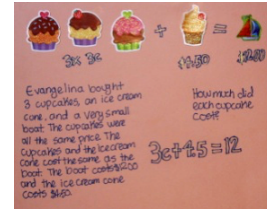


ARTS IMPACT LESSON PLAN

Visual Arts and Math Infused Lesson

Lesson Three: *Picturing Equations: Missing Variable Stories*

Author: Meredith Essex Grade Level: Sixth



Enduring Understanding

A story posing a mathematical problem can be expressed by combining pictures, symbols, writing, and algebraic expressions in a balanced composition.

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

Students analyze and generate ideas for story problems using art as a starting point. Students invent story problems with characters and situations that pose mathematical problems to solve. They explore representing their story problems through images, symbols, writing, and missing variable equations. Last, students create a final composition representing their story problem combining images (in sticker form), descriptive writing, and missing variable equations, then switch compositions with a partner and solve each other's equations.

Learning Targets and Assessment Criteria

Target: Creates a story problem.

Criteria: Invents characters and a situation that pose a mathematical problem to solve.

Target: Illustrates story problem using words and images.

Criteria: Combines symbols, pictures, and writing to communicate a context in sketchbook and final composition.

Target: Writes a missing variable equation for story problem.

Criteria: Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation.

Target: Makes a balanced composition.

Criteria: Arranges elements in all areas of the space.

Target: Solves a peer's missing variable story equation.

Criteria: Uses written and visual information to find the unknown number in equation.

Vocabulary

Arts infused:

Action
Character
Context
Narrative
Symbol

Math:

Algebraic Expression
Equation
Variable

Arts:

Balance
Composition
Illustrate

Materials

Museum Artworks or Performance

Seattle, WA

Seattle Art Museum

Tacoma, WA

Tacoma Art Museum

Materials

Drawing pencil: 4H; Arts Impact sketchbook; Stickers: small, fun pictures (ex.: ice cream cones, puppies, shoes, bananas, basketballs, and lower case letters and number stickers); Card stock: 8.5x11", various colors, cut into 4.25x5.5" pieces, one per student; Pens: fine-tipped metallic, white, and various colors; Class Assessment Worksheet

continued

Learning Standards

WA Arts State Grade Level Expectations

For the full description of each WA State Arts Grade Level Expectation, see:

<http://www.k12.wa.us/Arts/Standards>

1.1.4 Elements: Space
2.3.1 Responding Process
2.1.1 Creative Process
3.2.1 Communicate for Specific Purpose: Illustrate story problem
4.2.1 Connection between Visual Arts and Math

Common Core State Standards (CCSS) in

Math For a full description of CCSS Standards by grade level see:

<http://www.k12.wa.us/CoreStandards/Mathstandards/>

6.EE. Reason about and solve one-variable equations and inequalities.

continued

Seattle Art Museum images:
Codex Chicon Alvarez/Cuando El Oportunista Es Rey En El Barrio las Calles Estan Pavimentadas Con Oro y Sangre (Codex Chicon Alvarez/When the Opportunist is King in the Neighborhood, the Streets Are Paved With Gold and Blood), 1992, Cecilia Concepcion Alvarez, 93.51

A Feast, 2001, Li Jin, 2003.119

A Park In A Room, 1966, Michael Lawson, 68.204



6.EE.6. Use variables to represent numbers and write expressions when solving a real world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.


CCSS Mathematical Practices

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

MP.7. Look for and make use of structure.

ICON KEY:

 = Indicates note or reminder for teacher


 = Embedded assessment points in the lesson

Pre-Teach

Review equivalency and strategies for solving missing variable equations. Facilitate discussion of math story problems and ask students to identify situations in the classroom that could be translated into story problems.


Lesson Steps Outline

1. Introduce and guide art analysis of *Codex Chicon Alvarez/Cuando El Oportunista Es Rey En El Barrio las Calles Estan Pavimentadas Con Oro y Sangre* by Cecilia Concepcion Alvarez, *A Feast* by Li Jin, and *A Park In A Room* by Michael Lawson from The Seattle Art Museum collection. Facilitate discussion about how artists communicate stories through words and images.


 Criteria-based teacher process assessment: Participates in math and art visual analysis.

2. Introduces artistic and mathematical creative process through reflection on prior knowledge about the characteristics of math story problems.

3. Brainstorm story problem ideas with students using silly stickers as inspiration. Document ideas, record expressions, and note missing variable algebraic equations for story problems and examine ways to solve them.

 Criteria-based teacher process assessment: Participates in brainstorming ideas for story problems.

4. Guide students in generating draft ideas for story problems through sketching, writing, and/or mapping out ideas in their sketchbook. Distribute stickers to help generate ideas. Support students in writing missing variable equations for story problem.

 Criteria-based teacher checklist: Invents characters and a situation that pose a mathematical problem to solve. Combines symbols, pictures, and writing to communicate a context in sketchbook. Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation.

5. Guide students in reflecting with a peer on a draft idea for story problem. Demonstrate combining sticker images, symbols, and writing to illustrate a story problem.

