

## **Artist Kim Keats' introduction to her Unmasking the Art of Geometry lesson plan:**

Many of today's students do not have adequate understanding or mastery of measurement or how to use measuring tools. In addition, students spend most of their time engaged with technology related activities and have limited or underused fine motor skills. This mask making lesson employed manipulative and additive three dimensional techniques that required accurate measuring and fine motor skills. In addition, this project offered opportunities for the students to expand their commitment to learning through creative tasks that utilized critical thinking, innovation, and self-expression.

In the past, I have only taught this project to students in middle and high school studio art classes or in artistically gifted and talented programs. I was surprised at the level of success that St. Helena Elementary 5<sup>th</sup> grade students achieved in their math classroom venue. The students were well prepared by their classroom teacher, Lillie Harris. Time limitations required a very fast pace. I discovered that I needed to develop procedures to oversee glue application since a significant number of the students had difficulty with the task. I was encouraged by the enthusiasm and interest that the students displayed while making the project. The masks and writing responses were displayed in the hallways of both the school site and school district office.



**Teacher Lillie Legree Harris' commentary on arts integration and working with Kim Keats:**



When you use arts integration in any lesson, it's more interesting for the kids, it gets them involved, so that they're not just sitting there. They can create, and when they see the connection, it helps them retain, to remember. I can see that they're most excited when they connect through the arts, they are engaged, and they look forward other activities—when art will be a part, they are more likely to be involved.

I like art, I sing a lot and I appreciate many forms of art, so incorporating is not hard for me to do, but I need Teaching Artists to help me make the connection, to visualize the final product itself.

When saw Kim Keats' work, I saw the geometry connection. Seeing her work helped me envision how it could work in my classroom.

When I worked with heritage scholars Louise Miller Cohen and Ervena faulkner, it was great because as an African-American, it helped me with the conversation with the kids. The students had a lot of questions, they knew of certain things, they had heard of certain medicines, and with the scholars' help, they got answers. We created a conversation.

We have art all around us, we just have to find the ways of putting it into everyday life.

## Unmasking the Art of Geometry

Create rattan and bark paper masks using mathematical measurements and geometric shapes.

**Summary:** Masks have been created by artists throughout recorded history and have been used in rituals, celebrations, and as works of art. Mask making holds a significant place in the traditions of a variety of cultures and employs the use of various materials and techniques that often rely on mathematical properties and measurements.

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**Learning objectives:** Students will:

- Learn how geometry is incorporated in art.
- Use tools to determine mathematical measurements.
- Demonstrate their understanding of geometric shapes and spatial relationships.
- Learn about how the Otomi Indians make Amate bark paper.
- Understand basic weaving techniques.
- Create a mask using rattan and bark paper.
- Discuss or write a descriptive response of the creative process.



### Physical space:

Classroom or art studio with tables, Promethean board (optional), and sinks are needed.

### Materials & supplies needed:

rulers, pencils, measuring tape, scissors, #1 round rattan (reed), 1/2" flat oval rattan (reed), dish pan (for soaking rattan), clothespins (4 per student), Amate bark paper (15"X23"), liquid glue, acrylic matte medium (Modpodge), 1/2" flat paint brushes for glue, 1" flat bristle paint brushes for acrylic medium, raffia

**Staging:**

- Import images on USB (jump drive) to show students on Promethean Board
- Procure and prepare rattan for distribution to students
- Produce a video tape demonstrating how to make the rattan and bark paper mask

**Key skills:****Art-making:**

- Executing and implementing appropriate use of media, techniques and processes
- Generating, planning, and producing works of original art

**Academic:**

- Understanding measurements through mathematical processes
- Organizing and structuring writings using clear focus and sufficient detail

**Vocabulary:**

Geometric Shapes - Shapes according to geometry characterized by straight lines, angles, triangles, circles or regular forms.

Angle – Shape made by two straight lines meeting in a point.

