

ARTS IMPACT LESSON PLAN

Dance and Math Infused Lesson

Lesson Two: *Finding Zero on a Number Line Dance*

Author: Debbie Gilbert Grade Level: Seventh

Enduring Understanding

Opposite quantities of numbers or movements combine to make zero. Movement to the right or the left on a number line can represent addition of positive and/or negative integers.

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

In this dance and math lesson, students look at positive and negative integers on a number line and how combining the numbers with their opposites makes zero. They create a line dance with steps to the right and left to correspond to the numbers. In small groups, they create line dances to show equations on a number line.

Learning Targets and Assessment Criteria

Target: Dances a line dance that illustrates combining opposite integers to reach zero on a number line.

Criteria: Stands in a line formation. Steps to the right six times; steps to the left six times; claps. Steps to the left five times; steps to the right five times; claps. Steps to the right four times; steps to the left four times; claps. Steps to the left three times; steps to the right three times; claps.

Target: Creates a line dance that shows one of these two equations: $3 + (-2) = x$ or $(-2) + (-4) = y$.

Criteria: Stands in a line formation. Performs one of the following dances:

- 1) Steps to the right three times; steps to the left two times; makes a shape and says "1."
- 2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."

Vocabulary

Arts Infused:

Direction
Line
Opposite

Math:

Add
Negative Integer
Number Line
Positive Integer
Subtract
Zero

Arts:

Choreography
Diminution
Formation
Locomotor Movement
Variety

Materials

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; Music player; Class Assessment Worksheet

Music:

"Middle School BrainDance," *Middle School Math Dances* by Debbie Gilbert
"Zero Number Line Dance," *Middle School Math Dances* by Debbie Gilbert
"Adding on the Number Line Dance," *Middle School Math Dances* by Debbie Gilbert

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>

- 1.1.1 Elements: Space
- 1.1.4 Principles of Choreography: Form, Variety
- 1.2.1 Skills and Techniques: Moves with Others in Spatial Formations
- 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>

7.NS. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

continue

7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.1.a. Describe situations in which opposite quantities combine to make 0.

7.NS.1.b. Understand $p + q$ as the number located a distance q from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

CCSS Mathematical Practices

MP.1. Make sense of problems and 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.

ICON KEY:

 = Indicates note or reminder for teacher

 = Embedded assessment points in the lesson

Pre-Teach

Practice adding and subtracting positive integers on a number line. Explore what happens when combining opposite integers. Do the Middle School Math BrainDance. Practice dancing in a line formation.

Lesson Steps Outline

1. Introduce combining opposite quantities to make zero and how to illustrate that with a line dance.

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. Explore combining opposites to find zero on a number line.

 Criteria-based process assessment: Locates a series of positive and negative integers on a number line. Identifies the distance between each number and zero.

5. Create a line dance with students using movements to the left and right to show how combining opposite quantities can make zero.

Music: "Zero Number Line Dance," *Middle School Math Dances* by Debbie Gilbert

 Criteria-based teacher checklist: Stands in a line formation. Steps to the right six times; steps to the left six times; claps. Steps to the left five times; steps to the right five times; claps. Steps to the right four times; steps to the left four times; claps. Steps to the left three times; steps to the right three times; claps.

6. Guide students, in small groups, to create line dances that show equations on a number line.

Music: "Adding on the Number Line Dance," *Middle School Math Dances* by Debbie Gilbert

 Criteria-based teacher checklist, self-assessment: Stands in a line formation. Performs one of the following dances:

1) Steps to the right three times; steps to the left two times; makes a shape and says "1."

2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."

7. Lead performance and response to Adding on the Number Line Dances.
Discuss performer and audience behavior.

Criteria-based teacher checklist, peer assessment: Stands in a line formation.
Performs one of the following dances:

1) Steps to the right three times; steps to the left two times; makes a shape and says "1."

2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."

