ARTS IMPACT LESSON PLAN

Dance and Math Infused Lesson

Lesson Three: *Fraction Problem Dances*
Author: Debbie Gilbert   Grade Level: Fifth

Enduring Understanding
Adding and subtracting fractions can reveal the part necessary to complete the whole.

Lesson Description (Use for family communication and displaying student art)
In this math and dance lesson, students consider how choreographers use fractions to invent their dances. They explore making sharp body percussion sounds and smooth movements. They solve the following word problem and use it to create small group dances: The choreographer has been asked to create a dance for the dance company. The dance will have a pattern that is a total of 10 counts long. The pattern will have two parts: sharp and smooth. The sharp body percussion part is 2/5th of the pattern. How many counts is the sharp body percussion part? How many counts is the smooth full-body movement part?

Learning Targets and Assessment Criteria

Target: Solves a fraction word problem.
　　Criteria: Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts.

Target: Choreographs a dance based on a word problem.
　　Criteria: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

Vocabulary	Materials	Learning Standards
Arts Infused: Pattern Math: Addition Fractions Subtraction Arts: Body percussion Choreographer Contrast Energy Movement Sharp Smooth	**Museum Artworks or Performance** **Seattle, WA** Pacific Northwest Ballet UW World Series of Dance **Tacoma, WA** Broadway Center for the Performing Arts **Materials** *Math Dances* CD by Debbie Gilbert; CD player; Computer with internet connection and projector; White board, document camera, or chart paper & markers; 8.5x11" white copy paper: copy Fraction Problem Dances Choreographer's Worksheet, one per student; Writing pencils; Class Assessment Worksheet	**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* 1.1.3 Elements: Energy 1.2.1 Skills and Techniques: Focus and Concentration 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 **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* 5.NF. Use equivalent fractions as a strategy to add and subtract fractions. 5.NF.2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using equations to represent the problem. **CCSS Mathematical Practices** MP.1. Make sense of problems & persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.
	continued	

Pacific Northwest Ballet images:
Noelani Pantastico in Jean Christophe
 Maillot's *Roméo et Juliette*

Company Dancers in George
 Balanchine's *Serenade;* Choreography
 ©The George Balanchine Trust

James Moore and Choreographer
 Marcko Goeke in rehearsal for *Place a Chill*

©Angela Sterling

Video
Urban Bush Women BOLD: 2010
Summer Leadership Institute
Culminating Performance excerpt
*http://www.youtube.com/watch?v=2elOmIx
dC8g*

Soledad Barrio & Noche Flamenca
*http://www.youtube.com/watch?v=OSUmgB
coflE&list=UUjUbO8PDLWwuhnXKgbmqZ6Q*

The Moroccan Project, excerpt, Alonzo
King LINES Ballet
*http://www.youtube.com/watch?v=n5NcPI4
pvoU*

ICON KEY:
🗐 = Indicates note or reminder for teacher
☑ = Embedded assessment points in the lesson

Pre-Teach

Practice the Math BrainDance, see lesson step 3. Explore adding and subtracting with fractions.

Lesson Steps Outline

Day One

1. Introduce solving a fraction word problem to plan the choreography of a dance using smooth and sharp energy. Analyze photographs or video of professional dancers using the two types of energy.

2. Remind students about agreements for appropriate dance behavior.

3. Lead students in *Math BrainDance* warm-up.
Music: "Math BrainDance (Fifth Grade)" #6, *Math Dances* by Debbie Gilbert

4. Guide exploration of sharp body percussion and smooth full-body movement.
Music: No accompaniment for the body percussion, "Smooth Cinquain" #15, *Math Dances* by Debbie Gilbert

☑ Criteria-based process assessment: Makes patterns of body percussion movements. Moves smoothly using the whole body.

5. Read the word problem and discuss strategies for solving it. Distribute worksheets and pencils. Ask students to solve the problem on their worksheets.

☑ Criteria-based teacher checklist, self-assessment: Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts.

