

## ARTS IMPACT LESSON PLAN

### Dance and Science Infused Lesson

#### Structure

Author: Debbie Gilbert



#### Enduring Understanding

Correct body alignment is the dancer's physical structure that leads to physiological effectiveness. The choreographic structure of a dance can be its skeleton, i.e. how movement is put or held together in a dance about science, technology, engineering, arts, and/or math.

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

*In this dance and science lesson, students look at structure in two ways: physical structure (body alignment) and choreographic structure (the organization or skeleton of a dance). They explore smooth and sharp energy. They use that understanding to dance a STEM topic using the Rhombus Shadowing Structure.*

### Learning Targets and Assessment Criteria

**Target:** Demonstrates effective physical structure.

**Criteria:** Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture).

**Target:** Identifies the key ideas of a STEM theme.

**Criteria:** Selects and notates four important aspects of a science, technology, engineering, or math topic.

**Target:** Performs a STEM infused Rhombus Shadowing Structure.

**Criteria:** Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme.

**Target:** Demonstrates specific types of energy.

**Criteria:** Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.

**Target:** Communicates effectively.

**Criteria:** Actively listens; expresses ideas — visually/physically/verbally; responds to others.

#### Vocabulary

Arts Infused:  
Structure

Science:  
Climate  
Materials  
Matter  
Properties  
Weather

Arts:  
Alignment  
Dancer Neutral  
Movement  
Posture  
Shadowing  
Sharp  
Smooth

#### Materials

##### Museum Artworks or Performance

##### Seattle, WA

Pacific Northwest Ballet  
UW World Series of Dance

##### Tacoma, WA

Broadway Center for the Performing Arts

##### Materials

Drum; Music player; Computer with internet connection and projector;  
Chart paper and markers; Student Worksheets and pencils; Class Assessment Worksheet; Arts Impact sketchbook

*continued*

#### Learning Standards

##### WA Arts Learning Standards in Dance

For the full description of each standard, see:

<http://www.k12.wa.us/Arts/Standards>

##### Creating (Concepts: Shape, Space, Energy)

1. Generate and conceptualize artistic ideas and work.
2. Organize and develop artistic ideas and work.
3. Refine and complete artistic work.

##### Performing/Presenting/Producing

4. Select, analyze, and interpret artistic work for presentation.
5. Develop and refine artistic techniques and work for presentation.
6. Convey meaning through the presentation of artistic work.

*continued*

**Music:**

*STEAM BrainDance* by Debbie Gilbert

*Music for Creative Dance, Volume V*,  
by Eric Chappelle (available at  
CDBaby.com and iTunes.com)

**Responding**

7. Perceive and analyze artistic work.
8. Interpret intent and meaning in artistic work.
9. Apply criteria to evaluate artistic work.

**Connecting**

10. Synthesize and relate knowledge and personal experiences to make art.

**Early Learning Guidelines (Pre-K – Grade 3)**

*For a full description of Washington State Early Learning and Child Development Guidelines see:*

<https://www.del.wa.gov/sites/default/files/imported/publications/development/docs/guidelines.pdf>

(Age 4-5) 3. Touching, seeing, hearing and moving around: Using the large muscles (gross motor skills): Move with purpose from one place to another using the whole body.  
(Age 4-5) 6. Learning about my world: Science: Ask questions and identify ways to find answers; try out these activities and think about what to do next to learn more; talk about changes in the weather and seasons, using common words, such as rainy and windy. Arts: Show creativity and imagination.

**Common Core State Standards (CCSS) in Math**

<http://www.k12.wa.us/CoreStandards/Mathematics/default.aspx>

*Note that math topics may be addressed by students or teacher in this lesson. If a math topic is selected, choose the appropriate CCSS standard.*

**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.7. Look for and make use of structure.

**Next Generation Science Standards**

<http://www.nextgenscience.org/next-generation-science-standards>

**Topic:**

Weather and Climate; Structure, Function, and Information Processing; Structure and Properties of Matter

**Disciplinary Core Ideas:**

- PS1.A: Structure and Properties of Matter
- LS1.A: Structure and Function
- ESS2.D: Weather and Climate

*continued*

**Science Kits Addressed:**

PreK: Building Structures

K: Animals

1: Weather

2: Liquids, Solids

3: Sound, Plant Growth, and Development

4: Ecosystems

5: Micro Worlds, Models, and Designs

**Performance Expectations:**

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.