Criteria-based peer process assessment: Reflects on story problem idea artistically and mathematically with a partner and refines based on feedback.

6. Guide students in planning and creating story problem composition combining pictures/symbols, written description, and missing variable equation. Encourage students to balance elements in composition, using the whole space.

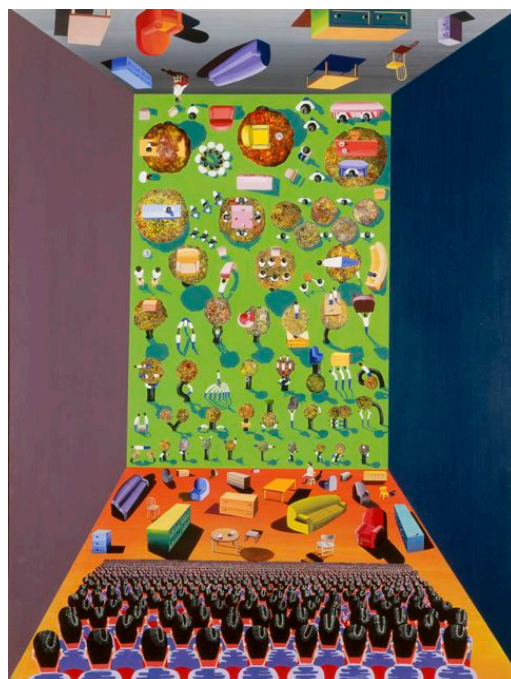
Criteria-based teacher checklist: Combines symbols, pictures, and writing to communicate a context in final composition. Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation. Arranges elements in all areas of the space.

7. Guide criteria-based peer and group assessment.

Criteria-based peer assessment and teacher checklist: Uses written and visual information to find the unknown number in equation. Reflects on process of generating a story problem.

LESSON STEPS

1. Introduce and guide art analysis of *Codex Chicon Alvarez/Cuando El Oportunista Es Rey En El Barrio las Calles Estan Pavimentadas Con Oro y Sangre* by Cecilia Concepcion Alvarez, *A Feast* by Li Jin, and *A Park In A Room* by Michael Lawson from The Seattle Art Museum collection. Facilitate discussion about how artists communicate stories through words and images.



▣ 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 at the beginning of the lesson.

- *How do the artists tell a story or suggest ideas in these artworks?*
- *Who are the characters? What is happening? What clues do you see that support your ideas? What story do you see in Cecelia Alvarez's artwork?*
- *What additional information about the artwork do the titles provide?*
- *In Li Jin's (60 foot!) scroll combining writing in Chinese along with images of food, what do you think is being communicated?*
- *Can you imagine finding a math story problem in one of these pictures? What might that story problem be?*

Criteria-based teacher process assessment: Participates in math and art visual analysis.

2. Introduces artistic and mathematical creative process through reflection on prior knowledge about the characteristics of math story problems.

- *Instead of giving you a story problem to solve, your job today is to invent your own story problem.*
- *What are the characteristics of the math story problems you are familiar with? What sorts of things are often happening in them?*
- *Like any story, there are usually characters, objects, parts of a setting or a context, and some sort of action or interaction.*
- *Often people are making things, buying things, selling things, dividing things up, going places, eating stuff... just like what everybody does every day in math problems.*
- *We are going to each invent a story problem, bring it to life with words and pictures, and then write an algebraic equation for it.*

3. Brainstorm story problem ideas with students using silly stickers as inspiration. Document ideas, record expressions, and note missing variable algebraic equations for story problems and examine ways to solve them.

▣ Teachers can differentiate by identifying equations of varying complexity within the brainstorming process.

- *Let's look to some silly stickers for ideas. We have bicycles, ice cream cones, flowers, butterflies, cupcakes, kitties, spiders, etc.*
- *How can we invent characters and made-up situations involving some of these things?*

- *What if Alfred bought a bicycle and a pet spider for \$72? We know the spider was \$19.50. How much did the bicycle cost? How can we represent this equation or problem to solve? ($b + 19.5 = 72$ where b is the cost of the bicycle.) How do we solve it now? $72 - 19.5 = b$ ($b = 52.5$)*
- *Lets invent a more complicated one: Evangelina bought 3 cupcakes, an ice cream cone, and a very small toy boat. The cupcakes (that were all the same price) plus the ice cream cone cost the same amount as the boat. The boat cost \$12.00, and the ice cream cone cost \$4.50. How much were the cupcakes each? What mathematical equation could we write to represent this problem to solve? ($3c + \$4.50 = \12.00 where c is the cost of the cupcake.) How do we figure out what c is?*
- *One strategy is to "undo" the equation by removing the same number from both sides of the equal sign. If we remove \$4.50 from both sides of the equation, then $3c = \$7.50$. What is multiplied by three to obtain \$7.50? Or what is \$7.50 divided by 3?*

Criteria-based teacher process assessment: Participates in brainstorming ideas for story problems.

4. Guide students in generating draft ideas for story problems through sketching, writing, and/or mapping out ideas in their sketchbooks. Distribute stickers to help generate ideas. Support students in writing missing variable equations for story problem.

