ARTS IMPACT LESSON PLAN

Dance and Math Infused Lesson

Lesson One: *Proportions in Saman*
Author: Debbie Gilbert   Grade Level: Seventh

Enduring Understanding
Proportional relationships describe how quantities of numbers, movements, or objects change in relationship to one another.

Lesson Description (Use for family communication and displaying student art)
In this dance and math lesson, students learn a pattern from Saman, a dance from Indonesia. They analyze the number of palm slaps in the pattern and calculate how many palm slaps are in multiple repetitions of the pattern. They plot their calculations on a coordinate grid to see if the relationship between palm slaps and pattern repetitions is proportional. They change the movement so it is not proportional and then do both the original dance and the variation to check their work.

Learning Targets and Assessment Criteria

Target: Dances a pattern from a traditional dance.
    Criteria: Performs the combination of arm movements and palm slaps from Saman.

Target: Repeats the dance pattern with an accelerating tempo.
    Criteria: Performs the combination of arm movements and palm slaps, beginning slowly and increasing speed with each repetition.

Target: Graphs the relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.
    Criteria: Plots the following points on a coordinate grid: (1,4), (2,8), (3,12), (4,16), (5,20).

Target: Dances a non-proportional variation of a pattern from a traditional dance.
    Criteria: Performs a combination of arm movements and palm slaps in which there is not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.

Vocabulary

Arts Infused:
Non-proportional
Pattern
Proportional
Relationship

Math:
Coordinate plane
Graph
Origin
x-axis
y-axis

Arts:
Choreographer
Movement
Repetition
Speed
Variation

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; Computer with internet connection and projector; Proportions in Saman Student Worksheet and pencil; Class Assessment Worksheet; Music player

Music:
"Middle School BrainDance," *Middle School Math Dances* by Debbie Gilbert

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
1.1.2 Elements: Time
1.2.1 Skills and Techniques: Extensions, Flexions, and Limb Rotations.
1.3.1 Cultural Dance Styles
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
4.4.1 Cultural/Historical Connection

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

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Video:
Saman Dance
http://www.youtube.com/watch?v=hsB6fmlFNXE

Reference: *Saman! Dance of a Thousand Hands*, World Music Press/Plank Road Publishing

7.RP. Analyze proportional relationships and use them to solve real-world and mathematical problems.
7.RP.2.a. Decide whether two quantities are in a proportional relationship, e.g. by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

CCSS Mathematical Practices
MP.2. Reason abstractly and quantitatively.
MP.4. Model with mathematics.
MP.6. Attend to precision.
MP.7. Look for and make use of structure.

Pre-Teach

Introduce proportional relationships. Practice graphing proportional relationships on a coordinate plane. Set expectations for physical and emotional safety for dancing.

Lesson Steps Outline

1. Introduce dancing a traditional dance from Indonesia and graphing the proportional relationships in the movements.

2. Show video of Saman.

3. Define expectations for movement.

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

5. Teach the juba movement pattern from Saman.

☑ Criteria-based teacher checklist: Performs the combination of arm movements and palm slaps from Saman. Performs the combination of arm movements and palm slaps, beginning slowly and increasing speed with each repetition.

6. Guide students to identify the number of palm slaps in one repetition of the pattern. Ask them to calculate the number of palm slaps in two and three repetitions of the pattern.

☑ Criteria-based process assessment: Identifies the number of palm slaps in one repetition of the pattern. Calculates the number of palm slaps in two and three repetitions of the pattern.

7. Ask students to create a graph on a coordinate plane that shows the number of repetitions of the pattern on the x-axis and the number of palm slaps on the y-axis. Distribute worksheets.

☑ Criteria-based teacher checklist, self-assessment: Plots the following points on a coordinate grid: (1,4), (2,8), (3,12), (4,16), (5,20).

8. Discuss whether the relationship between the number of repetitions of the pattern and the number of palm slaps is proportional. With students, design a non-proportional relationship between the number of repetitions of the pattern and the number of palm slaps.