4-LS1-1. Construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction.

5-PS1-3. Make observations and measurements to identify materials based on their properties.

**Crosscutting Concepts:**

Patterns

Structure and Function

Energy and Matter

Influence of Science, Engineering, and Technology on Society and the Natural World

**Science and Engineering Practices:**

2. Developing and Using Models

7. Constructing explanations (for science) and designing solutions (for engineering)

8. Obtaining, Evaluating, and Communicating Information

### ICON KEY:

 = Indicates note or reminder for teacher

= Embedded assessment points in the lesson

### Pre-Teach

Introduce movement safety, shape, self-space, and general space. Do the STEAM BrainDance. Explore STEM topics to be used in the dance structure.

### Lesson Steps Outline

**1.** Introduce the concept of Structure.

**2.** Prepare students for dancing by creating agreements for appropriate dance behavior. Chart student responses.

**3.** Lead students in *STEAM BrainDance* warm-up.

Music: "STEAM BrainDance" by Debbie Gilbert

Criteria-based process assessment: Performs the BrainDance while infusing STEM.

**4.** Analyze video of dancers using smooth and sharp energy. Introduce and guide exploration of the dance concept of smooth and sharp energy. Play a drum and/or other instrument for accompaniment.

Criteria-based teacher checklist: Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture).

Criteria-based process assessment: Moves with smooth energy. Moves with sharp energy.

**5.** Demonstrate and direct the Rhombus Shadowing Structure.

Music: "Violin Textures" (slow), "Gazelle" (moderate), "Potpourri 5" (variety of tempos and rhythms), all from *Music for Creative Dance, Volume V*, by Eric Chappelle

Criteria-based process assessment: Leads and follows using the Rhombus Shadowing Structure.

**6.** Guide the Rhombus Shadowing Structure exploration using smooth and sharp energy with a science topic: weather or climate. Chart the four important ideas.

Criteria-based teacher checklist: Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme. Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.

**7.** Ask small groups to choose a STEM topic, four key ideas, and to rehearse the Rhombus Shadowing Structure with smooth and sharp energy. Distribute worksheets for notating choices.

Music: "Violin Textures" (slow), "Gazelle" (moderate), "Potpourri 5" (variety of tempos and rhythms), all from *Music for Creative Dance, Volume V*, by Eric Chappelle

Criteria-based teacher checklist, self-assessment: Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture). Selects and notates four important aspects of a science, technology, engineering, or math topic. Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme. Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.

**8.** Describe and discuss how students can use the 21<sup>st</sup> Century Skill of communication when they work with their groups. Guide continued practice.

Criteria-based teacher checklist, self-assessment: Actively listens; expresses ideas — visually/physically/verbally; responds to others.

**9.** Guide small group performance and response. Review performer and audience expectations.

Criteria-based teacher checklist, peer assessment: Selects and notates four important aspects of a science, technology, engineering, or math topic. Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme. Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance. Actively listens; expresses ideas — visually/physically/verbally; responds to others.

**10.** Lead reflection.

Criteria-based reflection: Reflects on structure. Makes a connection between dance and STEM.

## LESSON STEPS

---

### 1. Introduce the concept of Structure.

- *Dancing Scientists, today we are going to dance the concept of Structure.*
- *What do you know about Structure? Turn and talk about your ideas and then we will share them.*
- *We are going to be looking at structure as the skeleton or organization on which we build or construct something.*
- *We are going to deal with Structure in two different ways. One is your physical structure. As a dancer, that is using correct body alignment. When you use good body alignment, your movement is more efficient and effective and your muscles do less work.*
- *Stand up and we will build our body alignment. Let your arms hang loose at your sides. Relax your shoulders. Keep your knees soft, not locked. Make sure your knees are over your toes. Stand tall with a long back. You are showing good posture. Sometimes we call this position "dancer neutral." Knowing what good alignment feels like when you are standing will make it easier for you to use good alignment when you are moving.*
- *Have a seat right where you are. The other way we will be looking at Structure is the skeleton of a dance, its organization or plan that puts all the parts together into one dance. The structure that we will dance today is the Rhombus Shadowing Structure. We will choose the parts of our dance based on finding the important parts of the STEM topics we select, build our structures, and dance them.*

---

### 2. Prepare students for dancing by creating agreements for appropriate dance behavior. Chart student responses.

- *How can you be creative and safe at the same time?*



Movement Safety

▣ Prepare the classroom for dance.



