

Visual Arts and Math Infused Lesson

Lesson Two: *Balancing Positive and Negative Space: Area Animals*

Author: Meredith Essex Grade Level: Third



Enduring Understanding

Creating equal areas of positive and negative space can generate balance in a composition.

Lesson Description (Use for family communication and displaying student art)

Students calculate the area of rectangles and study woven artworks with attention to grid structure, shapes, and balance of positive and negative space. Students then create animal designs on an 8x8 unit grid with half of the area dedicated to positive space for the figure and the other half dedicated to negative space for the background. Students use craftsmanship in adding color to clearly show grid structure and equal balance of space.

Learning Targets and Assessment Criteria

Target: Calculates area correctly.

Criteria: Uses counting or tiling strategies to determine number of square units of a rectangle.

Target: Makes a figure using a grid.

Criteria: Combines squares to make an animal or character.

Target: Balances positive and negative space in composition.

Criteria: Uses equal number of area (1/2 of total square units) for figure as for background.

Target: Uses craftsmanship in drawing.

Criteria: Adds colors and patterns within squares leaving grid lines visible.

Vocabulary	Materials	Learning Standards
<p>Arts Infused: Geometric shape Grid Horizontal Space Vertical</p> <p>Math: Addition Area Half Rectangle Square</p> <p>Arts: Background Balance Composition Craftsmanship Negative space Positive space Unify Weaving</p>	<p>Museum Artworks or Performance</p> <p>Seattle, WA Seattle Art Museum</p> <p>Tacoma, WA Tacoma Art Museum</p> <p>Materials Math manipulatives: 1" counting tiles; White copy paper: 8.5x11", print, do not copy, the 8x8 unit custom grid from the lesson, 3 per student (practice); White cardstock: 8.5x11", print, do not copy, the 8x8 unit custom grid from the lesson (final composition); Drawing pencils: 2H; Vinyl erasers; Rulers; Lyra® large diameter colored pencils; Arts Impact sketchbooks; Class Assessment Worksheet</p> <p>Connections <i>Everyday Mathematics</i> 3.6 – Exploring Perimeter and Area 3.7 – Area 3.8 – Number Models for Area 4.1 – Multiplication Arrays 4.5 – Multiplication Fact Power and Shortcuts <i>continued</i></p>	<p>WA Arts State Grade Level Expectations <i>For the full description of each WA State Arts Grade Level Expectation, see: http://www.k12.wa.us/Arts/Standards</i></p> <p>1.1.2 Elements: Geometric shape 1.1.5 Elements: Positive/negative space 1.1.7 Principles of Design: Balance 1.2.1 Skills and Techniques: Drawing 2.1.1 Creative Process</p> <p>Early Learning Guidelines (Pre-K – Grade 3) <i>For a full description of Washington State Early Learning and Child Development Guidelines see: http://www.del.wa.gov/development/guidelines/ (3rd grade) 6. Learning about my world: Math: Develop an understanding of fractions (e.g. 1/2, 1/4, etc); determine the perimeter and area of rectangles. Arts: Explain own artwork to others.</i></p> <p>Common Core State Standards (CCSS) in Math <i>For a full description of CCSS Standards by grade level see: http://www.k12.wa.us/CoreStandards/Mathstandards/</i></p> <p>3.MD.6. Measure areas by counting unit squares. 3.MD.5. Recognize area as an attribute of plane figures. and understand concepts of area measurement. 3.MD.7. Relate area to the operations of multiplication and addition. a. Recognize area as additive.</p> <p align="right"><i>continued</i></p>

Seattle Art Museum images:
yiQus (coiled basket), 1933-30, Susan
Wawatkin Bedal, 2005.99



Four-cornered Hat with Birds, ca. 500 –
800, Wari, 76.51



CCSS Mathematical Practices

- MP 2. Reason abstractly and quantitatively.
- MP 5. Use appropriate tools strategically.
- MP 6. Attend to precision.
- MP 7. Look for and make use of structure.
- MP 8. Look for and express regularity in repeated reasoning.