6. Demonstrate creating a Fraction Pattern Dance.
Music: "Fraction Pattern Dance" #16, *Math Dances* by Debbie Gilbert

7. Guide students as they create Fraction Pattern Dances in small groups of 4-5.
Music: "Fraction Pattern Dance" #16, *Math Dances* by Debbie Gilbert

☑ Criteria-based teacher checklist: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

8. Lead reflection.

☑ Criteria-based self-assessment and reflection: Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts. Makes a connection between dance and math.

Day Two

1. Prepare students for rehearsing their dances. Review the word problem.

2. Remind students about agreements for appropriate dance behavior.

3. Lead students in *Math BrainDance* warm-up.
Music: "Math BrainDance (Fifth Grade)" #6, *Math Dances* by Debbie Gilbert

4. Support students as they refine and rehearse their Fraction Pattern Dances.
Music: "Fraction Pattern Dance" #16, *Math Dances* by Debbie Gilbert

☑ Criteria-based teacher checklist, self-assessment: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

5. Facilitate performance of Fraction Pattern Dances and response. Review performer and audience expectations.

☑ Criteria-based teacher checklist, peer assessment: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

6. Lead reflection.

☑ Criteria-based reflection: Makes a connection between dance and math.

LESSON STEPS_____

Day One

▤ Prepare the classroom for dance.

Moving Desks/Set-up

1. Introduce solving a fraction word problem to plan the choreography of a dance using smooth and sharp energy. Analyze photographs or video of professional dancers using the two types of energy.

- *Choreographers, or the inventors of dances, use math to plan their dances. They use fractions to decide which part of the dance is one type of movement and which part of the dance is another type of movement.*

▤ You may use these photos: Pacific Northwest Ballet dancers to illustrate smooth and sharp energy: Noelani Pantastico in Jean Christophe Maillot's *Roméo et Juliette,* Company Dancers in George Balanchine's *Serenade*, and James Moore and Choreographer Marcko Goeke in rehearsal for *Place a Chill*. You could also choose to find your own photos or video that represent a variety of styles and cultures. Look for dancers that are moving with smooth and sharp energy.

- *We will be creating dances with a pattern of two types of movement: smooth energy and sharp energy. Here is a photo of a dancer from Pacific Northwest Ballet, a photo of three dancers, and a photo of a dancer and a choreographer. Where do you see smooth energy? Where do you see sharp energy? How do you know?*

▤ If you choose to use video, show one or more of the following video clips of professional dancers. Ask students to identify when the dancers are moving with sharp energy or smooth energy. If time is limited, you could do this part of the strategy on another day.

Urban Bush Women BOLD: 2010 Summer Leadership Institute Culminating Performance excerpt
http://www.youtube.com/watch?v=2elOmIxdC8g

Soledad Barrio & Noche Flamenca
http://www.youtube.com/watch?v=OSUmgBcoflE&list=UUjUbO8PDLWwuhnXKgbmqZ6Q

The Moroccan Project, excerpt, Alonzo King LINES Ballet
http://www.youtube.com/watch?v=n5NcPI4pvoU

- *Dancing Mathematicians, before we create our movements, we will solve a word problem that that will tell us which part of the pattern is sharp body percussion and which part of the pattern is smooth movement with our full bodies. But first, we need to prepare our brains and bodies to think and move.*

- *Let's do some math to warm up our brains for working with fractions. I'll notate our thinking and our solutions on the board.*

- *If my first type of movement is 5/7 of the dance, what fraction is the rest of the dance? What did you subtract to figure it out? If my dance is a total of seven counts, and my first movement is 5/7 of the dance, how many counts is the first movement? How many counts is the second movement? How do you know?*

- *If my first type of movement is 3/4 of the dance, what fraction is the rest of the dance? If my dance is a total of eight counts, and my first movement is 3/4 of the dance, how many counts is the first movement? How many counts is the second movement? How do you know?*

2. Remind students about agreements for appropriate dance behavior.

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

Movement Safety

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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 (Fifth Grade)" #6, *Math Dances* by Debbie Gilbert
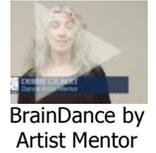
BrainDance by Artist Mentor