Moving Desks/Set-up

**3. Lead students in *STEAM BrainDance* warm-up.** (BrainDance originally developed by Anne Green Gilbert, [www.creativedance.org](http://www.creativedance.org), reference: *Brain-Compatible Dance Education*, video: *BrainDance, Variations for Infants through Seniors.*)

Music: "STEAM BrainDance" by Debbie Gilbert



STEAM BrainDance

- *Let's warm-up our brains and bodies with the BrainDance! Notice when we use science, technology, engineering, arts, and math in the BrainDance.*

### **Breath**

- *STEAM Dancers, stand with good body alignment. Let your arms hang loosely at your sides, and relax your shoulders. With soft knees, stand with your knees over your toes. Your back should be tall and straight with a natural curve at the base of your spine.*
- *Inhale, taking oxygen in through your nose and filling your lungs.*
- *Exhale through your mouth.*

### **Tactile**

- *Energize the surface of your body. Tap from the top of your head all the way to your toes. We'll count by fives to eighty: 5, 10, 15 ... 80.*
- *Brush the surface of your body from your head to your toes.*

### **Core-Distal**

- *Expand into a huge shape in which your distal edges (finger and toenails) reach as far from the center of your body as possible.*
- *Shrink into a small shape, pulling everything to your core.*

### **Head-Tail**

- *Think about your alignment, your body structure. Curl your spine forwards and backwards and from side to side. We'll count by tens: 10, 20, 30 ... 80.*

### **Upper Half**

- *While the lower half of your body is frozen, dance the water cycle with your upper body: precipitation, collection, evaporation, condensation. Repeat.*

### **Lower Half**

- *While the upper half of your body is frozen, dance the life cycle of a plant with your lower body: seed, seedling, flower, seeds are released, plant dies. Repeat.*

### **Body-Half**

- *With one side of your body while the other side is frozen, dance three states of matter: solid, liquid, gas.*
- *With the other side of your body while the first side is frozen, dance three states of matter: solid, liquid, gas.*

### Eye-Tracking:

- Focus on your right thumb. Draw a 3D shape in the air.
- Repeat with your left thumb.

### Cross-Lateral

- Reach across your body up high, up high, down low, down low. We'll count to twelve: 1, 2, 3 ... 12. Let's cut that in half: 1, 2, 3 ... 6. Let's cut that in half again: 1, 2, 3.

### Vestibular

- Turn, then freeze, in a rainy weather shape. Turn, then freeze, in a snowy weather shape. Turn, then freeze, in a windy weather shape. Turn, then freeze, in a hot weather shape.

### Breath:

- STEAM Dancers, stand with good body alignment.
- Breath quietly and calmly, inhaling and exhaling.

Criteria-based process assessment: Performs the BrainDance while infusing STEM.

## 4. Analyze video of dancers using smooth energy and sharp energy. Introduce and guide exploration of the dance concept of smooth and sharp energy. Play a drum and/or other instrument for accompaniment.

- We are going to be dancing with sharp and smooth energy today.

☐ 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. 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.

STG Presents DANCE This 2010 Massive Monkeys

<https://www.youtube.com/watch?v=cQZRWCvnlIg>

Urban Bush Women BOLD: 2010 Summer Leadership Institute Culminating Performance excerpt

<http://www.youtube.com/watch?v=2elOmIxdC8g>

- Here are some video clips of dancers. Identify when you see dancers using smooth energy and when you see dancers using sharp energy.
- Now we are going to dance with sharp and smooth energy in self-space. That means you will stay on one spot and use your whole body when you move — your head, your arms, your legs, and your back!
- Before you begin to move, show me good body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture).
- Sharp movements are jerky. They stop and start. Move sharply in one spot. Freeze.
- Smooth movements are flowing. They keep going and don't stop. Move smoothly in one spot. Freeze.



Prompting for Creativity

Repeat moving with sharp and smooth energy a few more times until all students can show the dance concept.

- *What smooth and sharp movements did you do? How do you know?*

Criteria-based teacher checklist: Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture).

Criteria-based process assessment: Moves with smooth energy. Moves with sharp energy.

