

Dance and Math Infused Lesson

Lesson Two: *Constructing and Deconstructing Dancing Puzzle Shapes*

Author: Debbie Gilbert Grade Level: Kindergarten
 Reference: Sue Grote, Grant Center for the Expressive Arts, *Subtracting Puzzle Shapes (Some and Some Went Away)*



Enduring Understanding

Addition and subtraction can be represented by adding to and taking away from numbers, shapes, objects, or dancers.

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

In this math and dance lesson, students observe addition and subtraction with objects and dancers. They add one dancer at a time until five dancers construct a puzzle shape by freezing over, under, around, through, or beside the other dancers, then subtract one dancer at a time to deconstruct the puzzle shape. Students perform and reflect on the connection between addition and subtraction in dance and math. They solve equations that correspond to the number of dancers in the puzzle shapes.

Learning Targets and Assessment Criteria

- Target:** Demonstrates addition by constructing a puzzle shape with a group.
Criteria: Adds to a shape by dancing in when given a numerical cue, and freezing over, under, around, through, or beside four other dancers.
- Target:** Demonstrates subtraction by deconstructing a puzzle shape with a group.
Criteria: Takes away from a shape by floating away when given a numerical cue.
- Target:** Solves addition and subtraction equations that correspond to the number of dancers.
Criteria: Adds and subtracts to show how many dancers are in each puzzle shape.

Vocabulary	Materials	Learning Standards
<p><u>Arts Infused:</u> Add to Take away from</p> <p><u>Math:</u> Addition Subtraction</p> <p><u>Arts:</u> General Space Movement Puzzle Shape Shape</p>	<p><u>Museum Artworks or Performance:</u></p> <p>Seattle, WA Pacific Northwest Ballet UW World Series of Dance</p> <p>Tacoma, WA Broadway Center for the Performing Arts</p> <p>Materials Math manipulatives: connecting cubes; <i>Math Dances</i> CD by Debbie Gilbert; <i>Music for Creative Dance, Volume IV</i>, by Eric Chappelle; CD player; White board or chart paper & markers; Class Assessment Worksheet</p> <p align="center"><i>continued</i></p>	<p>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</p> <p>1.1.1 Elements: Shape, Space 1.4.1 Audience Skills 2.1.1 Creative Process 2.2.1 Performance Process 2.3.1 Responding Process 4.2.1 Connection between Dance and Math</p> <p>Early Learning Guidelines (Pre-K – Grade 3) For a full description of Washington State Early Learning and Child Development Guidelines see: http://www.del.wa.gov/development/guidelines/ (Age 4-5) 6. Learning about my world: Math: find the sum when joining two sets of up to five objects; follow simple directions for position. Arts: show creativity and imagination. (Age 5 and K) 6. Learning about my world: Math: add and subtract numbers up to 10 using objects or drawings. Arts: develop skills for movement.</p> <p align="center"><i>continued</i></p>

Pacific Northwest Ballet images:
Company dancers in Annabelle Lopez
Ochoa's *Cylindrical Shadows*



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Common Core State Standards (CCSS) in Math

For a full description of CCSS Standards by grade level see:
<http://www.k12.wa.us/CoreStandards/Mathematics/default.aspx>

K.OA. Understand addition as putting together & adding to;
understand subtraction as taking apart & taking from.

K.OA.1. Represent addition and subtraction with acting out
situations, verbal explanations, expressions, or equations.

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

Practice the *Math BrainDance*, see lesson step 3. Practice addition and subtraction in writing and with manipulatives.

Lesson Steps Outline

1. Introduce adding and subtracting with dance and math. Display photographs of professional dancers demonstrating subtraction.