- *The BrainDance will warm up your body and make your brain work better at the same time. Notice when we use fractions in the BrainDance.*

BrainDance by Students

Breath
- *Dancing Mathematicians, breathe silently.*

Tactile
- *Tap the top of your head twelve times. Tap your arms six times. Tap your stomachs three times. Tap your legs 1.5 times. What's my rule?*

Core-Distal
- *Grow into a large symmetrical quadrilateral shape. Shrink into a small shape that is not symmetrical.*

Head-Tail
- *What is 1/3 of 24? Curl your backbone forwards and backwards and from side to side eight times.*

Upper Half
- *Freeze the lower half of your body. Draw parallel lines with the top half of your body.*

Lower Half
- *Freeze the upper half of your body. Draw perpendicular lines with the lower half of your body.*

Body-Half Right
- *Dance with your whole right side while the left side is frozen. Dance with 2/3 of your right side. Dance with 1/3 of your right side.*

Body-Half Left
- *Dance with your whole left side while the right side is frozen. Dance with 2/3 of your left side. Dance with 1/3 of your left side.*

Eye-Tracking
- *Focus on your right thumb. Watch it as you draw a cube in the air. Watch your left thumb as you draw a cube in the air.*

Cross-Lateral
- *What is one fourth of 80? Reach across your body up high, up high, down low, down low for a total of 20 reaches.*

Vestibular
- *Turn, then freeze in a parallelogram shape. Turn, then freeze in a rectangle shape. Turn, then freeze in a rhombus shape. Turn, then freeze in a square shape.*

Breath
- *Breathe silently, Dancing Mathematicians.*

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4. Guide exploration of sharp body percussion and smooth full-body movement.

Music: No accompaniment for the body percussion, "Smooth Cinquain" #15, *Math Dances* by Debbie Gilbert

- *Our dances will have two types of movement: sharp body percussion and smooth movement with your whole bodies. Let's practice them before we calculate how many counts they will be in the pattern.*

- *Body percussion is making music and movement by clapping, tapping, snapping, or stomping.*

- *I'll clap a pattern and you can echo it.*

▤ Repeat with tapping, snapping, or stomping. Create a signal (e.g. a director's cut) for when you want them to stop making the body percussion patterns.

- *Now, mix it up and make your own body percussion patterns by combining clapping, tapping, snapping, or stomping.*

- *The other part of the dance will be a contrast to the body percussion. Contrast makes dances more interesting. This contrasting part will be smooth movement using your whole body. To dance smoothly, you can move slowly and fluidly without stopping.*

- *Let's explore smooth energy using music. Use your whole body; don't forget your backbone. Extend the movement all the way to your fingernails and toenails. You can travel or stay in one spot.*

- *Now we'll create a pattern to practice using sharp and smooth energy. It will be eight counts long. The first half will be sharp body percussion and the second half will be smooth full-body movement. How many counts will be sharp? How many counts will be smooth? Start frozen in a shape. Move sharp: 1, 2, 3, 4. Move smooth: 1, 2, 3, 4. Move sharp: 1, 2, 3, 4. Move smooth: 1, 2, 3, 4. Freeze.*

☑ Criteria-based process assessment: Makes patterns of body percussion movements. Moves smoothly using the whole body.

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5. Read the word problem and discuss strategies for solving it. Distribute worksheets and pencils. Ask students to solve the problem on their worksheets.

▤ You could display the word problem on a document camera, the board, or on chart paper.

▤ If working with fifths for this problem is too challenging for some students, you could rewrite it and use tenths ($10/10 - 6/10 = 4/10$).

