ARTS IMPACT LESSON PLAN

Dance and Math Infused Lesson

Lesson Three: *Single Variable Equation Problem Dances*
Author: Debbie Gilbert   Grade Level: Sixth

Enduring Understanding
The solution to a mathematical or movement problem can be uncovered by creating one-variable equations and finding the value of the variables. Numbers or movements can represent the value.

Lesson Description (Use for family communication and displaying student art)
In this dance and math lesson, students solve a word problem about a choreographer creating a 16-count movement phrase. To solve the problem, they write two one-variable equations and find the values of the variables. Then they create movements to represent the equations and add the choreographic principle of variety to make the movement more interesting.

Learning Targets and Assessment Criteria

Target: Create one-variable equations to solve a word problem.
  Criteria: Writes two equations with one variable in each to solve a given choreographer's problem. The first equation includes 2 plus a variable to equal 8 counts. The second includes 5 plus a variable to equal 8 counts.

Target: Performs movements that represent the equations and value of the variables that solve the word problem.
  Criteria: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts.

Target: Adds variety to choreography.
  Criteria: Uses different levels, direction, and/or body parts to perform movements.

Vocabulary	Materials	Learning Standards
Arts Infused: Counts Solve Math: Equation Variable Arts: Attitude Direction Level Movement Movement Phrase Shape Variety	**Museum Artworks or Performance** **Seattle, WA** Pacific Northwest Ballet UW World Series of Dance **Tacoma, WA** Broadway Center for the Performing Arts **Materials** *Middle School Math Dances* CD by Debbie Gilbert; White board, document camera, or chart paper & markers; Single Variable Equation Problem Dances Choreographer's Worksheet & pencil; Class Assessment Worksheet; Music player Music: "Middle School BrainDance," *Middle School Math Dances* by Debbie Gilbert "Sixteen Counts," *Middle School Math Dances* by Debbie Gilbert	**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* 1.1.1 Elements: Space, Level, Direction, Shape 1.1.4 Principles of Choreography: Variety 1.2.1 Skills and Techniques: Clarity and Precision 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* 6.EE. Reason about and solve one-variable equations and expressions. *continued*

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.

6.EE.7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

CCSS Mathematical Practices
MP.1. Make sense of problems and persevere in solving them.
MP.2. Reason abstractly and quantitatively.
MP.4. Model with mathematics.
MP.6. Attend to precision.

ICON KEY:

▤ = Indicates note or reminder for teacher

☑ = Embedded assessment points in the lesson

Pre-Teach

Write and solve one-variable equations. Do the Middle School BrainDance. Introduce dance concepts of level, direction, and shape.

Lesson Steps Outline

1. Introduce writing and solving one-variable equations for a choreographer's problem.

2. Review expectations for movement.

3. Lead students in the *Middle School BrainDance* warm-up.
Music: "Middle School BrainDance," *Middle School Math Dances* by Debbie Gilbert

4. Facilitate as students solve the choreographer's word problem by writing two one-variable equations and finding the value of the variables.

☑ Criteria-based teacher checklist: Writes two equations with one variable in each to solve a given choreographer's problem. The first equation includes 2 plus a variable to equal 8 counts. The second includes 5 plus a variable to equal 8 counts.

5. Collaborate with students to dance the 16-count phrase that shows the solution to the problem.
Music: "Sixteen Counts," *Middle School Math Dances* by Debbie Gilbert

☑ Criteria-based teacher checklist: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts.

6. Challenge students to add variety to the choreography and shapes for the beginning and the end of the movement phrase.

☑ Criteria-based teacher checklist, self-assessment: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts. Uses different levels, direction, and/or body parts to perform movements.

7. Lead performance and response to Single Variable Equation Dances. Discuss performer and audience behavior.

☑ Criteria-based teacher checklist, peer assessment: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts. Uses different levels, direction, and/or body parts to perform movements.

8. Guide reflection.

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

LESSON STEPS_____

1. Introduce writing and solving one-variable equations for a choreographer's problem.

- *Dancing Mathematicians, we are going to be using math to plan a dance phrase or sequence. We'll be choreographers, the inventors of dances.*

- *We'll be looking at a word problem about a choreographer who is trying to match the movements in his or her dance to a 16-count music composition. We'll write two one-variable equations to help us solve the problem. We'll solve the equations and use the numbers from the equations to make the dance phrase.*

- *What do you know about variables?*

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2. Review expectations for movement.