2. Review agreements for appropriate dance behavior. Chart student responses.

3. Lead students in *Math BrainDance* warm-up.

Music: "Math BrainDance (Kindergarten)" #1, *Math Dances* by Debbie Gilbert

4. Demonstrate constructing a puzzle shape using a group of five volunteers.

Music: "Totem Pole" #13, *Music for Creative Dance, Volume IV*, by Eric Chappelle

5. Demonstrate deconstructing a puzzle shape with the five volunteers.

Music: "Totem Pole" #13, *Music for Creative Dance, Volume IV*, by Eric Chappelle

6. Guide students in groups of five to construct and deconstruct a puzzle shape. Cue students by number to add to and take away from the shape.

 Criteria-based process assessment: Adds to a shape by dancing in when given a numerical cue, and freezing over, under, around, through, or beside four other dancers. Takes away from a shape by floating away when given a numerical cue.

7. Direct students in performance of constructing and deconstructing the puzzle shapes. Discuss performer and audience behavior. Facilitate response to performances.

 Criteria-based teacher checklist, peer assessment: Adds to a shape by dancing in when given a numerical cue, and freezing over, under, around, through, or beside four other dancers. Takes away from a shape by floating away when given a numerical cue.

8. Lead a reflection connecting addition and subtraction in dance and math. Write equations to illustrate the addition and subtraction in the dance.

Criteria-based reflection, teacher checklist, self-assessment: Adds and subtracts to show how many dancers are in each puzzle shape.

LESSON STEPS

- ▣ Prepare the classroom for dance.



Moving Desks/Set-up

1. Introduce adding and subtracting with dance and math. Display photographs of professional dancers demonstrating subtraction.

- *Today, we will do dance and math at the same time. We'll be Dancing Mathematicians! Dancing Mathematicians ask questions, explore new ideas, and solve problems.*
- *We are going to be adding to and taking away from – doing addition and subtraction with our bodies.*
- *First, let me add and take away with cubes. Here are five connecting cubes. I am going to start with one cube and connect another cube to it. How many cubes do I have? How do you know?*

- ▣ Repeat process of connecting and questioning until all five cubes are connected.

- *Now, I'll take away one of the cubes. How many cubes do I have? How do you know?*

- ▣ Repeat process of disconnecting and questioning until all five cubes are taken away.

- *Now, let's do that with dancers. I need a volunteer. I need another volunteer to stand behind the first dancer. So we have added one dancer. How many dancers do I have? How do you know?*



Prompting for Creativity

- ▣ Repeat process of adding dancers until five dancers are standing in a line.

- *Let's ask the dancer at the end of the line to go back and sit down with the rest of the class. So we've taken away one dancer. How many dancers do I have? How do you know that's true?*

- ▣ Repeat process of subtracting dancers until all of the students are sitting down.

- ▣ You may use these photos: Pacific Northwest Ballet: Company dancers in Annabelle Lopez Ochoa's *Cylindrical Shadows*. You could also choose to find your own photos that represent a variety of styles and cultures. You could review, for example, The UW World Dance Series, <http://uwworldseries.org>.



- Here are two photographs of dancers from the Pacific Northwest Ballet in puzzle shapes. How many dancers are in the first picture? How many dancers are in the second picture? How many dancers were taken away?
- We will be dancing puzzle shapes today by adding dancers and taking dancers away.

2. Review agreements for appropriate dance behavior. Chart student responses.

- Remind me, how can you be creative and safe at the same time?



Movement Safety

3. Lead students in **Math BrainDance warm-up.** (BrainDance originally developed by Anne Green Gilbert, www.creativedance.org, reference: *Brain-Compatible Dance Education*, video: *BrainDance, Variations for Infants through Seniors.*)

Music: "Math BrainDance (Kindergarten)" #1, *Math Dances* by Debbie Gilbert

- The BrainDance is designed to warm up your body and make your brain work better at the same time. Notice how we use numbers in the BrainDance.