8. Guide reflection.

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

LESSON STEPS

1. Introduce combining opposite quantities to make zero and how to illustrate that with a line dance.

- *Dancing Mathematicians, we are going to create a line dance, not just any line dance, but a number line dance.*
 - *Where on the number line would I end, if I started on zero, added six, and then added negative six?*
 - *That's it — zero! Show me that with a hand dance. Start at zero. Move your hand to the right 1, 2, 3, 4, 5, 6. To show adding the negative six, move your hand to the left 5, 4, 3, 2, 2, 1, 0.*
 - *We are going to do that same process with our whole bodies to create a number line dance in which we combine opposite numbers to end at zero.*
 - *We'll extend our learning by creating small group dances that show equations on a number line.*
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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."

- *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.*
- *Notice the variety of movements we do with our upper bodies. You may be able to use some of them later to add variety to the number line dance.*

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. Explore combining opposites to find zero on a number line.

▣ Use a white board or document camera for drawing the number line.

- *I am going to draw a number line. We'll find a series of positive and negative integers and calculate the distance between those numbers and zero.*
- *Find six on the number line. What negative integer would we add to get to zero? How do you know?*
- *Find negative five on the number line. What positive integer would we add to get to zero? How do you know?*
- *Find four on the number line. What negative integer would we add to get to zero? How do you know?*

- Find negative three on the number line. What positive integer would we add to get to zero? How do you know?
- What do all of these calculations have in common?

Criteria-based process assessment: Locates a series of positive and negative integers on a number line. Identifies the distance between each number and zero.

5. Create a line dance with students using movements to the left and right to show how combining opposite quantities can make zero.

Music: "Zero Number Line Dance," *Middle School Math Dances* by Debbie Gilbert

▣ When assessing the criteria in this lesson, any students who are not meeting criteria will be very clear to you, so you may want to use a reverse checklist, putting a "0" where students have not met criteria, rather than trying to note every single one who has met criteria. You can go back later and give those who have met criteria a "1." This information will let you know who needs more practice, so you can repeat the exploration in the future.

▣ When you are moving in front of the class while doing this dance, you will either need to face away from your students or move to your left when they are moving to their right (mirroring them).

- *Combining opposite integers brings you to zero. We are going to use that big idea to make a line dance. We'll move to the right for positive integers and to the left for negative integers.*
- *We will use the numbers we have generated to make a line dance. The numbers will correspond to side steps in the dance. The steps are called locomotor movements because they travel.*
- *We'll start in a line formation.*
- *For six and adding negative six, dance six steps to the right and six steps to the left. Clap to show you have reached zero.*
- *For negative five and adding five, dance five steps to the left and five steps to the right. Clap to show you have reached zero.*
- *For four and adding negative four, dance four steps to the right and four steps to the left. Clap to show you have reached zero.*
- *For negative three and adding three, dance three steps to the left and three steps to the right. Clap to show you have reached zero.*
- *Add variety by adding movements with your upper body as you move from side to side in the line dance.*
- *Let's put it all together and practice it with music.*
- *You have just used combining opposites to create your dance, but you have also used the dance choreographic device called diminution. That means you have decreased the number of movements.*

Criteria-based teacher checklist: Stands in a line formation. Steps to the right six times; steps to the left six times; claps. Steps to the left five times; steps to the right five times; claps. Steps to the right

four times; steps to the left four times; claps. Steps to the left three times; steps to the right three times; claps.

6. Guide students, in small groups, to create line dances that show equations on a number line.

Music: "Adding on the Number Line Dance," *Middle School Math Dances* by Debbie Gilbert (This music is the same beat as the previous music, but does not include the verbal counting cues.)

▣ You can choose the groups in advance to keep the momentum of the class going. You can also list their names in the order of their groups on the assessment checklist to make assessing during the performance easier. Groups of four to five work well for this.