Balance – Principal of design referring to the arrangement of visual elements to create stability.

Symmetry – Similarity of form or arrangement on either side of dividing line or plane.

Asymmetrical Balance – A feeling of balance attained when the units on either side of a vertical axis are actually different but are placed in the composition to create interest.

Unity - A principle of design that relates to the sense of wholeness which results from the successful combination of the elements of art.

Vertical – Line or direction that runs upright and parallel to the shape or form.

Horizontal – Line or direction that runs across and parallel to the shape or form.

Measure – A standard for determining extent, dimensions, capacity, units of anything.

Mask – Coverings that conceal, disguise, transform or represent the faces of individuals often used in rituals or as art objects.

Weave – The interlacing of materials through opposing motions such as over and under, in and out, up and down.

Lash – A basic weaving technique that holds two or more materials together through opposing over and under motions.

Rattan – A climbing palm vine-like material that grows in Asia which can be cut into measured strips and used in the weaving arts (it is often marketed as reed).

Amate Bark Paper (papel amate) – Hand- made paper from the bark of mulberry and fig trees that was developed in the Pre-Columbian Mayan civilization and continues to be produced by a number of indigenous Mexican cultures.

## Handouts & informative resources:

- Websites

<http://www.artisticpapers.com>

<http://www.festivalofmexico.com/sanpablito.htm>

<http://www.masksoftheworld.com>

- Books

Hobbs, Jack, Salome, Richard.

*The Visual Experience*

*Teacher's Edition*. 2<sup>nd</sup> ed.

Worcester, MA: Davis

Publications, Inc., 1995.

Jensen, Elizabeth. *Baskets from Nature's Bounty*.

Loveland, CO: Interweave Press, 1991.

Rosbach, Ed. *The Nature of Basketry*. West Chester,

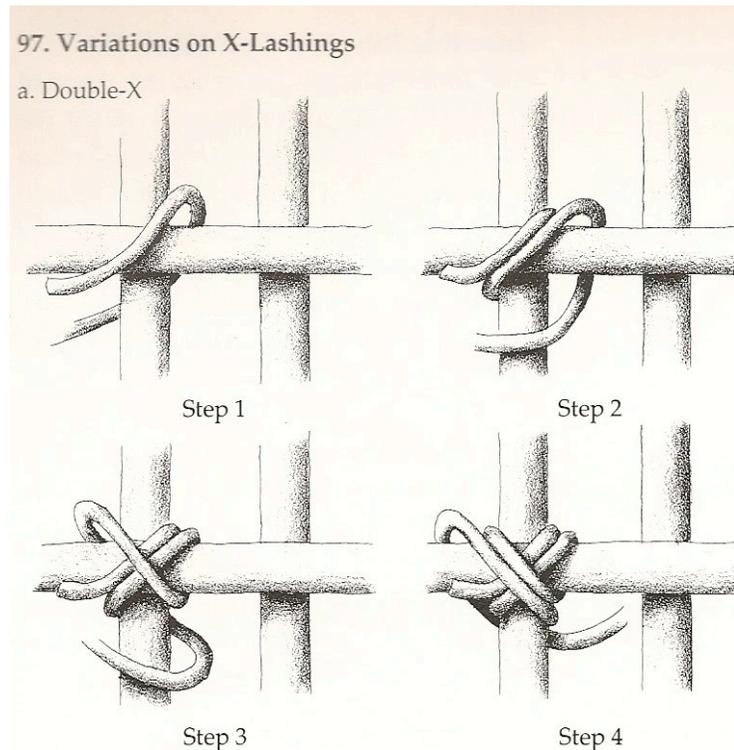
Pennsylvania: Schiffer

Publishing, Ltd., 1986.

- This image as a handout →

X-lashing illustration credit:

*Baskets from Nature's Bounty*



## Instruction:

### Engage

1. Discuss with the students some of the reasons why people began making masks: Questions to consider:

- Why do you think people began making masks?