- *Before we move, think about our expectations for dancing.*

- *I am looking for focus and respect.*

- *Keep empty space around yourself at all times and keep your eyes open and your body under control.*

- *Have fun and learn simultaneously.*

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3. Lead students in the *Middle School 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: "Middle School BrainDance," *Middle School Math Dances* by Debbie Gilbert

▤ In the BrainDance music, you will hear the title of each pattern spoken. The prompts below are suggestions if you would like to give the students more detail. You can also adapt the prompts to meet the needs of your students and the lesson. If you prefer to have the prompts spoken for you, you can use the "Middle School BrainDance with narration."

▤ In the BrainDance, you could introduce some of the movements from the word problem (twist, reach, jazz hands). Twisting could happen during the head-tail or cross-lateral sections. Reaching and jazz hands could happen during the upper half and body-half sections.

- *Before we start moving, we are going to do a BrainDance to warm-up our brains and bodies in preparation for learning the dance.*

- *The BrainDance will take us through a series of patterns that help to wire the central nervous system. The movement will increase oxygen and blood flow to your brain and body, and help with balance, alignment, and coordination.*

Breath
- *Dancing Mathematicians, breathe quietly.*

Tactile
- *Energize the surface of your body, tapping from your head to your toes.*

Core-Distal
- *Expand from your core into a large shape, reaching to the limits of your distal edges.*

- *Shrink into a small shape pulling everything back towards your core.*

Head-Tail
- *Curl your spine forwards and backwards and forwards and backwards.*

- *Curve from side to side.*

Upper Half
- *Freeze the lower half of your body. Move the upper half.*

Lower Half
- *Freeze the upper half of your body. Move the lower half.*

Body-Half Right
- *Dance with your whole right side while the left side is frozen.*

Body-Half Left
- *Dance with your whole left side while the right side is frozen.*

Cross-Lateral
- *Reach across your body with your arms on different levels.*

Vestibular
- *Turn. Freeze in a shape. Turn. Freeze in a shape. Turn. Freeze in a shape. Turn. Freeze in a shape.*

Breath
- *Breathe quietly, Dancing Mathematicians.*

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4. Facilitate as students solve the choreographer's word problem by writing two one-variable equations and finding the value of the variables.

▤ Distribute worksheets. You may want to use a document camera to project the word problem.

- *Here is our word problem: The choreographer is commissioned to create a dance to a piece of music that is 16 counts long. The first 8-count part includes 2 counts of twisting movements. How many counts of reaching movements will be in the first 8 counts? The second 8-count part includes 5 counts of strolling movements. How many counts remain for doing "jazz hands"? Write two one-variable equations to solve the choreographer's problem.*

- *Before you write your equations to solve the choreographer's problem, let's define our variables. Since a variable is a symbol for an unknown number, what does the variable stand for in the first equation? What about the variable in the second equation?*

▤ Make sure that the students understand that the first variable symbolizes the number of counts of reaching movement, rather than number of reaches. The second variable stands for the number of counts of "jazz hands," rather than the number of "jazz hands."

- *Write your two one-variable equations on your worksheets.*

▤ Look for equations like 2 + x = 8 and 5 + y = 8.

- *Let's share our results. How do you know that your equations can be used to solve the problem?*

- *What are the values of each variable in the equations?*

☑ Criteria-based teacher checklist: Writes two equations with one variable in each to solve a given choreographer's problem. The first equation includes 2 plus a variable to equal 8 counts. The second includes 5 plus a variable to equal 8 counts.

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5. Collaborate with students to dance the 16-count phrase that shows the solution to the problem.
Music: "Sixteen Counts," *Middle School Math Dances* by Debbie Gilbert

- *Now that we have done the math, we can do the dance.*

- *Let's listen to the musical phrase and count the 16 counts together.*

- *We begin with two counts of twisting. Twist 1, 2.*

- *How many counts of reaching do we have? Reach 1, 2, 3, 4, 5, 6.*

- *Next are five counts of strolling. Stroll 1, 2, 3, 4, 5.*

- *How many counts of jazz hands do we have? Jazz hands 1, 2, 3.*

- *Let's put the whole movement phrase together and dance it!*

- *Does the dance solve the choreographer's problem? How do you know?*

☑ Criteria-based teacher checklist: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts.