☑ Criteria-based teacher checklist: Performs a combination of arm movements and palm slaps in which there is not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.

9. Direct students to repeat the original proportional version and the non-proportional variation of the dance to check their work.

☑ Criteria-based teacher checklist, self-assessment: Performs the combination of arm movements and palm slaps from Saman. Performs a combination of arm movements and palm slaps in which there is not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.

10. Lead reflection.

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

LESSON STEPS_____

1. Introduce dancing a traditional dance from Indonesia and graphing the proportional relationships in the movements.

- *Dancing Mathematicians, we are going to analyze how proportional relationships are used in Saman, a traditional dance from Indonesia.*

- *First, we'll learn one of the patterns from the dance. Then we will test our work by graphing the relationships and dancing them.*

- *What do you know about proportional relationships?*

- *How do you think a choreographer, an inventor of dances, might use proportional relationships?*

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2. Show video of Saman.
Saman Dance: http://www.youtube.com/watch?v=hsB6fmlFNXE

▤ This video is long. You may want to begin at 1:50 and watch until 3:23. (If you have time to continue, watching from 5:34 to the end will show you a variety of different patterns.)

- *Saman originated in the Aceh province of the island of Sumatra in Indonesia. It is also called the Dance of a Thousand Hands.*

- *After we have watched the video, let's take a few moments to discuss the movement we saw.*

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3. Define expectations for movement.

- *When you are dancing, I expect you to be focused and to be respectful of each other and of yourself as a dancer.*

- *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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4. 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.*

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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5. Teach the juba movement pattern from Saman.
▤ This dance is usually done in a kneeling position. If any students have issues with their knees, they could sit in a more comfortable way. You could also choose to teach it with students sitting in chairs.

- *This is the juba pattern from Saman. Each movement takes one count. There are twelve counts in one repetition of the pattern.*

- *Begin with your arms crossed, right over left, with your hands touching your shoulders. This is count one.*

- *Touch your right hand to your right leg, palm up* (count two).

- *Touch your right hand to your left leg, palm down* (count three).

- *Touch your right hand to your right leg, palm up* (count four).

- *Bring your left hand down to the center and slap the bottom of your left hand with your right palm* (count five).

- *Touch your right hand to your right leg, palm up* (count six).

- *Slap the bottom of your left hand with your right palm* (count seven).

- *Touch your right hand to your right leg, palm up* (count eight).

- *Slap the bottom of your left hand with your right palm* (count nine).

- *Touch your right hand to your right leg, palm up.* (count ten)

- *Slap the bottom of your left hand with your right palm* (count eleven).

- *Touch your right hand to your right leg, palm up* (count twelve).

- *Let's practice the whole pattern together slowly.*

- *Repeat the pattern, increasing the speed slightly each time.*

☑ Criteria-based teacher checklist: Performs the combination of arm movements and palm slaps from Saman. Performs the combination of arm movements and palm slaps, beginning slowly and increasing speed with each repetition.

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6. Guide students to identify the number of palm slaps in one repetition of the pattern. Ask them to calculate the number of palm slaps in two and three repetitions of the pattern.

- *How many palm slaps are in one repetition of the twelve count pattern?*

- *Two repetitions?*

- *Three repetitions?*

☑ Criteria-based process assessment: Identifies the number of palm slaps in one repetition of the pattern. Calculates the number of palm slaps in two and three repetitions of the pattern.

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7. Ask students to create a graph on a coordinate plane that shows the number of repetitions of the pattern on the x-axis and the number of palm slaps on the y-axis. Distribute worksheets.