ICON KEY:

 = Indicates note or reminder for teacher

 = Embedded assessment points in the lesson

Pre-Teach

Sketchbook Activity: Tape a piece of 1/2" grid paper on a sketchbook page and practice drawing different figures or objects by filling in grid squares. Count the total number of squares for each.

Lesson Steps

1. Warm-Up: Demonstrate and guide calculating the area (number of square units) rectangles drawn on a grid.

 Criteria-based teacher checklist: Uses counting or tiling strategies to determine number of square units of a rectangle.

2. Introduce and guide student math analysis of *yiQus (coild basket)* by Susan Wawatkin Bedal and *Four-cornered Hat with Birds* from Peru from the Seattle Art Museum collection with focus on grids and area. Introduce concept of positive and negative space. Guide discussion of how concept of area and equal balance relates to positive and negative space in artistic compositions.

3. Guide calculating equal amount of positive and negative space for an 8x8 unit design.

4. Demonstrate and guide exploring simple ways to represent a fish, bird, or face of an animal through arranging square pattern blocks and practicing on the gray grid printed on white copy paper. Select a design for figure/animal that equally balances area of positive and negative space.

 Criteria-based teacher checklist: Combines squares to make an animal or character.

5. Demonstrate and guide using craftsmanship to add bright color pencil color to positive space leaving white gridlines visible (so the math is visible) with care to keep balance of equal positive and negative space. Emphasize that although the positive shape animal is squares only, blending, patterns, and details can be creatively developed within those squares.

 Criteria-based teacher checklist: Uses equal number of area (1/2 of total square units) for figure as for background.

6. Demonstrate and guide using craftsmanship to add one consistent color to each of the negative space squares in colored pencil leaving white grid lines visible.

Criteria-base teacher checklist: Adds colors and patterns within squares leaving grid lines visible.

7. Lead criteria-based peer-assessment and group gallery walk reflection.

Criteria-based student self assessment and group reflection: Checks for equal balance of areas of positive and negative space. Reflects on craftsmanship and imagines design as part of a textile.

LESSON STEPS

1. Warm-Up: Demonstrate and guide calculating the area (number of square units) rectangles drawn on a grid.

▣ An image of the three rectangles can be projected or students can be provided a worksheet for calculating area.

- *What does area mean? What does it mean to measure something in square units?*
- *How does a grid help us figure out square units? When we look at these rectangles, what are some strategies we can use for figuring out their area?*
- *Calculate the area of the following rectangles...the last one is important (an 8x8 unit grid will be the size that we are working with in our art later.)*

Criteria-based teacher checklist: Uses counting or tiling strategies to determine number of square units of a rectangle.

2. Introduce and guide student math analysis of *yiQus (coild basket)* by Susan Wawatkin Bedal and *Four-cornered Hat with Birds* from Peru from the Seattle Art Museum collection with focus on grids and area. Introduce concept of positive and negative space. Guide discussion of how concept of area and equal balance relates to positive and negative space in artistic compositions.



Responding to Art in the Classroom



▣ The Seattle Art Museum's collection is available on-line at:

<http://www.seattleartmuseum.org/emuseum/code/collection.asp>. To find the images in this lesson, enter the accession number for the work of art in the search box on the collections page of SAM's website. Accession numbers for these works of art are listed in the materials box on page 1 of the lesson.

▣ Other examples of textiles, looms, clothing and baskets from various cultures can also be shown to illustrate the vertical and horizontal grid format of weaving. Enlarging digital images to show pixels is another strategy to support creating images of grid squares.