### 5. Demonstrate and direct the Rhombus Shadowing Structure.

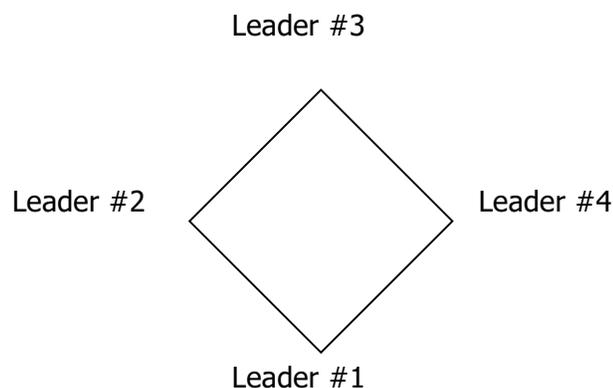
Music: "Violin Textures" (slow), "Gazelle" (moderate), "Potpourri 5" (variety of tempos and rhythms), all from *Music for Creative Dance, Volume V*, by Eric Chappelle

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.

- *I'll need three assistants so there will be four of us demonstrating the dance structure.*
- *We'll stand in a rhombus formation using good body alignment. We will all face in one direction with leader #1 in front. Leader #1 does smooth or sharp nonlocomotor movements. All will shadow the leader, then make a 90° turn to the right.*
- *Leader #2 is now the leader. We will continue until all four of us have had a chance to lead.*



Rhombus Shadowing Structure



- *Now we will all try this structure. In your group of four, begin leading and following using smooth or sharp energy.*

Criteria-based process assessment: Leads and follows using the Rhombus Shadowing Structure.

## **6. Guide the Rhombus Shadowing Structure exploration using smooth and sharp energy with a science topic: weather or climate. Chart the four important ideas.**

▣ When assessing the criteria, because any students who are not meeting criteria will be very clear to you, you may want to use a reverse checklist, putting a "0" where students have not met criteria, rather than trying to notate 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 what and who needs more practice, so you can return to it in the future. You can choose to use the checklist during rehearsal or wait until the performance.

- *Let's repeat the Rhombus Shadowing Structure and add a STEM topic.*

▣ You can choose a STEM topic your students are currently investigating. As an example, I am using weather.

- *Since we have four leaders in this dance structure, let's choose four important things about weather that we have learned about in our science unit. That will be the structure for our exploration.*
- *What are four important weather ideas? (e.g. sun, rain, wind, lightning)*
- *Begin by standing with good body alignment.*
- *Leader #1 dance "sun." Choose smooth or sharp energy, based on which energy quality best shows your weather idea.*

▣ Continue cuing the second, third, and fourth leaders with their weather ideas.

☑ Criteria-based teacher checklist: Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme. Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.

---

## **7. Ask small groups to choose a STEM topic, four key ideas, and to rehearse the Rhombus Shadowing Structure with smooth and sharp energy. Distribute worksheets for notating choices.**

Music: "Violin Textures" (slow), "Gazelle" (moderate), "Potpourri 5" (variety of tempos and rhythms), all from *Music for Creative Dance, Volume V*, by Eric Chappelle

▣ For choosing their STEM topic, you can make a chart of possible choices or limit the choices (one or two) to what your students are currently studying. Choices could include: weather, world climates, kinds of materials (color/texture/hardness/flexibility or color/hardness/reflectivity/conductivity, solubility, internal/external structures), structure and function, structure and properties of matter, and more.

- *We are going to repeat the Rhombus Shadowing Structure, but this time your group can choose its own STEM topic.*
- *Your group's first job is to choose your STEM topic.*
- *Your next job is to choose the four important ideas you want to share about the structure of your topic.*
- *On your worksheets, notate your topic and four important ideas.*
- *Decide who will be the leader for each important idea.*

- *Think about your important idea.*
- *Begin by standing with good body alignment.*
- *Practice.*
- *Ask yourselves, when you are leading: Does every movement show your important idea? Does smooth or sharp energy best express that idea? Are you using correct physical structure — your body alignment?*

Criteria-based teacher checklist, self-assessment: Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture). Selects and notates four important aspects of a science, technology, engineering, or math topic. Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme. Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.

## **8. Describe and discuss how students can use the 21<sup>st</sup> Century Skill of communication when they work with their groups. Guide continued practice.**

- *When you work with your groups, you are using a 21<sup>st</sup> Century Skill — communication!*
- *What does communication look like?*

Elicit responses from students.

