Combinations and Shapes, an integrated math/dance unit for the 1st grade

Teaching artist: Toby MacNutt
Essential Questions: How can making dance demonstrate algebraic thinking with geometric shapes? How does dance-making use math?

Curriculum Standards:

Mathematics	**Dance**
1.OA.A.1: algebraic thinking, word problems with operations such as “add to”, “take from”, “put together”, “take apart”	Creation: a phrase of three movements
1.G.A.2: geometry, composing 2D/3D shapes & combining into new shapes	Dance concepts: copying, leading, and following movements with a group

Unit Overview – 6 one-hour lessons:

Lesson Timeline	**UDL checkpoints**
Getting to know you: meet students, introduce warm-ups and movement games, assess dance and math fluencies	2.1 Clarify vocab & symbols 2.2 Clarify syntax & structure 3.1 Activate/supply background knowledge
Making shapes: drawing (what we know about shapes), moving (dance terms “shapes” and “freeze”), “shape bank” shared vocabulary, copying/mimicking	2.5 Illustrate through multiple media 3.3 Guide information processing, visualization, and manipulation 4.1 Vary methods for response & navigation 5.2 Use multiple tools for construction and composition
Group composition: unison, more/less, bigger/smaller, observation & audience	6.2 Support planning and strategy development 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community
Group shapes: add, combine, put together, take away dancer shapes; freeze drawings	3.3 Guide information processing, visualization, and manipulation 7.1 Optimize individual choice & autonomy
Phrase building: groups use shapes and three operations to make a short phrase	7.1 Optimize individual choice & autonomy 8.3 Foster collaboration and community
Perform & assess	7.2 Optimize relevance, value, authenticity 9.3 Develop self-assessment and reflection
	Checkpoints Throughout: 4 Provide options for physical action 5.3 Build fluencies with graduated levels of support for practice & performance

Assessment Criteria & Methods:

- Observation of classes and performance
- Drawings and labeling
- Discussion during lessons and following performance; students' self-observations
- Asking questions about key topics
- Pre-/post-unit rubric, one per student filled out by teacher

A successful unit looks like: students engaging in dance safely and appropriately, responding to dance vocabulary and instructions, using math terms in creation of movements, learning shapes/movement from each other, discussing the dance and math elements they have seen, making and labeling representations of their math and dance learning

Rubric – per student, complete before & after unit:

	Not yet	Sometimes	Often	Always
Student understands algebraic operations for word problems (add to, take away, etc)				
Student can compose (draw) 2D and 3D shapes				
Student can combine geometric shapes into new compositions				
Student can observe and imitate others' movements				
Student can create and remember a three-part phrase in a group				
Student can move his or her body safely and follow movement instructions				

Some students may not have the fine motor skills necessary to draw shapes. Depending on the situation, this may be worked with differently, such as drawing by dictation or using a computer interface. Key elements for assessment in these cases: student can differentiate between different 2D and 3D shapes; student can identify shapes made by combining other shapes.

Lesson One: Getting to know you

Lesson Topic: preparation for using math and dance together

Goals:

Dance – introduce warm-ups, introduce safe/appropriate standards for dance, determine students' strengths and abilities
Math – review properties of shapes and discuss known math vocabulary, determine students' comfort level and challenges

Essential question: What is it like/what does it mean to do dance in the classroom?

Preparation and materials: none

Lesson plan:

- Introduce guest artist, students self-introduce
- What is a warm-up?
- Demonstrate appropriate dance behaviour, body control, movement rather than speaking in process of warm-up. Warm-up activity: move different body parts individually.
- Discuss what we know about math. Ask about word problems, addition, subtraction, counting on. Ask about shapes: name some shapes, name some qualities of shapes. (Assess & activate background knowledge.)
- Moving through space (again, safe & attentive behaviour; quiet mouths, following directions)
- Regroup. What is your favourite thing about dance? What is your favourite thing about math? Can you show me that favourite thing with a movement?

Lesson Two: Making shapes

Lesson Topic: What “shape” means in geometry or dance

Goals:

Dance – “freeze”, static shapes
Math – draw, label, identify shapes

Essential question: How are shapes made?