- What are some of the purposes that the masks served?

- Have you ever made a mask that you can wear?

2. Show students examples of masks from a variety of cultures:

- Using a Promethean Board, show images of masks from indigenous African, South American, North American, and Oceanic cultures that utilize geometric shapes throughout the design.

- Discuss how the mask makers used geometric shapes to depict facial features.

Ask students to identify some of the geometric shapes.

- Discuss some of the materials and techniques used to create the masks and how the artists may have used mathematical measurements to achieve their results.

## Build Knowledge

1. Introduce students to examples of masks made out of lashed rattan and Amate bark paper.

- Show students actual examples of masks made by teaching artist and explain how the masks were created.

- Using a Promethean Board, show participants images of masks made by students who worked with the teaching artist in some of her other classes.



2. Introduce students to materials that will be used in the construction of their masks.

- Show students the rattan weaving material, which is also called reed, and describe how the material grows in Asia and is a climbing palm vine that can grow up to 200 yards in length. It is harvested and cut into measured sizes and shapes and exported all over the world. It is usually soaked in water and woven while the material is wet.

- Show students sheets of Amate bark paper and explain that the paper is made by hand from the bark of mulberry and fig trees. The bark is soaked and cooked, making it soft and pliable. The bark is then pounded with stones and the fibers are smoothed, fused into shapes and allowed to dry. The Otomi culture from the San Pablito region of Puebla, Mexico, continues to make the paper developed in the Pre-Columbian Maya civilization.

3. Introduce students to basic overview of weaving arts.

- Give examples of how weaving techniques were developed more than 12,000 years ago on the North American continent and used to create implements, tools, weapons, shelter, furniture, watercraft, clothing, jewelry, etc.

- Explain how most weaving techniques employ opposite motions like over and under, up and down, or in and out to interlace or hold materials together.

## Apply

1. Executing and implementing the construction of the rattan mask frameworks:

### Step 1-I

- Show students how to use a measuring tape to determine vertical rattan flat oval strips of



mask frame by measuring from top of head to chin; emphasize that the oval side of material must be on outside of mask framework and the flat side of the material must be on the inside of mask framework; add two inches to the measurement and place measuring tape on rattan strips; cut two strips.

- Show students how to measure top horizontal strip of mask framework by using measuring tape to measure from left side of temple to right side of temple; add two inches to the measurement and place measuring tape on rattan strip; cut one strip.

- Show students how to measure bottom horizontal strip of mask framework by using measuring tape to measure from left side of jaw area to right side of jaw area; add two inches to the measurement and place measuring tape on rattan strip; cut one strip.

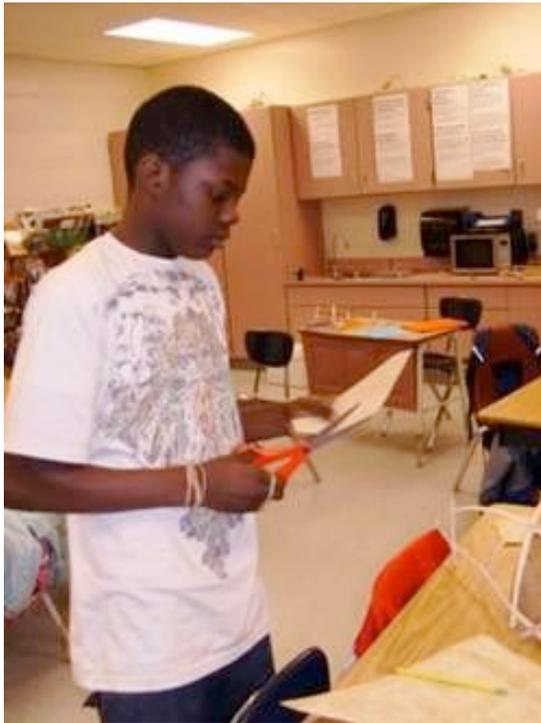
- Distribute measuring tapes, pencils, scissors, clothespins, 1/2" flat oval rattan strips (pre soaked for 10 minutes) to students.