BrainDance by Artist Mentor

Breath

- *Dancing Mathematicians, breathe quietly.*



BrainDance by Students

Tactile

- *Tap from the top of your head all the way to your toes. We'll count by ones to twenty: 1, 2, 3 ... 20.*

Core-Distal

- *Grow into a big square shape and shrink into a small square shape.*

Head-Tail

- *Curl your backbone forwards and backwards and from side to side. We'll count by tens to one hundred: 10, 20, 30 ... 100.*

Upper Half

- *The top half of your body will move and the lower half will freeze. Draw circles in the air with your arms, your shoulders, and your head.*

Lower Half

- *The lower half of your body will move and the upper half will freeze. Draw rectangles with your feet, your knees, and your legs.*

Body-Half Right

- *Move the right side of your body while the left side is frozen. We'll count backwards from 10: 10, 9, 8 ... 1.*

Body-Half Left

- *Move the left side of your body while the right side is frozen. We'll count backwards from 10: 10, 9, 8 ... 1.*

Eye-Tracking

- *Focus on your right thumb. Move it from one side to the other and up and down. Watch your left thumb moving from side to side and up and down.*

Cross-Lateral

- *Reach across your body up high, up high, down low, down low. We'll count by tens to one hundred sixty: 10, 20, 30... 160.*

Vestibular

- Turn, then freeze in a triangle shape. Turn, then freeze in a square shape. Turn, then freeze in a rectangle shape. Turn, then freeze in a trapezoid shape.

Breath

- Breathe quietly, *Dancing Mathematicians*.

4. Demonstrate constructing a puzzle shape using a group of five volunteers.

Music: "Totem Pole" #13, *Music for Creative Dance, Volume IV*, by Eric Chappelle



Constructing a Puzzle Shape

Write the equation on the board and read the equation each time you add a dancer. For example, write $0 + 1 = 1$, and say, *zero plus one equals one*.

- *I need five volunteers. I will give each of you a number (1, 2, 3, 4, 5) and then call you to add into the shape by your number. We are going to create a puzzle shape with addition. We will construct it by adding on one dancer at a time. In a puzzle shape, the dancers do not touch.*
- *We begin with zero dancers in our shape.*
- *Dancer #1, dance in. You can tiptoe, jump, stomp, skitter, or do another **general space** movement to dance in and then make a big shape with open spaces. So we have one dancer.*
- *Dancer #2, dance in and make shape that is over, under, around, through, or beside the other dancer. We had one dancer and added one. How many dancers do we have? How do you know?*
- *Dancer #3, dance in and add to the shape. We had two dancers and added one. How many dancers do we have? How do you know?*
- *Dancer #4, dance in and add to the shape. We had three dancers and added one. How many dancers do we have? How do you know?*
- *Dancer #5, dance in and add to the shape. We had four dancers and added one. How many dancers do we have? How do you know?*

When you ask students, "How do you know?" encourage them to use a variety of strategies for adding.

5. Demonstrate deconstructing a puzzle shape with the five volunteers.

Music: "Totem Pole" #13, *Music for Creative Dance, Volume IV*, by Eric Chappelle



Deconstructing a Puzzle Shape

Write the equation on the board and read the equation each time you subtract a dancer. For example, write $5 - 1 = 4$, and say, *five take away one equals four*.

- *Now, we'll use subtraction. We have five dancers in our shape.*
- *Dancer #5, float away. We had five dancers and took away one. How many dancers do we have? How do you know?*
- *Dancer #4, float away. We had four dancers and took away one. How many dancers do we have? How do you know?*

- *Dancer #3, float away. We had three dancers and took away one. How many dancers do we have? How do you know?*
- *Dancer #2, float away. We had two dancers and took away one. How many dancers do we have? How do you know?*
- *Dancer #1, float away. We had one dancer and took away one. How many dancers do we have? How do you know?*

■ When you ask students “How do you know?” encourage them to use a variety of strategies for subtracting.

6. Guide students in groups of five to construct and deconstruct a puzzle shape. Cue students by number to add to and take away from the shape.