- *I'll read our problem that we'll need to solve in order to create our dances: The choreographer has been asked to create a dance for the dance company. The dance will have a pattern that is a total of 10 counts long. The pattern will have two parts: sharp and smooth. The sharp body percussion part is 2/5th of the pattern. How many counts is the sharp body percussion part? How many counts is the smooth full-body movement part?*

- *What are some strategies we could use to solve this problem? Will you use addition or subtraction? Turn and talk to a partner and discuss your ideas.*

- *Let's discuss our strategies with the class.*

▤ Discuss the steps needed to solve the problem and the strategies for each step. Display effective strategies on chart paper, the boards, or with a document camera.

- *Write your solution on your worksheets.*

- *When everyone is done, let's discuss our solutions.*

☑ Criteria-based teacher checklist, self-assessment: Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts.

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6. Demonstrate creating a Fraction Pattern Dance.
Music: "Fraction Pattern Dance" #16, *Math Dances* by Debbie Gilbert

Fraction Pattern Dance

▤ "Fraction Pattern Dance" #16 includes two different sound qualities that support four sharp counts followed by six smooth counts. An additional version (#17) has one quality throughout. You may use that if you prefer.

- *I will be a choreographer and create a Fraction Pattern Dance.*

- *I'll freeze in a shape to begin. Then I'll do four counts of body percussion. I think I'll do tap, tap, clap, tap, tap, clap. My rhythm is 1 & 2, 3 & 4 for a total of four counts.*

- *Then I'll do six counts of smooth full-body movement. I think I'll travel slowly drawing huge circles with my arms.*

- *Now I'll put the two parts of the pattern together and dance it with the music, repeating the whole pattern four times. I'll start frozen in a shape and end in a shape.*

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7. Guide students as they create Fraction Pattern Dances in small groups of 4-5.
Music: "Fraction Pattern Dance" #16, *Math Dances* by Debbie Gilbert

▤ You can choose the groups in advance to keep the momentum of the class going. You can also list their names on the checklist in the order of their groups to make assessing during the performance easier.

▤ As you assess the criteria on Day One, use a reverse checklist, placing a "0" for students who are not successful. Use pencil; this is preliminary and will be revisited on Day Two. Your notations on Day One will help you determine who will need extra attention on Day Two. Hopefully on the second day, you will be able to erase the zeros.

- *Bring your worksheets to your small group and check your work to make sure you all agree on the number of counts for each part of the dance. You should have a total of ten counts in the pattern, and the solution should be notated on your paper.*

- *Plan what body percussion movements you will do. Plan what smooth movements you will do. Use your whole body on the smooth movements. You can travel or stay in one spot.*

- *Practice the two parts in sequence.*

- *I'll play the music so you can practice. Start in a shape. Repeat the pattern four times. End in a shape.*

☑ Criteria-based teacher checklist: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

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8. Lead reflection.
▤ Invite students to look at their worksheets to analyze their solutions to the word problem.

- *Now that you have danced your word problem, look at your worksheet and check your math. Think about how your dancing can inform your mathematical reasoning.*

- *Dancing Mathematicians, what did you discover about how choreographers use math? What mathematical operations did you use to discover the number of counts for the two parts that made up the whole dance? How did you use them?*

- *The next time we dance, you'll have time to refine, rehearse and perform your Fraction Pattern Dance.*

☑ Criteria-based self-assessment and reflection: Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts. Makes a connection between dance and math.

Day Two

1. Prepare students for rehearsing their dances. Review the word problem.

- *Dancing Mathematicians, today we will focus on our Fraction Pattern Dances.*

- *I'll read the word problem that we used to create our dances: The choreographer has been asked to create a dance for the dance company. The dance will have a pattern that is a total of 10 counts long. The pattern will have two parts: sharp and smooth. The sharp body percussion part is 2/5th of the pattern. How many counts is the sharp body percussion part? How many counts is the smooth full-body movement part?*

- *What did you discover when you solved the choreographer's problem? How many counts is the sharp body percussion part? How many counts is the smooth full-body movement part?*

- *Could you use the same process to solve other word problems? Let's test that idea. Try this: The choreographer wants to invent a dance that is 12 counts long. It will have shaking movement and swinging movement. The shaking movement is 3/4 of the dance. How many counts is the shaking movement? How many counts is the swinging movement? Let's do an instant hand dance to try out our solution.*

- *Dancing Mathematicians, today after we warm up with the BrainDance, we'll refine, rehearse, and perform our Fractions Pattern Dances with the 10-count pattern.*

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2. Remind students about agreements for appropriate dance behavior.

