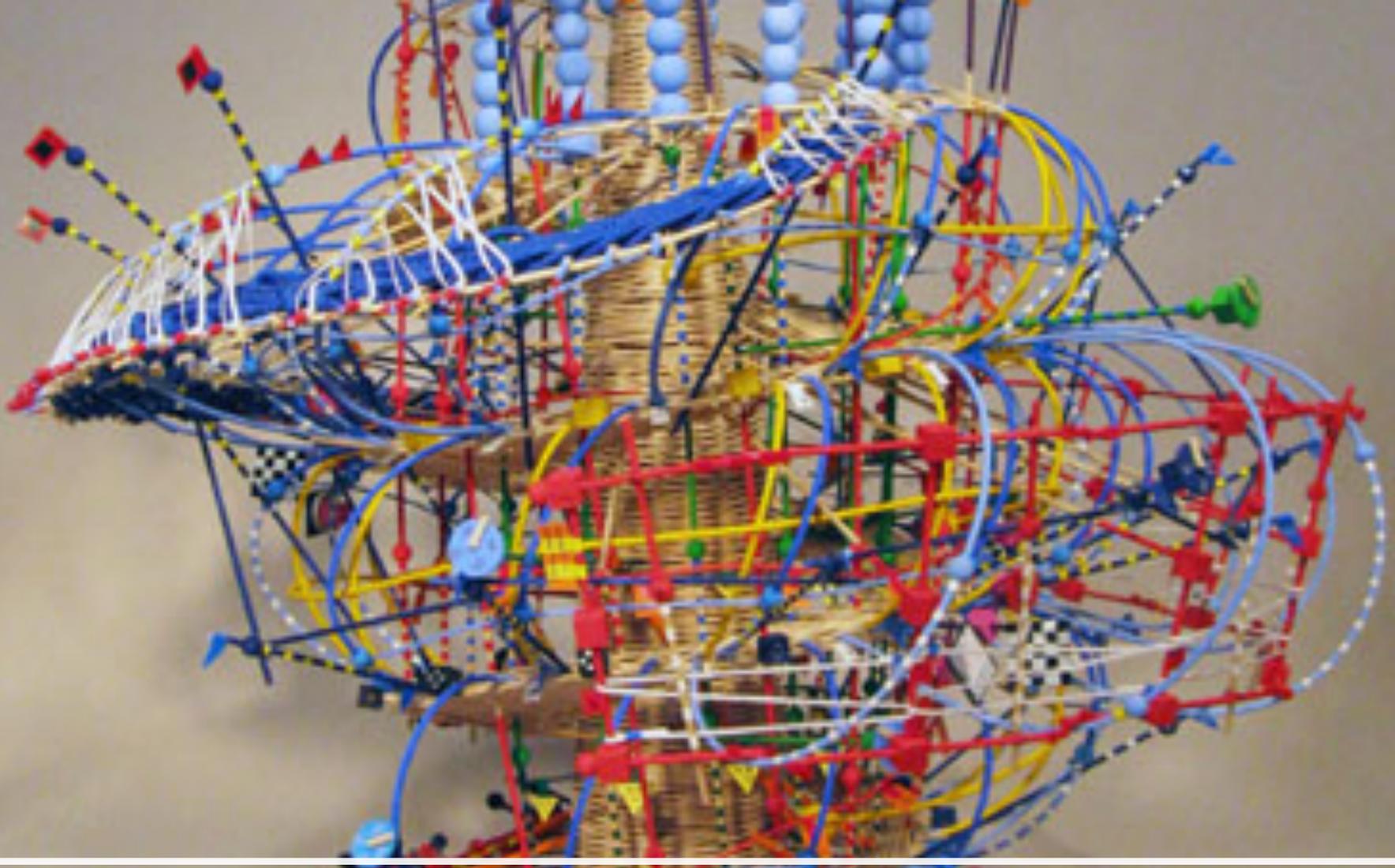
Handmade costume in Brooklyn's annual West Indian Day Parade, which celebrates Caribbean culture.

*Man in Costume*, 2008

Photo by Fordmadoxfraud

[https://commons.wikimedia.org/wiki/File:West\\_Indian\\_Day\\_Parade\\_2008-09-01\\_man\\_in\\_costume.jpg](https://commons.wikimedia.org/wiki/File:West_Indian_Day_Parade_2008-09-01_man_in_costume.jpg)