- Direct students to begin making measurements and cutting their strips; encourage students to consider a number of geometric shapes for the outside framework of their masks; provide assistance where needed.

#### Step 1-II

- Show students how to use clothespins to clamp rattan strips together to form mask outside framework; make certain that the strips extend one inch beyond point where clothespins are clamped and that the oval side of material is on outside of mask frameworks and the flat side of material is on the inside of the mask frameworks.

- Direct students to clamp their rattan strips together; provide assistance where needed.



- Show students how to hold mask frameworks up to their faces to determine placement of eyes, nose, and mouth strips and how to measure and cut their rattan strips; explain that the facial features will be open so that it will be possible for the person to see, breathe or speak while wearing the mask; encourage the students to consider a variety of geometric shapes as they plan their designs.

- Direct students to begin generating and planning the placement of their facial feature rattan strips and to execute measuring and cutting them; remind students to allow one inch extension beyond point where clothespins are clamped.

- Direct students to clamp facial feature rattan strips to inside of mask framework; some of these strips will overlap outside mask strips and require re-clamping of clothespins.

### Step 1-III

- Demonstrate for the students how to lash (weave) the #1 round rattan (reed) around the flat oval rattan strips; this lashing will permanently secure the mask framework.
- Distribute pre-soaked #1 round reed to students.
- Direct students to begin lashing their strips; tell students that they will have to remove clothespins before lashing; provide assistance where needed.

### Step 1-IV

- Demonstrate for the students how to shape mask framework to fit the curve of their faces; the frameworks will need to be soaked in water prior to shaping.
- Show students how to wrap the reed (#1 round) weavers around one or more of the one inch extension pieces on outside of the eye, nose or mouth framework strips.
- Direct students to soak their mask frameworks (approximately five minutes); remove from water and allow excess water to drip; then shape the damp frameworks around the curves of their faces and wrap weavers (#1 round reed) around one or more of the extension strips; provide assistance where needed.
- Allow mask frameworks to dry overnight.

## 2. Executing and implementing the application of the Amate bark paper onto the rattan mask frameworks:

### Step 2-I

- Using framework examples, show students how to measure the geometric lashed section shapes that will be covered with the Amate bark paper; indicate that the paper measurement must also include the 1/2" width of the frameworks on all sides of the shapes; explain that each shape will need to be individually measured and cut before being glued and that the students should place numbers on the mask framework sections above each shape being measured.
- Show the students the paper and tell them that they may use one or all of the available colors in their mask designs and to plan how they want to use color to create unity and balance in their



compositions.

- Direct students to begin determining their bark colors and numbering their shapes.
- Examine each student's mask framework and custom cut pieces of bark paper large enough for each student to make final measurements; emphasize the importance of making accurate measurements that are double checked since the paper is handmade and expensive.
- Direct students to cut measured shapes out of their bark paper and to write the numbers on the cut out shapes that correspond to the numbers on their frameworks; tell students that they need to cut out all of their shapes before they begin gluing them to the mask frameworks.

#### Step 2-II

- Demonstrate for the students how to paint glue on the back (flat side) of 1/2" rattan mask frameworks using 1/2" flat bristle brushes; emphasize that the glue must be evenly applied and that each shape has to be glued and attached individually.
- Set up glue stations and direct students to begin gluing and attaching the bark paper shapes to their mask frameworks; assists students where needed.

#### Step 2-III

- Demonstrate for the students how to use 1" flat bristle brush to evenly apply acrylic medium (Modpodge) to bark paper on inside of mask; allow acrylic medium to dry before applying to front side of mask; repeat application to both sides in same order; explain that the medium will make the fragile bark paper stronger and moisture resistant.
- Direct students to apply acrylic medium to their masks; provide assistance where needed.