- *Think about the grid with rectangles we just worked with. How could the artists of the basket and the hat use a grid to help them make their art?*
- *These artworks were both woven using vertical and horizontal materials. Since that is the basis of looms and weavings, how do you think the weaving artists used math in these artworks?*
- *If a weaver was making a basket or hat with a design, why would they need to calculate area to figure out how to weave it or where certain colors of yarn or materials would go?*
- *What do you notice about this basket: look very closely at the lines and shapes. Where do you see straight edges?*
- *What about the hat? What are some of the geometric shapes that you see? When we look at an enlarged or magnified view of the hat, what do we see? Do we see curved shapes?*

Introduce concept of positive and negative space. Guide discussion of how concept of area and equal balance relates to positive and negative space in artistic compositions.

- *We are going to be thinking of area and positive and negative space. In art, positive space is a shape, object, or figure. Negative space is the space around it. Point to an area of positive space in the hat and the basket. Point to an area of negative space.*
- *What does balance mean? If we balanced positive and negative space in a work of art, what would that mean? (Equal area of positive and negative space).*

3. Guide calculating equal amount of positive and negative space for an 8x8 unit design.

- *Our total area for our art is an 8x8 unit grid. Think back to the third rectangle we looked at and write down the total number of square units for the 8x8 unit rectangle. (64)*
- *If 64 units is our total area and half of that area will be positive space (an animal or figure in our design), what is the total amount of positive space we will have? (32 units) How do you know? $64 \times \frac{1}{2} = 32$*
- *If the other half is negative space or background, how much area will the negative space be? (32 units)*

4. Demonstrate and guide exploring simple ways to represent a fish, bird, or face of an animal through arranging square pattern blocks and practicing on the gray grid printed on white copy paper. Select a design for figure/animal that equally balances area of positive and negative space.

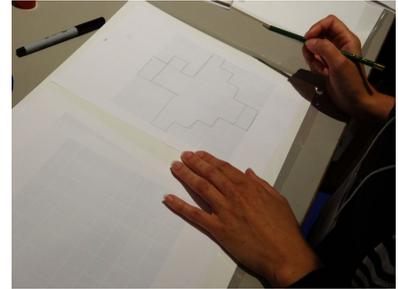


Prompting for Creativity

▣ Enlarging digital images to show pixels is another strategy to support creating images composed of grid squares.

- *Think about animals like the birds on the hat or simple shapes as seen in the basket. Try arranging square pattern blocks to form an animal.*
- *Drawing very lightly, experiment with filling in grid squares (use the practice gray grid printed on white copy paper) to create a bird, fish, animal face, or other character (no curves or shapes that are not made with squares of the grid).*

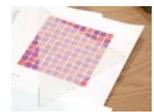
- *Think about your ideas for a turtle, a bird, a fish...or some creature or character you have invented that can be shown using just squares. Select your favorite idea to develop. The tricky part is creating the design so that the area of this animal or character (positive space) is precisely a total of 32 square units and the background (negative space) is also a total of 32 square units. You can use counting or addition to help figure out the area that the animal shapes occupy.*



- *You are making a plan for your final artwork. Very lightly shade in the grid squares that will become your positive space animal or character, count and adjust using your eraser, so that their total area is 32 square units. Check your background to make sure it is a total of 32 units also.*

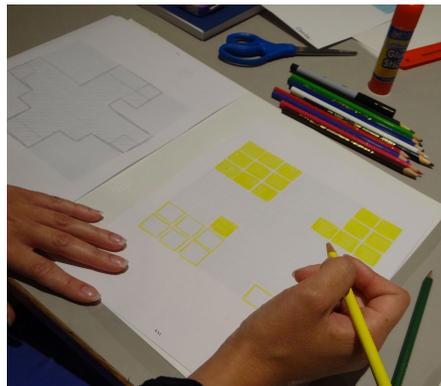
Criteria-based teacher checklist: Combines squares to make an animal or character.

5. Demonstrate and guide using craftsmanship to add bright color pencil color to positive space leaving white gridlines visible (so the math is visible) with care to keep balance of equal positive and negative space. Emphasize that although the positive shape animal is squares only, blending, patterns, and details can be creatively developed within those squares.