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

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3. Lead students in *Math BrainDance* from Day One.

- *The BrainDance will warm up your body and make your brain work better at the same time. Notice when we use fractions in the BrainDance.*

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4. Support students as they refine and rehearse their Fraction Pattern Dances.
Music: "Fraction Pattern Dance" #16, *Math Dances* by Debbie Gilbert

- *Review your sharp body percussion and your full-body smooth movements.*

- *Ask yourself, are your body percussion movements as sharp as you can possibly make them?*

- *Are you moving your whole body as smoothly as possible?*

- *Think about your formation (which is another way dancers use math). Will you begin in a circle, a line, a clump, or scattered?*

- *Practice beginning in a shape, repeating your two-part pattern four times, and ending in a shape.*

- *Practice the dance with music several times.*

☑ Criteria-based teacher checklist, self-assessment: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

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5. Facilitate performance of Fraction Pattern Dances and response. Review performer and audience expectations.

Audience and Performer Expectations

- *What do the performers want from their audience? What does the audience want from the performers?*

- *Each group will perform its dance. Audience, I'll ask you to describe the body percussion and smooth movements that you observed. What fraction of the pattern was body percussion and what fraction was smooth?*

☑ Criteria-based teacher checklist, peer assessment: Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.

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6. Lead reflection.

- *Dancing Mathematicians, what have you discovered by doing dance and math at the same time? How can that help you when you do fractions in math?*

☑ Criteria-based reflection: Makes a connection between dance and math.

Name: _____ Date: _____

The choreographer has been asked to create a dance for the dance company. The dance will have a pattern that is a total of 10 counts long. The pattern will have two parts: sharp and smooth. The sharp body percussion part is 2/5 of the pattern. How many counts is the sharp body percussion part? How many counts is the smooth full-body movement part?

You may show your work here:

The sharp body percussion part is _____ counts.

The smooth full-body movement part is _____ counts.

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH		DANCE/MATH				Total
Concept	Fractions		Fractions				6
Criteria	Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts.		Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.				
Student Name	Sharp	Smooth	10 counts total	2/5 sharp	3/5 smooth	Repeats	

CLASS ASSESSMENT WORKSHEET

Disciplines	MATH		DANCE/MATH				Total
Concept	Fractions		Fractions				6
Criteria	Finds the number of counts of sharp movements and the number of counts of smooth movements, given a total number of counts of 10, and sharp movements that are 2/5 of the total number of counts.		Creates a movement sequence with a total of 10 counts with 2/5 of the counts as sharp body percussion and 3/5 of the counts as smooth full-body movement. Repeats the sequence.				
Student Name	Sharp	Smooth	10 counts total	2/5 sharp	3/5 smooth	Repeats	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
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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 dance and math?

Teacher: _____   Date: _____

DANCE AND MATH LESSON: *Fraction Problem Dances*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We talked about how both mathematicians and dancers can add or subtract fractions to choreograph or invent a dance.

- We did the Math BrainDance to warm up our brains and bodies.

- We explored making sharp body percussion like clapping, tapping, snapping, and stomping. We also made smooth movements with our full bodies.

- We solved this word problem: The choreographer has been asked to create a dance for the dance company. The dance will have a pattern that is a total of 10 counts long. The pattern will have two parts: sharp and smooth. The sharp body percussion part is 2/5th of the pattern. How many counts is the sharp body percussion part? How many counts is the smooth full-body movement part?

- We invented and performed a dance that solved the word problem.

- We discussed how using fractions in dance helps us when we work with fractions in math.

At home, you could sing a song and figure out what fraction of the song is the chorus and what fraction is the verse. Ask your child to show you how to use fractions to make a dance.

Enduring Understanding

Adding and subtracting fractions can reveal the part necessary to complete the whole.