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6. Challenge students to add variety to the choreography and shapes for the beginning and the end of the movement phrase.
▤ This strategy can be done with each student creating her or his own variations or they may work in small groups.

- *Choreographers add interest to their choreography by adding variety.*

- *Explore different ways to twist. You could use different levels or twist different parts of your body.*

- *Make a choice for how you will twist for two counts. Twist 1, 2.*

- *Explore different ways to reach. Try different levels and directions. Reach with your arms, reach with your legs.*

- *Choose at least three different ways to reach. Reach 1, 2, 3, 4, 5, 6.*

- *How will you choose to stroll as you travel through the space? Add some attitude. Stroll 1, 2, 3, 4, 5.*

- *Will your jazz hands be high or low or in between? Jazz hands 1, 2, 3.*

- *Freeze in a shape at the beginning and the end.*

- *Let's put the whole movement phrase together with your variations and dance it!*

- *Ask yourself, even though you are adding variety to your choreography, do your movements still match our mathematical solution to the choreographer's problem?*

☑ Criteria-based teacher checklist, self-assessment: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts. Uses different levels, direction, and/or body parts to perform movements.

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7. Lead performance and response to Single Variable Equation Dances. Discuss performer and audience behavior.
▤ You may choose to have half of the class perform at a time or in smaller groups.

- *Now is your opportunity to show the 16-count phrase with your variations.*

- *Before we begin, performers, what do you want from your audience?*

- *Audience, what do you want from your performers?*

- *Audience, when they are done, describe some of the variations you saw.*

- *Audience, what did the dancers do to show you they solved the word problem and identified the variables?*

☑ Criteria-based teacher checklist, peer assessment: Twists for two counts; reaches for six counts; strolls for five counts; does jazz hands for three counts. Uses different levels, direction, and/or body parts to perform movements.

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8. Guide reflection.

- *Dancing Mathematicians, what did you discover about variables by dancing?*

- *The next time you work with variables and one-variable equations in math, remember how you used them with movement and it will help you understand.*

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

Single Variable Equation Problem Dances Choreographer's Worksheet

Name: _____   Date: _____

The choreographer is commissioned to create a dance to a piece of music that is 16 counts long. The first 8-count part includes 2 counts of twisting movements. How many counts of reaching movements will be in the first 8 counts? The second 8-count part includes 5 counts of strolling movements. How many counts remain for doing "jazz hands"?

Write two one-variable equations to solve the choreographer's problem.

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH		DANCE/MATH				DANCE	Total
Concept	**One-variable Equations**		**Choreography One-variable Equations**				**Variety**	7
Criteria	Writes two equations with one variable in each to solve a given choreographer's problem.		Twists for two counts.	Reaches for six counts.	Strolls for five counts.	Does jazz hands for three counts.	Uses different levels, direction, and/or body parts to perform movements.	
Student Name	The first equation includes 2 plus a variable to equal 8 counts.	The second includes 5 plus a variable to equal 8 counts.						

CLASS ASSESSMENT WORKSHEET

Disciplines	MATH		DANCE/MATH				DANCE	Total
Concept	One-variable Equations		Choreography One-variable Equations				Variety	7
Criteria	Writes two equations with one variable in each to solve a given choreographer's problem.		Twists for two counts.	Reaches for six counts.	Strolls for five counts.	Does jazz hands for three counts.	Uses different levels, direction, and/or body parts to perform movements.	
Student Name	The first equation includes 2 plus a variable to equal 8 counts.	The second includes 5 plus a variable to equal 8 counts.						
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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: _____

<u>DANCE AND MATH LESSON:</u> ***Single Variable Equation Problem Dances***

Dear Family:

Today your child participated in an **Arts and Math** lesson. We talked about how writing and solving one-variable equations can help choreographers plan dances.

- We read a word problem about a choreographer who had to create a dance that matched a 16-count piece of music.

- We figured out two one-variable equations to help us solve the problem.

- We found the values of the variables in the equation.

- We created a 16-count dance to match the equations.

- We added variety to our dances to make them more interesting.

At home, you could ask your child to explain how using variables can help solve problems. Ask your child to show you their 16-count dance.

Enduring Understanding

The solution to a mathematical or movement problem can be uncovered by creating one-variable equations and finding the value of the variables. Numbers or movements can represent the value.