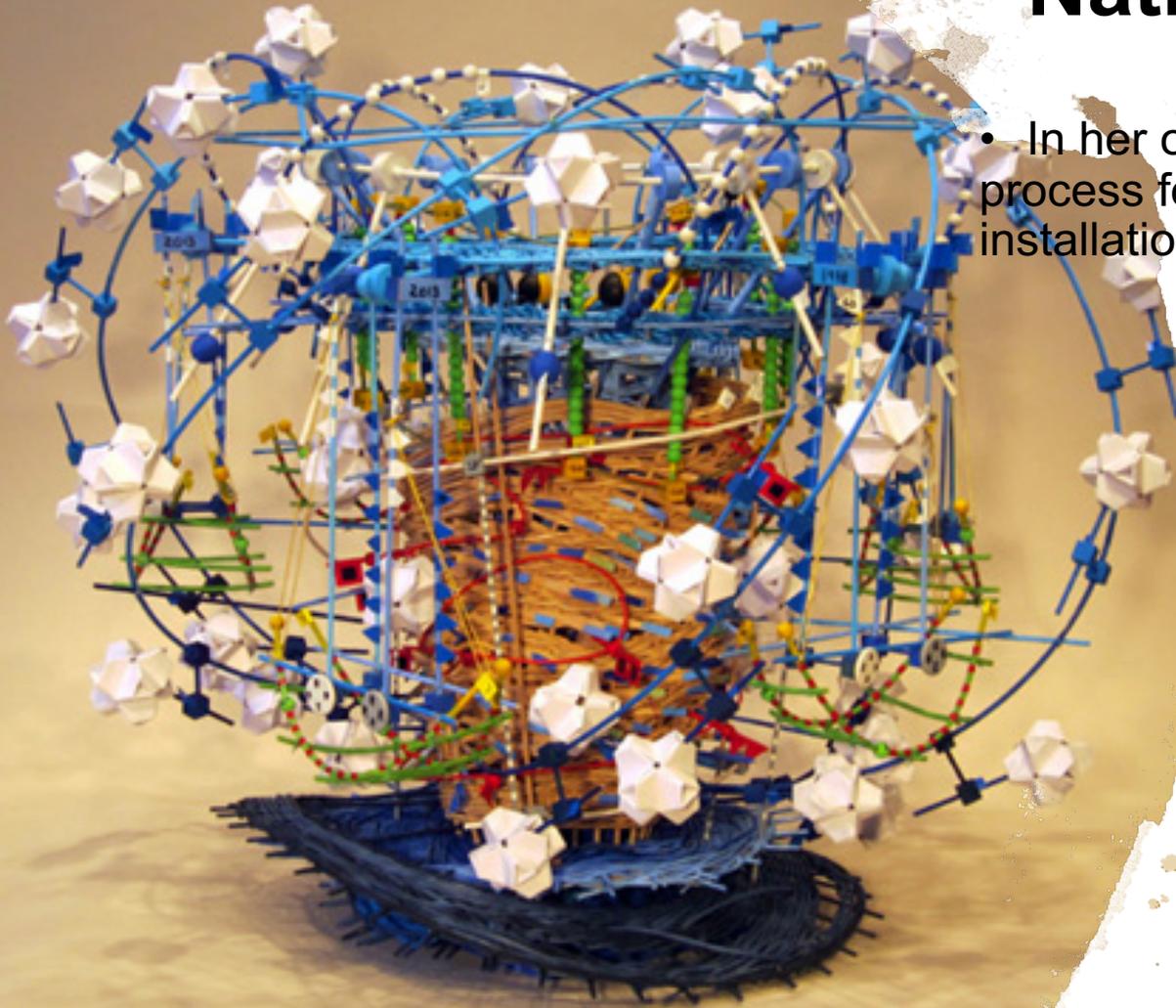


**Creative Installations:  
Showing Data through Art**

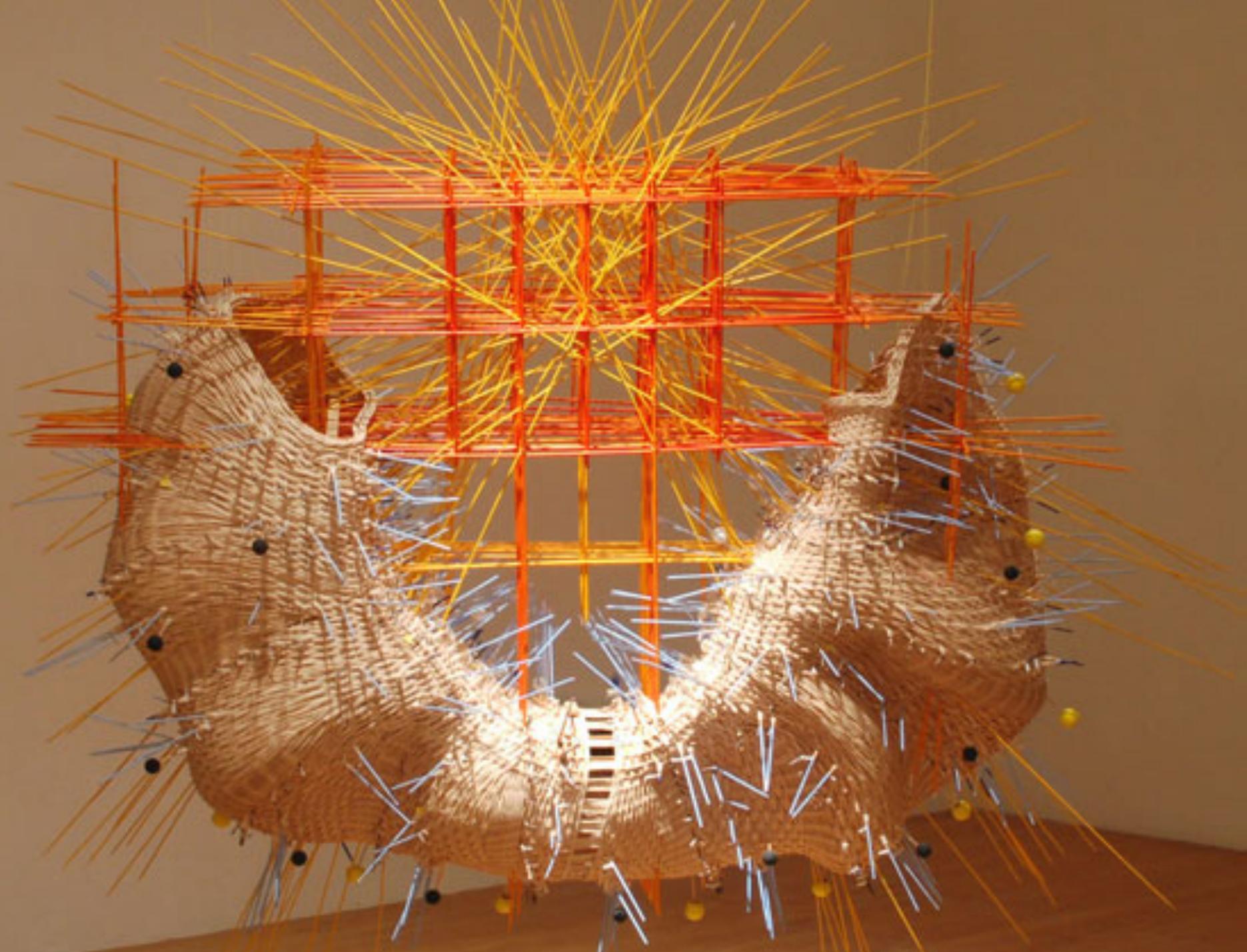


# • Nathalie Miebach

- In her own words describes her process for creating these installations.