- *Notice how you are actively listening to your partners as they express their movement ideas physically, non-verbally. You are also responding to them as you shadow their movements.*
- *When you practice your dance this time, make sure that every movement communicates your STEM idea.*

Criteria-based teacher checklist, self-assessment: Actively listens; expresses ideas — visually/physically/verbally; responds to others.

## **9. Guide small group performance and response. Review performer and audience expectations.**

- *Let's share our movement structures.*
- *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 smooth and sharp movements that you observed. When you describe a movement, be so specific that someone who didn't see the dancer do the movement would know just how to do it.*
- *The performers are communicating with each other and they also are communicating with you, the audience. Can you identify the STEM topic the group has chosen for its Shadowing Structure? How did they communicate that to you?*



Audience and Performer Expectations

- *Can you identify the four important aspects of their topic? What did the dancers do that helped you identify the four important ideas? Why are they important?*

Criteria-based teacher checklist, peer assessment: Selects and notates four important aspects of a science, technology, engineering, or math topic. Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme. Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance. Actively listens; expresses ideas — visually/physically/verbally; responds to others.

---

## **10. Lead reflection.**

- *Dancing Scientists, what did you discover about Structure?*
- *What have you understood today by dancing that will help you in science?*

Criteria-based reflection: Reflects on structure. Makes a connection between dance and STEM.

---

## Structure Student Worksheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

What is your STEM topic?

\_\_\_\_\_

What are the four key ideas about your STEM topic that you will use as the structure for your Rhombus Shadowing Structure?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

**ARTS IMPACT LESSON PLAN Arts Infusion**

*Structure*

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

**STUDENT SELF-ASSESSMENT WORKSHEET**

Disciplines	<b>DANCE</b>	<b>STEM</b>	<b>DANCE/STEM</b>	<b>DANCE</b>	<b>DANCE/STEM</b>	Total
Concept	<b>Structure</b>	<b>Structure</b>	<b>Structure</b>	<b>Energy</b>	<b>Communication</b>	5
Criteria	Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture).	Selects and notates four important aspects of a science, technology, engineering, or math topic.	Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme.	Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.	Actively listens; expresses ideas — visually/physically/verbally; responds to others.	
Student Name						

**ARTS IMPACT LESSON PLAN Arts Infusion**

*Structure*

**CLASS ASSESSMENT WORKSHEET**

Disciplines	<b>DANCE</b>	<b>STEM</b>	<b>DANCE/STEM</b>	<b>DANCE</b>	<b>DANCE/STEM</b>	Total
Concept	<b>Structure</b>	<b>Structure</b>	<b>Structure</b>	<b>Energy</b>	<b>Communication</b>	5
Criteria	Stands with correct body alignment (arms loose at sides, relaxed shoulders, soft knees, knees over toes, long back, good posture).	Selects and notates four important aspects of a science, technology, engineering, or math topic.	Leads and follows in a quartet with each dancer positioned at each vertex of a rhombus to show a science, technology, engineering, or math theme.	Uses smooth (flowing, connected) and/or sharp (abrupt stopping/starting, choppy) movements in a dance.	Actively listens; expresses ideas — visually/physically/verbally; responds to others.	
Student Name						
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
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 STEM?*

Teacher: \_\_\_\_\_ Date: \_\_\_\_\_

DANCE AND SCIENCE LESSON: *Structure*

---

Dear Family:

Today your child participated in an **Arts and Science** lesson. We talked about physical structure and choreographic structure.

- We discovered that physical structure is good body alignment and we used good body alignment throughout the lesson.
- We danced with smooth energy (flowing, connected) and sharp energy (abrupt stopping/starting, choppy).
- We learned that a choreographic structure is the skeleton or organization of a dance.
- We created Rhombus Shadowing Structures using smooth or/or sharp energy to show our understanding of science, technology, engineering, or math topics.
- We communicated with and responded to our groups when we were leading and following as we expressed our topic and our movement ideas physically or non-verbally.

At home, you could practice standing in dancer neutral with good body alignment or posture. Can you create a structure to show an important real-life idea like the life cycle of a plant or the ingredients in a birthday cake?

**Enduring Understanding**

Correct body alignment is the dancer’s physical structure that leads to physiological effectiveness. The choreographic structure of a dance can be its skeleton, i.e. how movement is put or held together in a dance about science, technology, engineering, arts, and/or math.