- *Think about a situation and character for your story problem. Use our group brainstorming as a point of inspiration. Have some fun with it! Be silly!*
- *Take a look at our sticker choices; we will be combining them with writing in a final illustrated version of our story problem.*
- *In your sketchbook, do not adhere any stickers; identify the ones you will use and sketch, diagram, map, and write notes to help develop your idea.*
- *Write an equation that matches your story problem and solve it. Now write the equation using a missing variable that represents an unknown number. Be sure to indicate what letter represents that missing variable and what that letter stands for.*
- *You will create final illustrations of your story problems on colorful paper using stickers, writing, and equation using decorative pens in a moment.*

Criteria-based teacher checklist: Invents characters and a situation that pose a mathematical problem to solve. Combines symbols, pictures, and writing to communicate a context in sketchbook. Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation.

5. Guide students in reflecting with a peer on a draft idea for story problem. Demonstrate combining sticker images, symbols, and writing to illustrate a story problem.

- *Share your story problem idea and the way you are thinking about representing it both artistically and mathematically with a partner. Have your partner check for correctness of your math. Use their feedback to help refine your ideas.*
- *Select the stickers and edit your narrative/description of characters and situation expressed in the story problem.*

- *You will create a final illustration of your story problem on colorful paper using stickers, a written description of your story problem, and a missing variable expression that represents your story problem. Be sure to indicate what the variable in the story problem stands for.*

Criteria-based peer process assessment: Reflects on story problem idea artistically and mathematically with a partner and refines based on feedback.

6. Guide students in planning and creating story problem composition combining pictures/symbols, written description, and missing variable equation. Encourage students to balance elements in composition, using the whole space.

- *Select a color cardstock paper and plan your composition. Identify where the stickers/symbols that illustrate your story will go, where your written description of characters and situation/context will go, and where you will write your missing variable expression for your story problem.*
- *Think about "balancing" all of the elements of your composition through placement of writing, stickers, and equation so that all parts of the paper are used. Crowding some areas and leaving large gaps in other areas will be less effective visually.*
- *Attach stickers/symbols to illustrate your story problem then carefully add your written description and missing variable equation based on your plan for your composition.*

Criteria-based teacher checklist: Combines symbols, pictures, and writing to communicate a context in final composition. Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation. Arranges elements in all areas of the space.

7. Guide criteria-based peer and group assessment.

- *Switch compositions with a partner and solve their missing variable equation. Check with them for correctness of answer.*
- *Look at the story problem compositions as a group. Where do you see illustrations and/or written descriptions that convey the equation effectively?*
- *As solvers of many story problems in math over your school careers, what were the challenges of inventing and illustrating a story problem instead of just solving one?*

Criteria-based peer assessment and teacher checklist: Uses written and visual information to find the unknown number in equation. Reflects on process of generating a story problem.

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Sixth Grade Lesson Three: *Picturing Equations: Missing Variable Stories*

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH AND VISUAL ARTS			MATH		Total 6
Concept	Story Problems Composition			Missing Variable Equations		
Criteria	Invents characters and a situation that pose a mathematical problem to solve.	Combines symbols, pictures, and writing to communicate a context.		Arranges elements in all areas of the space.	Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation.	Uses written and visual information to find the unknown number in equation.
Student Name		in sketch-book.	in final composition.			

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Sixth Grade Lesson Three: *Picturing Equations: Missing Variable Stories*

CLASS ASSESSMENT WORKSHEET

Disciplines	MATH AND VISUAL ARTS			MATH		Total 6
Concept	Story Problems Composition			Missing Variable Equations		
Criteria	Invents characters and a situation that pose a mathematical problem to solve.	Combines symbols, pictures, and writing to communicate a context.		Arranges elements in all areas of the space.	Combines known numbers, operations symbols, and a variable for an unknown number to represent story problem equation.	Uses written and visual information to find the unknown number in equation.
Student Name		in sketch-book.	in final composition.			
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						
Total						
Percentage						

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: *Picturing Equations: Missing Variable Stories*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We looked at art and talked about how an image can be interpreted as a story, and how words in a title or integrated into the art itself can reveal meaning.

- We talked about the characteristics of story problems based on our prior knowledge. We brainstormed different ideas for story problems with focus on characters and situations that pose a mathematical problem to solve.
- We figured out how we could write and solve missing variable equations that represent story problems.
- We created our own story problem using silly stickers to inspire us. We created a draft idea for representing our story problem through mapping out ideas, writing a description, and creating a missing variable equation to represent the problem.
- We planned and created a final balanced composition using stickers, symbols, a description of our problem to solve, and a missing variable equation to represent our story problem.
- We switched compositions with a partner and solved their story problem using their composition as a guide.

At home, you could identify real life situations that could become a story problem and create pictures and equations to represent them. You could create fantasy story problems featuring invented characters and futuristic situations that require concrete math knowledge to solve.

Enduring Understanding

A story posing a mathematical problem can be expressed by combining pictures, symbols, writing, and algebraic expressions in a balanced composition.