HIGHER  
MANAGERIAL  
& PROFESSIONAL  
OCCUPATIONS

10.2%

LOWER  
MANAGERIAL  
& PROFESSIONAL  
OCCUPATIONS

21.9%

INTERMEDIATE  
OCCUPATIONS

10.4%

SMALL EMPLOYERS  
& OWN ACCOUNT  
WORKERS

7.3%

LOWER SUPERVISORY  
& TECHNICAL  
OCCUPATIONS

9.6%

SEMI ROUTINE  
OCCUPATIONS

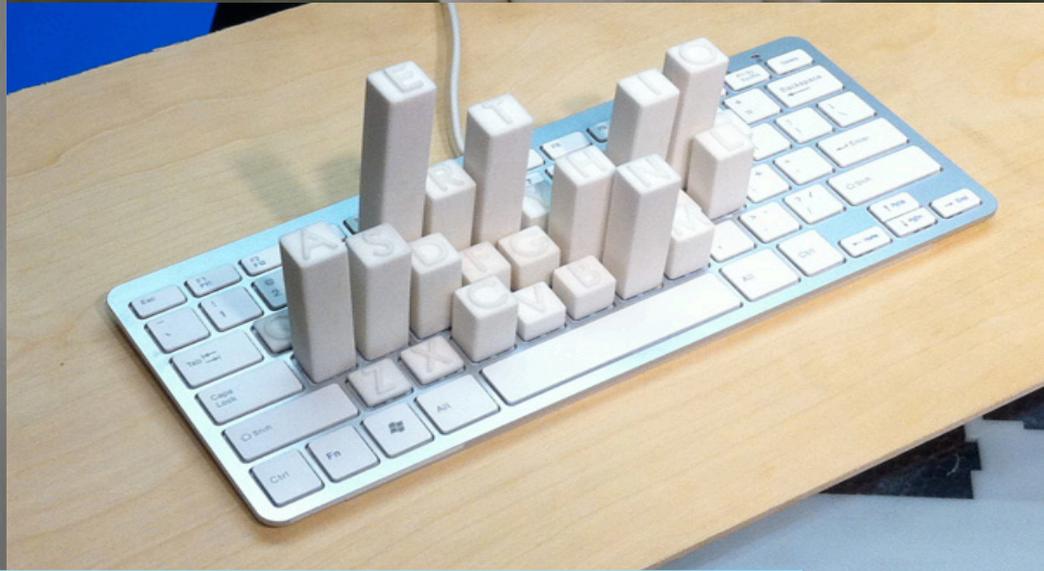
13.0%

ROUTINE  
OCCUPATIONS

10.2%

LONG TERM  
UNEMPLOYED

17.5%



**Jer Thorp**

**Data Artist, Office for Creative Research**

Made to contemplate the global impact of each disease, the artworks are created as alternative representations of viruses to the artificially colored imagery received through the media. In fact, viruses have no color as they are smaller than the wavelength of light. By extracting the color from the imagery and creating jewel-like beautiful sculptures in glass, a complex tension has arisen between the artworks' beauty and what they represent.



Luke Jerram, Glass microbiology



**Stef Lewandowski, “Data Necklace”**



The Data Necklace is a laser-cut, laser-etched acrylic necklace that displays your tweets as a data visualization.



This is a physical three-dimensional cartogram. The map is made of Legos and represents migrant flows into the Americas. One side represents emigration, the other immigration. Each Lego piece represents 10,000 people. Made in collaboration with Sandra Cabello for the exhibition, 200 years redesigned, in Madrid, Spain.

Samuel Granados, “Lego Cartography”

**Indizes is a data sculpture visualizing the stock market indices S & P 500, Dow Jones Industrial and NASDAQ in the year 2008 from January to November.**

**The values are shown on the three peaks of the five rows of polygons.**

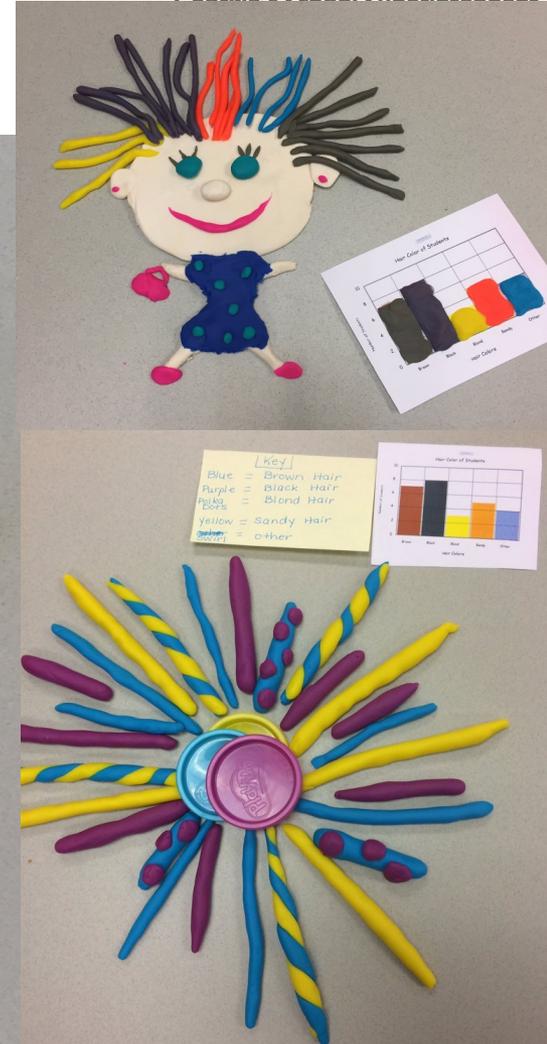


# Now it is your turn...Arts Integration Activity...Data Art



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- Use your smart phone or laptop to find the weather for a city in the US & create an art form that represents the weather for the last 5 days from the items on your table.





# Resources



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Critical Links: Learning in the Arts and Student Academic and Social Development

<http://www.nasaa-arts.org/publications/critical-evidence.pdf>

Report on Learning, Arts, and the Brain:

[http://www.dana.org/uploadedFiles/News and Publications/Special Publications/Learning,%20Arts%20and%20the%20Brain\\_ArtsAndCognition\\_Compl.pdf](http://www.dana.org/uploadedFiles/News_and_Publications/Special_Publications/Learning,%20Arts%20and%20the%20Brain_ArtsAndCognition_Compl.pdf)

Research Article:

J., Horowitz, R., & Abeles, H. (1999). Learning in and through the arts: Curriculum implications. In Champions of change: The impact of the arts on learning (pp. 35–46). Columbia: Columbia University.

PBS Math and Art Resources:

<https://www.pbslearningmedia.org/collection/matharts/>

Arts Integration: <https://files.eric.ed.gov/fulltext/EJ1128967.pdf>

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*The Why, Who, What, and How?*

**Presenter: Jessica Booth, Fine Arts Program  
Manager  
Georgia Department of Education**

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