- *I'll divide you into groups of five and give each of you a number.*
- *We'll use addition by adding dancers to build our puzzle shape.*
- *Then, we'll use subtraction by taking away dancers from our puzzle shape.*
- *I'll call your number, starting with one, to dance in and add to the puzzle shape.*
- *Then, I'll call your number, counting backwards from five, to float and take away from the puzzle shape.*

☑ **Criteria-based process assessment:** Adds to a shape by dancing in when given a numerical cue and freezing over, under, around, through, or beside four other dancers. Takes away from a shape by floating away when given a numerical cue.

7. Direct students in performance of constructing and deconstructing the puzzle shapes. Discuss performer and audience behavior. Facilitate response to performances.

- *What is the job of the audience?* (For example: sit with quiet voices and bodies; watch the performers; notice what happens when you add or subtract a dancer; clap when they are done.)
- *What is the job of the performers?* (For example: do your best; dance into your shape when your number is called, freeze, and float away when your number is called the second time; take a bow at the end.)
- *I am going to invite one or two groups at a time to demonstrate adding to the puzzle shape and then taking away from the puzzle shape.*
- *Audience, watch their dance. When they are done, I'll ask you to tell me what you saw, describing the shapes and movements that they did.*



Performer and Audience Expectations

☑ **Criteria-based teacher checklist, peer assessment:** Adds to a shape by dancing in when given a numerical cue and freezing over, under, around, through, or beside four other dancers. Takes away from a shape by floating away when given a numerical cue.

8. Lead a reflection connecting addition and subtraction in dance and math. Write equations to illustrate the addition and subtraction in the dance.

- *Dancing Mathematicians, how did we do addition today? Turn and talk with someone close to you. How was it different from the way we have done addition in math? How was it the same?*
- *How did we do subtraction today? Turn and talk with someone close to you. How was it different from the way we have done subtraction in math? How was it the same?*
- *To connect with our math study, I am going to write the equations again to show how we added to the shape and subtracted from the shape today. This time you can help me solve them. $1 + 1 = \square$, etc.*

▣ Decide how you would like to ask your students to show their understanding, e.g. vocally, hold up fingers, white boards, number cards.

- *The next time you add and subtract in math, remember how you added to and took away from the puzzle shapes by using your whole body. It will help you do better in math.*

▣ You could repeat this exploration by adding and subtracting more than one dancer at a time.

Criteria-based reflection, teacher checklist, self-assessment: Adds and subtracts to show how many dancers are in each puzzle shape.

ARTS IMPACT LESSON PLAN Dance and Math Infusion

Kindergarten Lesson Two: *Constructing and Deconstructing Dancing Puzzle Shapes*

CLASS ASSESSMENT WORKSHEET

Disciplines	DANCE/MATH	DANCE/MATH	MATH	Total
Concept	Shape Addition	Shape Subtraction	Addition and Subtraction	3
Criteria	Adds to a shape by dancing in when given a numerical cue, and freezing over, under, around, through, or beside four other dancers.	Takes away from a shape by floating away when given a numerical cue.	Adds and subtracts to show how many dancers are in each puzzle shape.	
Students				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
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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 dance and math?

Teacher: _____

Date: _____

DANCE AND MATH LESSON: *Constructing and Deconstructing Dancing Puzzle Shapes*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We talked about how both mathematicians and dancers can use objects or dancers to demonstrate adding and subtracting.

- We observed addition and subtraction with connecting cubes and with dancers.
- We did the Math BrainDance to warm up our brains and bodies.
- We constructed puzzle shapes by adding one dancer at a time to freeze over, under, around, through, or beside the other dancers.
- We used subtraction to take away one dancer at a time from the shape.
- We performed the puzzle shapes for each other.
- We solved equations that matched the number of dancers in each puzzle shape.

At home, you could add and subtract with blocks, coins, or other objects. Ask your child to show you how to add to and subtract from a puzzle shape.

Enduring Understanding

Addition and subtraction can be represented by adding to and taking away from numbers, shapes, objects, or dancers.