- *On your Graphing the Proportions in Saman Worksheet, the x-axis shows the number of repetitions of the pattern and the y-axis shows the number of palm slaps.*

- *Plot the number of palm slaps in one, two, and three repetitions.*

- *Determine the number of palm slaps in four and five repetitions of the pattern.*

- *Plot the number of palm slaps in four and five repetitions.*

- *Draw a line from the origin that connects all the points you plotted on your graph.*

- *Look at your graphs. What do you observe? What does that tell you?*

▤ Lead a discussion about what drawing a straight line from the origin through all the points plotted on the graph shows about proportionality.

☑ Criteria-based teacher checklist, self-assessment: Plots the following points on a coordinate grid: (1,4), (2,8), (3,12), (4,16), (5,20).

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8. Discuss whether the relationship between the number of repetitions of the pattern and the number of palm slaps is proportional. With students, design a non-proportional relationship between the number of repetitions of the pattern and the number of palm slaps.

- *Is the relationship between the number of repetitions of the pattern and the number of palm slaps proportional? How do you know?*

- *How does your graph help you determine whether the relationship is proportional?*

- *What would we need to do to create a non-proportional relationship between the number of repetitions of the pattern and the number of palm slaps?*

- *Let's try it!*

☑ Criteria-based teacher checklist: Performs a combination of arm movements and palm slaps in which there is not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.

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9. Direct students to repeat the original proportional version and the non-proportional variation of the dance to check their work.

- *Let's check our work by dancing.*

- *First, dance the original proportional version of the dance. Repeat the pattern five times. We'll need someone to keep track of the number of repetitions and someone to keep track of the number of palm slaps.*

- *Now we'll dance the non-proportional variation of the dance. Repeat the pattern five times. We'll need someone to keep track of the number of repetitions and someone to keep track of the number of palm slaps.*

- *Ask yourself, did you accurately perform both the traditional proportional pattern and our non-proportional pattern?*

- *What did you notice? What is the same? What is different? Why?*

☑ Criteria-based teacher checklist, self-assessment: Performs the combination of arm movements and palm slaps from Saman. Performs a combination of arm movements and palm slaps in which there is

not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.

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10. Lead reflection.

- *Dancing Mathematicians, what did you discover about proportional relationships by dancing them?*

- *Now that you have used proportional relationships in movement, how do you think dancers and choreographers use them in creating and learning dances?*

- *The next time you use proportional relationships in math, remember how you danced them and it will help you.*

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

▤ Optional: You can repeat the process with another pattern from Saman: waves. Reach up left, up right, down left, down right. Determine how many times "up right" reaches happen in multiple repetitions. A more complex variation in which the patterns interlock is to have every other person do a different pattern: reach down right, down left, up right, up left.

Proportions in Saman Student Worksheet

Graphing the Proportions

Name: _____   Date: _____

In one repetition of the pattern there are four palm slaps.