#### Step 2-IV

- Demonstrate for students how to braid strips of raffia that will be attached to the 1" extension pieces on both sides of their masks; the braided strips need to be long enough so that they can be tied together to hold the masks on their faces.
- Distribute raffia and direct students to begin braiding their strips; provide assistance where needed.

### **Reflect**

- Have students write responses that describe the mathematical processes and creative processes used in the production of their rattan and bark paper masks.
- Have students wear their masks and read from their written responses.
- Have students discuss if they were successful in communicating the information they wanted.
- Have students discuss what they would do differently if they made another mask.

- Have an exhibition of the students' masks and display their writing responses alongside their works.

**Assessment:**

Evaluation Questions

- Did student successfully use measuring tape to measure rattan strips for mask framework?
- Did student successfully use a variety of geometric shapes in their mask design?
- Did student successfully use weaving (lashing) technique to construct their mask framework?
- Did student successfully measure the Amate bark paper and apply it to mask framework?
- Did student use a clear focus and sufficient detail in their writing response?

...rubric on the next page...

Rubric:				
<b>CRITERIA</b>	<b>Ineffective 1 point</b>	<b>Effective 3 points</b>	<b>Outstanding 5 points</b>	<b>Actual Points</b>
Preparation (Following Directions)	The student did not follow directions and was unprepared	The student followed some of the directions and was partially prepared	The student followed all of the directions and was completely prepared	
Participation	The student did very little or nothing in the activity	The student did participate and was involved with the completion of the activity	student showed superior involvement, resulting in completion of the activity exceeding expectations	
<b>Performance Task</b> Observable measurable	The student showed ineffective use of art media and measuring tools	The student showed effective use of art media and measuring tools	The student showed outstanding use of art media and measuring tools	
<b>Performance Task</b> Observable measurable	The student showed ineffective arrangement of geometric shapes to represent facial features in the design of their mask	The student showed effective arrangement of geometric shapes to represent facial features in the design of their mask	The student showed outstanding arrangement of geometric shapes to represent facial features in the design of their mask	
<b>Performance Task</b> Observable measurable <i>To be completed by collaborating teacher</i>	The student's writing response was ineffective in communicating the mathematical and creative processes used to create their mask	The student's writing response was effective in communicating the mathematical and creative processes used to create their mask	The student's writing response was outstanding in communicating the mathematical and creative processes used to create their mask	
	<b>TOTAL</b>	<b>25 Points</b>	<b>Possible</b>	

## **2011 Curriculum standards:**

### Math

5-4: The student will demonstrate through the mathematical processes an understanding of congruency, spatial relationships, and relationships among the properties of quadrilaterals.

5-5: The student will demonstrate through the mathematical processes an understanding of the units and systems of measurement and the application of tools and formulas to determine measurements.

### ELA

5-4: The student will create work that has a clear focus, sufficient detail, coherent organization, effective use of voice, and correct use of the conventions of written Standard American English.

5-5: The student will write for a variety of purposes and audiences.

## **Art standards:**

### Visual Arts Standard

5-1: The student will demonstrate competence in the use of media, techniques and processes.

VA5-1.5: Utilize more sophisticated tool and materials in safe and responsible ways.

VA5-1.6: Determine and describe what media are used within the historical and cultural arts and artifacts that they observe.

5-6: The student will make connections between the visual arts, other arts disciplines, other content areas, and the world.

VA5-6.1: Identify connections between the visual arts and content areas across the curriculum.

student reflection:

**Unmasking the Art of Geometry by Jordan  
5<sup>th</sup> grader at St. Helena Elementary**

Making a mask uses patience and persistence. You have to have exact measurements, or your mask will not turn out right. Here are the steps and other things you will do while making a mask. The lady who taught us to make the masks is Ms. Keats.