- *Now that you have danced finding zero on the number line, let's increase the mathematical rigor. In your group, you will select one of these two equations: $3 + (-2) = x$ or $(-2) + (-4) = y$.*
- *Your task is to show that equation in a Number Line Dance.*
- *Move to the right or left based on your given numbers. End your dance in a shape and say the number that is the solution to your equation.*
- *You can count out loud as you are moving. It will help you stay together as dancers and it will help the audience keep track of you mathematically.*
- *To make your line dance more interesting, you can add movements with your upper bodies.*
- *Make choices with your group and then practice.*
- *Ask yourself, are you being accurate with the numbers of steps and movements? Are you moving in the correct direction? Can you move in unison with your group?*

☑ Criteria-based teacher checklist, self-assessment: Stands in a line formation. Performs one of the following dances:

- 1) Steps to the right three times; steps to the left two times; makes a shape and says "1."
- 2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."

7. Lead performance and response to Adding on the Number Line Dances. Discuss performer and audience behavior.

- *Now is your opportunity to show your Adding on the Number Line Dance and we can check our work.*
- *Before we begin, performers, what do you want from your audience?*
- *Audience, what do you want from your performers?*
- *Audience, when the dance is done, I am going to ask you which of the equations they danced and what they did that helped you make that observation.*
- *Did they make any movement choices that showed variety?*

☑ Criteria-based teacher checklist, peer assessment: Stands in a line formation. Performs one of the following dances:

- 1) Steps to the right three times; steps to the left two times; makes a shape and says "1."
 - 2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."
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8. Guide reflection.

- *Dancing Mathematicians, what did you discover about adding opposite quantities in the Zero Number Line Dance?*
- *How was that dance different from the small group Adding on the Number Line Dances? The same?*
- *The next time you work with positive and negative integers, combining opposites, and the number line in math, remember how you used them with movement and it will help you understand.*

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

ARTS IMPACT LESSON PLAN Dance and Math Infusion

Seventh Grade Lesson Two: *Finding Zero on a Number Line Dance*

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH/DANCE				MATH/DANCE	Total
Concept	Combining Opposite Integers Direction				Addition on the Number Line	5
Criteria	Stands in a line formation.				Stands in a line formation. Performs one of the following dances:	
Student Name	Steps to the right six times; steps to the left six times; claps.	Steps to the left five times; steps to the right five times; claps.	Steps to the right four times; steps to the left four times; claps.	Steps to the left three times; steps to the right three times; claps.	1) Steps to the right three times; steps to the left two times; makes a shape and says "1." 2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."	

ARTS IMPACT LESSON PLAN Dance and Math Infusion

Seventh Grade Lesson Two: *Finding Zero on a Number Line Dance*

CLASS ASSESSMENT WORKSHEET

Disciplines	MATH/DANCE				MATH/DANCE	Total 5
Concept	Combining Opposite Integers Direction				Addition on the Number Line	
Criteria	Stands in a line formation.				Stands in a line formation. Performs one of the following dances:	
Student Name	Steps to the right six times; steps to the left six times; claps.	Steps to the left five times; steps to the right five times; claps.	Steps to the right four times; steps to the left four times; claps.	Steps to the left three times; steps to the right three times; claps.	1) Steps to the right three times; steps to the left two times; makes a shape and says "1." 2) Steps to the left two times; steps to the left four times; makes a shape and says "-6."	
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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: *Finding Zero on a Number Line Dance*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We talked about how combining opposite numbers results in zero.

- We looked at a number line and discovered if we started on six, and moved six places to the left, we ended at zero.
- We repeated the same process with negative five, four, and negative three.
- We created a line dance with steps to the left and right that showed traveling from six to zero, negative five to zero, four to zero, and negative three to zero. We clapped every time we reached zero.
- We added variety to our dances with moves with our arms, shoulders, backbones, and heads.
- We used movement to the right and/or the left to illustrate addition equations on a number line.

At home, you could look at a thermometer. What is the temperature? How many degrees would it need to change to reach zero? Ask your child to teach you the number line dance. Don't forget to clap at zero!

Enduring Understanding

Opposite quantities of numbers or movements combine to make zero. Movement to the right or the left on a number line can represent addition of positive and/or negative integers.