How many palm slaps are in two
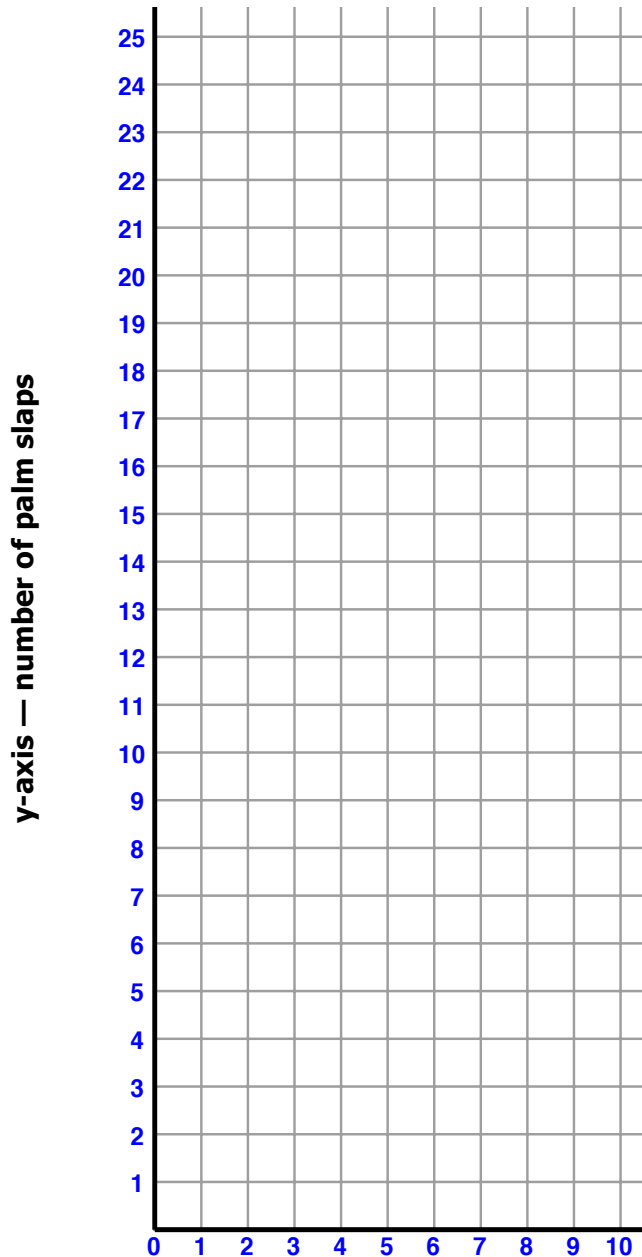repetitions? _____

How many palm slaps are in three
repetitions? _____

How many palm slaps are in four
repetitions? _____

How many palm slaps are in five
repetitions? _____

On this graph, the x-axis shows the
number of repetitions of the pattern
and the y-axis shows the number of
palm slaps.

Plot the number of palm slaps in one,
two, three, four, and five repetitions.

Draw a straight line from the origin
through all the points you plotted on
your graph.

y-axis — number of palm slaps

25
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5
4
3
2
1

0 1 2 3 4 5 6 7 8 9 10

x-axis — number of repetitions of the pattern

reference: http://www.math-aids.com

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	DANCE	DANCE/MATH	MATH	DANCE/MATH	Total
Concept	**World Dance**	**Tempo Proportion**	**Proportion**	**Proportion**	4
Criteria Student Name	Performs the combination of arm movements and palm slaps from Saman.	Performs the combination of arm movements and palm slaps, beginning slowly and increasing speed with each repetition.	Plots the following points on a coordinate grid: (1,4), (2,8), (3,12), (4,16), (5,20).	Performs a combination of arm movements and palm slaps in which there is not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.	

CLASS ASSESSMENT WORKSHEET

Disciplines	DANCE	DANCE/MATH	MATH	DANCE/MATH	Total
Concept	**World Dance**	**Tempo Proportion**	**Proportion**	**Proportion**	4
Criteria Student Name	Performs the combination of arm movements and palm slaps from Saman.	Performs the combination of arm movements and palm slaps, beginning slowly and increasing speed with each repetition.	Plots the following points on a coordinate grid: (1,4), (2,8), (3,12), (4,16), (5,20).	Performs a combination of arm movements and palm slaps in which there is not a proportional relationship between the number of palm slaps in each pattern and the number of repetitions of the pattern.	
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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: ***Proportions in Saman***

Dear Family:

Today your child participated in an **Arts and Math** lesson. We talked about how proportional relationships can be found in world dances.

- We learned a pattern from Saman, a traditional dance from Indonesia.

- We repeated the pattern, starting slowly and getting faster and faster.

- We created a graph that showed the proportional relationship between one of the movements in the pattern and how many times we repeated the pattern.

- We choreographed a variation of the Saman pattern that was not proportional and compared it to the Saman pattern that was proportional.

- We reflected on the connection between math and dance.

At home, you could look for proportional relationships in baking, shopping, or entertaining. Ask you child to show you the pattern from Saman.

Enduring Understanding

Proportional relationships describe how quantities of numbers,
movements, or objects change in relationship to one another.