

**ITQ ARTS AND SCIENCE INTEGRATION  
GRADE 5  
DANCE AND PHYSICAL SCIENCE**

**Families Stick Together, Part 1  
The Periodic Table of Elements  
Lesson 2**

**CONTENT STANDARDS**

**Dance**

- 1.4** Incorporate the principles of variety, contrast, and unity with dance studies.  
**2.2** Invent multiple possibilities to solve a given movement problem and analyze problem-solving strategies and solutions.

**Physical Science**

- PS1e** Students know that each element is made of one kind of atom and that the elements are organized in the periodic table by their chemical properties.

**ESSENTIAL QUESTIONS** (*Questions that students might ask about the topic*)

- What is the Periodic Table of Elements and how do I read it?
- How do I use contrast and variety to make my dance interesting?
- How does dance help me to understand the periodic table?

**OBJECTIVES & STUDENT OUTCOMES** (*Students will be able to.....*)

- distinguish between periods, groups and transition elements on the Periodic Table of the Elements.
- demonstrate and describe the importance of variety and contrast in dance.

**ASSESSMENT** (*Various strategies to evaluate effectiveness of instruction and student learning*)

- **Feedback for Teacher**
  - Student response to inquiry
  - Student performance
  - "Student Guide for Creating Movement: Periodic Table of Elements" Handout (included)
  - Color coded Periodic Table of Elements done by students
- **Feedback for Student**
  - Teacher feedback
  - Performance/Rubric
  - "Student Guide for Creating Movement: Periodic Table of Elements" Handout (included)
  - Blank Periodic Table of Elements handouts to color code

**WORDS TO KNOW**

**Dance**

- **Beat:** Steady and evenly spaced pulse of movement.
- **Contrast:** To set side-by-side to show differences in size, shape, energy, direction, level or design (symmetry, asymmetry, open, closed or in patterns).
- **Dance sequence:** The order in which a series of movements and shapes occurs.
- **Formation:** The pattern into which a number of dancers are arranged giving shape and structure to the dance.
- **Shape:** The positioning of the body in space. Shapes are curved, straight, angular, twisted, symmetrical or asymmetrical.

- **Spatial relationship:** the position of the body in relationship to another body or object (over, under, above, below, between, beside, around through, etc.).
- **Stillness:** ceasing all movement in a frozen shape.
- **Variety:** the quality or range of different things that maintains audience interest. Contrast and repetition provide variety.

#### Science

- **Group:** The columns of the Periodic Table. The elements in each group have similar chemical properties.
- **Period:** The rows of the Period Table that identify the elements according to their atomic number.
- **Periodic Table of Elements:** An arrangement of the elements that provides information about their properties.
- **Transition metals:** The 38 elements in groups 3 through 12 of the periodic table are called transition metals. As with all metals, the transition elements are both ductile and malleable, and conduct electricity and heat.

#### MATERIALS

- Student Guide for Creating Movement: Periodic Table of Elements Handout (included)
- Periodic Table of the Elements (3 per student)
- Video Camera
- Hand drum or other percussive instrument
- Science notebooks (one per student)

#### RESOURCES

- FOSS “Physical Science: Mixtures and Solutions”, Grade 5, Investigation 4: Elements

#### PREPARATION

- Post Periodic Table of Elements on overhead.
- One copy per student of the Student Instruction Sheet, “Creating Movement for the Periodic Table of the Elements” handout.
- Three copies of a blank (no color) **Periodic Table of Elements** per student.
- Review before dance instruction:
  - *Say/Ask: Each element is made of one and only one kind of atom. How many elements in oxygen (O), in hydrogen (H) and in sodium (Na)? [one]*
  - *Say: Elements on the **periodic table** are arranged in families according to similar properties. Just as you and your family have the same last name, these elements are organized by their chemical properties.*
  - *Ask: Have students ever seen a helium balloon? A neon light? Explain that the gases found in these items are elements found on the **periodic table**. Have students locate Helium and Neon on the periodic table.*
  - *Ask: What do you notice about where they are located on the PTE? [They are located in the same column or group. They have similar properties, are both Noble Gases and do not react with other elements.]*
  - *Say: Let’s look at the elements on the **Periodic Table of Elements** and see how groups of elements are related.*

#### WARM UP *(Engage students, access prior learning, review, hook or activity to focus the student for learning)*

(10 minutes)

- Dance Vocabulary and Skills: **variety, contrast, beat, shape.**
- As a group review the double basic step. Perform several times.