Filling in Grid Squares

- *Using your practice grid/plan to guide you, now fill in each of your grid squares for your positive space (figure) with very bright colors on the grid printed on the heavy white cardstock paper. You can also create patterns or blending.*
- *Craftsmanship and mathematical precision are important (imagine if you are designing a weaving). Show your math by leaving the white grid lines visible and filling in gray squares only with color at this point.*



Criteria-based teacher checklist: Uses equal number of area (1/2 of total square units) for figure as for background.

6. Demonstrate and guide using craftsmanship to add one consistent color to each of the negative space squares in colored pencil leaving white grid lines visible.

- *Show your mathematical precision by leaving the white grid lines visible and filling in gray squares with one color only for the negative background space.*

Criteria-based teacher checklist: Adds colors and patterns within squares leaving grid lines visible.

7. Lead criteria-based peer-assessment and group gallery walk reflection.



Guiding Reflecting on Student Art

- *Switch artworks with a neighbor and check for equal balance of the areas of positive and negative space. Calculate area of rectangles within their composition using counting or addition.*
- *Walk around the room and notice craftsmanship. Where do you clearly see the grid squares and the positive and negative space in other artist's work?*
- *How could you imagine your design being a part of a beautiful woven blanket, basket, or article of clothing?*

Criteria-based student self assessment and group reflection: Checks for equal balance of areas of positive and negative space. Reflects on craftsmanship and imagines design as part of a textile.



ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Third Grade Lesson Two: *Balancing Positive and Negative Space: Area Animals*

Teachers may choose to use or adapt the following self-assessment tool.

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH	VISUAL ARTS AND MATH		VISUAL ARTS	Total 4
Concept	Area	Shapes/ Grid	Positive/Negative Space	Craftsmanship	
Criteria	Uses counting or tiling strategies to determine number of square units of a rectangle	Combines squares to make an animal or character	Uses equal number of area (1/2 of total square units) for figure as for background	Adds colors and patterns within squares leaving grid lines visible	
Student Name					

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Third Grade Lesson Two: *Balancing Positive and Negative Space: Area Animals*

CLASS ASSESSMENT WORKSHEET

Disciplines	MATH	VISUAL ARTS AND MATH		VISUAL ARTS	Total 4
Concept	Area	Shapes/Grid	Positive/Negative Space	Craftsmanship	
Criteria	Uses counting or tiling strategies to determine number of square units of a rectangle	Combines squares to make an animal or character	Uses equal number of area (1/2 of total square units) for figure as for background	Adds colors and patterns within squares leaving grid lines visible	
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What was effective in the lesson? Why?

What do I want to consider for the next time I teach this lesson?

What were the strongest connections between visual arts and math?

Teacher: _____ Date: _____

VISUAL ARTS AND MATH LESSON: *Balancing Positive and Negative Space: Area Animals*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We looked at two woven objects: a basket made by a Muckleshoot, Native American artist and an ancient hat from Peru. We noticed how designs on both objects were created using small squares or a grid. We talked about how weavings are created on a vertical and horizontal grid. Weaving artists also need to understand the math concept of area to be able to create their designs. We created animals on a grid through applying our knowledge of area.

- We calculated the area of three rectangles drawn on grids using counting.
- We studied the woven artworks with attention to grid structure, shapes, and balance of positive and negative space. Positive space is the shapes, objects, or figures in a work of art. Negative space is the background, or the space around those elements.
- We created animal designs on 8x8 unit grid paper that were inspired by the weavings we saw. We used math to create our designs so that half of the area was positive space for the figure, and the other half was negative space for the background.
- We used craftsmanship by adding color to clearly show grid structure and equal balance of space in our designs.

At home, you could search for pictures made using grids. Together, you could experiment with enlarging pictures on a computer and noticing and drawing the grid effect of pixels—the color squares that compose digital images. You could also talk about all of the ways that area calculations are used in the work world by carpenters, bricklayers, carpet installers, and others.

Enduring Understanding

Creating equal areas of positive and negative space can generate balance in a composition.