The first thing you do when making a mask is, measure the top of your head. Next, you measure the sides and afterwards make a chin piece. Do not forget to hold your mask together with clothes pins. After that you get a lasher and start lashing.

When you are done lashing, you can add other pieces. Make sure all of the pieces that are crossed are lashed down. The materials you use are, rattan, lasher, water and a bucket. Make sure the lashers are wet when you start lashing. There are many shapes like, squares, triangles, rhombuses, quadrangles, trapezoids, pentagons, hexagons, etc. There are many different kinds of masks you can make. They can be ones with ears, a chin, a mouth piece, even a flap open mouth! You can make a mask in many different sizes and shapes and colors.

Masks can be hung on a wall or worn. There are endless possibilities the way a mask can come out. A mask is worn to conceal your identity.

**Unmasking the Arts of Geometry by Imari  
5<sup>th</sup> grader at St. Helena Elementary**

In class we made a mask with Ms. Keats. The materials were rattan, lashing/reed, and amate paper.

The steps were to measure your forehead and the sides. Label them right or left. Then you see what kind of chin you want, triangle or square. Next we cut the pieces you don't need. Then you start lashing your pieces together.

While I was listening and learning I found out that we had to use geometry. We used measurement, division, shapes and also constructions.

Where did all the materials come from and who made it? I also learned about the different colored bark paper. It is really a lot of patience to get this far.

Amate paper was made in Puebla, Mexico. Otomi people made the amate paper. They made the amate paper with tree bark. The bark paper is boiled and soaked overnight until soft so the fiber can be pulled apart. The amate paper can be dyed into different colors or it can be a normal color.

At last we cut the bark paper so that it fits in the places we wanted it to be in. The geometrical shapes I used are rectangles and equilateral triangles. Now we are displaying it in the hallways. Then it is going to be in the art show. Then we take it home.

## **Unmasking the Art of Geometry by Starr 5<sup>th</sup> grader at St. Helena Elementary**

One day Ms. Keats, an artist came to our class. All of my classmates knew why she was there. She was there to teach us how to make a mask. Not just any mask, cool mask.

We began our lesson by drawing shapes that we wanted our mask to have on a piece of paper. We needed to make sure our shapes were even. We also had to listen very well to do our mask the right way. Three reasons we had to listen very well was for example, you could have your mask un-even, or you could have your supplies in wrong places, and last you could make your mask ugly.

Our materials were lashers and rattan. The lasher was used to tighten our rattan together. The rattan was just the outside of our mask. The rattan was very hard and it was brownish. To use our materials it had to be wet so we could bend it. If it was not wet it would probably break.

The steps we used to do this project were first we measured the sides of our face. Then we measured our chin and forehead. After we were done doing that, we had to label all of our pieces so they would not get lost. Then we had to decide how we wanted our chin shape to look like. We also had to know what we wanted our ears to look like. The choices were pointy, little, or even tall and long.

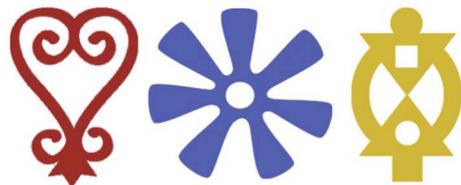
Ms. Keats' main purpose for being here was to teach us more about geometry. Geometry is the branch of mathematics that measures and compares lines, angles, surfaces and solids in space; mathematics in space. We were learning geometry by having the shapes even on the mask. I used geometry by making my shapes even or side to side. It was very hard to make my mask have correct geometry.

The shapes I used were triangles and rectangles. I used four triangles and two rectangles. My mask has 28 angles of which are obtuse, right, and acute.

I enjoyed making the mask a lot. It was something that I had never experienced before. I had fun making my mask with Ms. Keats and my classmates because everyone was happy and excited to do this.

~ end of Unmasking the Art of Geometry.

The Lowcountry Arts Integration Project  
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Model & Dissemination Grant  
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creative learning + wisdom helps me & lets me help you