- Define **beat**.
  - Say/Ask: **Beat** is the steady pulse of the movement. In the double basic dance step, each time we take a step it is one **beat**. How many **beats** are in a double basic step? [four **beats**] If I do the double basic step four times, how many **beats** will that be? [16 **beats**]
- Define **shape**.
  - Say: **Shape** is a position of the body in space that can be moving or still. We will be doing still **shapes**.
  - Note: Take a brief amount of time to review making **shapes** (curved, straight, zigzag, twisted, wide, narrow, low, medium, high levels, etc.).
- Define **contrast**.
  - Say/Ask: When I do the double basic step over and over again it is very boring to watch. I want to make it look more interesting. How can I make the step more interesting? [Accept student responses]
  - Perform the double basic and change the following: wiggle the step, change the direction (e.g., turn, forward and back), add a frozen **shape** on **beats** four and eight.
  - Say/Ask: Let's add a turn on the third and fourth sequences. End in a still **shape**. How did the changes we made create interest in the double basic step? [Accept student responses].
  - Movement that looks different when placed side-by-side is called **contrast**. If all the movements were the same in a dance, the dance would be boring to watch, just like doing the double basic step over and over again. In **contrast**, if every single movement were different that would be too chaotic. So in order to keep the audience interested in our performance, we need a little of each. That is what we call **variety** in dance.
  - Ask: What did we do to change the dance step and how did that create **variety**? [It made the dance step look different and more interesting by changing quality, direction, and **shape**].
  - Say: Remember this **sequence** because we will be doing it again when we perform a dance about the **Periodic Table**.

**MODELING** (Presentation of new material, demonstration of the process, direct instruction)  
(15 minutes)

- Structure: **Periodic Table of Elements**

- 1. **Periods**

- Say: Each row of the **periodic table** is called a **period**.
- Have students use the gesture of arms even with the shoulders, out to the sides (in a horizontal "t" shape) to represent the **periods**. Every time you say **period**, the students should extend arms out to sides.
- Say/Ask:
  - Let's count the number of **periods** (rows) together. Run your finger across each row as you say the number of the **period**. How many **periods** are there? [Seven]
  - How many elements are in the first **period** and what are they? [two; hydrogen and helium]. Hydrogen is the most abundant of the elements. 75% of the universe's elemental mass is made up of hydrogen.
  - The elements in the second and third **periods** include the most essential elements (besides hydrogen) for living things and basic geology.
  - Locate carbon (C), nitrogen (N), oxygen (O); and sodium (Na), and chlorine (Cl) on the **Periodic Table of Elements**.
  - Point out to students that as we look at the elements in the **period table** from left to right we notice the atomic number (number of protons in the nucleus) increases. Refer to **period #2** and say: Lithium is smaller than neon. The way we can tell is to look at the atomic number of elements from lithium to neon. Ask: What do you notice about the atomic number of these elements? [They increase, i.e., the number of protons in the nucleus increases, therefore they are larger atoms.]

2. **Groups**
    - Say:
      - *Each **group** represents a column of the **periodic table**. Elements found in the same group have similar chemical properties. This means that they react in a similar way with other elements.*
        - Have students use the gesture of raising their right arm up and extending their left arm down to represent the vertical columns. Every time you say the word “**groups**,” the students respond with the gesture.
      - *Let’s count the **groups** on the **Periodic table**. Run your finger down each column and count from 1-18. Select and run your finger down groups 1 and 2 and say *all the elements occurring in this **group** have similar chemical properties.**
    - Locate in which **group** the following elements are located.
      - Hydrogen [group #1]
      - Carbon [group #14]
      - Nitrogen [group #15]
      - Oxygen [group #16]
  3. Point out to students that as the elements in the **group** move from top to bottom the atomic number also increase, i.e., the number of protons in the nucleus increases. Refer to **group 1**. Ask: *What is the atomic number of hydrogen (H)? [1] What is the atomic number of potassium (K)? [19] Which is larger? [potassium] How do you know? [Potassium has a larger atomic number therefore it is larger than hydrogen.*
  4. **Transition metals**
    - Say: (Point to the middle elements on the PTE)
      - *All the elements in the middle section, including the bottom two rows are special. There are 38 elements in groups 3 through 12 of the **periodic table** are called **transition metals**. As with all metals, the **transition elements** are both ductile and malleable, and conduct electricity and heat. The **transition elements** include the important metals iron, copper and silver. Iron and titanium are the most abundant **transition elements**.*
- Teaching formations
    - Arrange students in groups of six.
    - **Period Formation**
      - Arrange each group into a shoulder-to-shoulder line, facing front.
      - Arrange the student on your far right (at the end of the line) to make a small **shape**.
      - Arrange the student on your far left (at the other end of the line) to make a very large shape that looks similar to the small shape.
      - Arrange the rest of the students in the line to create shapes arranging in size from small to large moving from their right to left (your left to right). All **shapes** must look similar since these elements are in the same **period**.
      - Have students scatter for eight beats and reform into a **period**. Do this several times.
    - **Group Formation**
      - Follow same procedure lining students one behind the other, facing front.
      - Arrange the student in the back of the line into a small **shape**.
      - Arrange the student in the front of the line into a large **shape** that looks similar to the small shape.
      - Arrange the rest of the students in the line to create shapes arranging in size from small to large moving from their right to left (your left to right). All **shapes** must look similar since these elements are related and in the same **group**.
      - Have students scatter for eight beats and reform into a **group**. Do this several times.
    - **Transition Elements**
      - **Transition elements** will not be taught in this lesson. Refer to the extension part of this lesson for teaching this section of the **periodic table**.
  - Have students practice forming into a **period** then into a **group**. Alternate back and forth until students can move through both smoothly.