Preparation and materials: paper and drawing materials, prepared by classroom teacher; two large papers for “shapes we know” and “shapes we've made” to establish a vocabulary bank

Lesson plan:

- Warm-up: move body parts individually, stretch & hold still body parts individually
- What is a shape? What shapes do you know? What properties do shapes have? Do you have questions about shapes?
- Draw any shape (2D or 3D). Label the shape and any parts it has.
- Put these on the “shapes we know” paper. Ask for a few observations about what these shapes look like.
- “Freeze” game: move around the room, then when I say “freeze!” hold still while making a shape with your body. Do this several times.
- Regroup. Have a student share a shape they made with the group; others mimic the shape. Three or so students.
- Draw a shape you made with your body today. (Think about 3D shapes if you can.) Label it. Put these shapes on the “shapes we've made” page. Ask for a few observations about what these shapes look like.

Lesson Three: Group composition

Lesson Topic: Sharing ideas, groups of various sizes

Goals:

Dance – “unison”, role of observer/audience
Math – more, less, adding to, putting together, taking away

Essential question: How do dancers combine to make movement in groups?

Preparation and materials: Vocab bank from previous lesson; drawing materials; classroom teacher is responsible

Lesson plan:

- Warm-up: making shapes in the body (long, pointy, round, flat, square, triangular, circular; whole body, or one body part)
- Introduce “unison” and non-unison movement
- Whole group movement, whole group unison
- What is the job of an audience? Split to partial audience, partial performance group.
- Ask audience members to direct group movement. Add to, take away, put together, take apart. Group size shifts as needed. As much self-direction as students can handle safely.
- Regroup. What is addition? What did it look like? What is subtraction? What did it look like? If time allows, draw a picture.

Lesson Four: Group shapes

Lesson Topic: combining multiple shapes

Goals:

Dance – composition with multiple people
Math – combination of individual shapes into new compositions

Essential question: What happens when different shapes are put together?

Preparation and materials: Vocabulary bank, drawing materials

Lesson plan:

- Warm-up: pass a shape around the circle
- Review vocabulary bank
- What happens when multiple shapes are put together? Choose two or three shapes from the vocabulary bank. Make a drawing with those shapes as one new shape. Label its parts (including the component shapes). Add these drawings to “shapes we know”.
- Brief round of “freeze!” game as previously played.
- Build tableaux of shapes – freeze in small groups.
- Freeze small groups with other students as audience. “Add to” and “take away” from example groups.
- Draw a combined shape (frozen group) you saw today. Label it. Add these shapes to “shapes we've made” sheet.

Lesson Five: Phrase building

Lesson Topic: combinations in sequences

Goals:

Dance – “phrase”, creation of phrases
Math – using operations on a group

Essential question: How do math and dance use sequences?

Preparation and materials: Vocabulary bank; video recording for reference/memory – if tech is on-hand in the classroom, classroom teacher is responsible; if not, teaching artist is responsible

Lesson plan:

- Warm-up: pass a shape around the circle.
- Review math operations/word problem vocabulary. Review shape vocabulary bank. Review “unison”/”non-unison” and introduce “phrase”.
- Divide students into groups of 4-5 students.
- Task for each group: as a group, three shapes, and the changes between them need to be operations we have covered (add to, take away, put together, etc).
- Guiding/assessing questions for groups: what shapes are you making? When do you make them? Is this unison or non-unison? How do you change between shapes? How many people make this shape?
- Record each group's phrase.

Lesson Six: Perform & assess

Lesson Topic: performance and discussion

Goals:

Dance – performance, audience, critique/observation
Math – identification of elements used by others

Essential question: How do we demonstrate math understanding through dance?

Preparation and materials: creation of “performance space” and “audience space” for more formal presentation in the classroom; vocab bank; recording equipment (as previous lesson); classroom teacher is responsible except as noted last lesson

Lesson plan:

- Warm-up: “freeze” game
- What makes performance special? What does the audience do? What will we look for today?
- Review dances in groups
- Perform for the group (and record)
- Discussion: What did you see? Were there shapes from the vocabulary bank? New shapes? What changes (transitions) did people use? Did you see any unison? Is a shape the same thing in dance as geometry? Can you do math with people?