### **GUIDED PRACTICE** (*Application of knowledge, problem solving, corrective feedback*)

(20 minutes)

- Divide the class into groups of six.
- Tell students that they will be creating a dance that will show **variety** and **contrast** and end in a **formation** that will identify them as a **group** or a **period** of the **periodic table**.
- Distribute “Student Guide for Creating Movement: Periodic Table of Elements” Handout to one member of each group and review directions.
  - Select two or three groups to end their dance as a **period**, and two or three groups to end their dance as a **group**.
  - Each group will select a **formation** in which to perform (attached illustration).
  - Review the dance sequence with the contrasting changes.
    1. Double basic with a clap on beats 4 and 8
    2. Double basic with a level change (wide step to the side with hands on knees).
    3. Single basic to the left with a turn beats 1-4, freeze on beats 5 hold 6, change shape on beat 7 hold 8.
    4. Single basic to the right with a turn beats 1-4, freeze on beats 5 hold 6, change shape on beat 7 hold 8.
    5. Move into either a **period** (long line, shoulder-to-shoulder) or **group** (long file, one behind the other) for 8 beats.
    6. Create the appropriate shapes showing increasing size from right to left (**period**) or from back to front (**group**). Freeze.
- Plan and rehearse for 10-15 minutes.
- Each group will perform in turn while the rest of the class observes. Ask observers to identify the **groups** or **periods** in each **dance sequence**.
- Videotape each group’s performance.

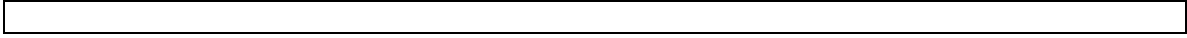
### **DEBRIEF AND RELLECT** (*Identify problems encountered, ask and answer questions, discuss solutions and learning that took place. Did students meet expected outcomes?*)

(5 minutes)

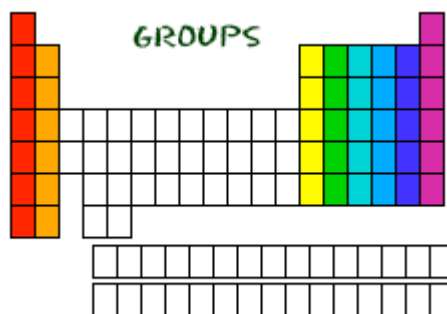
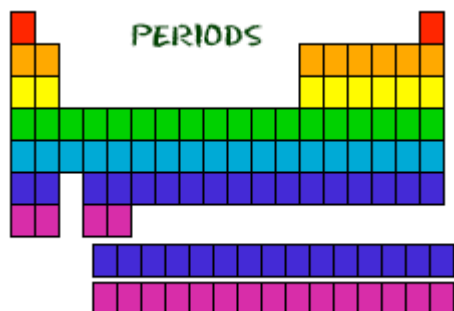
- \*Note: If time permits, show students the videotape so that they can observe their performance and make comments and suggest improvements.
- Exit questions: Record in science journals:
  - What did I learn about the structure of the **Periodic Table of Elements**? [The table is arranged into **periods** (rows) and **groups** (columns). The atomic mass of the elements increases as we look at the periodic table from left to right and top to bottom. This means there are more protons in the nucleus of the atoms.]
  - How did movement help me understand the periodic table?
  - How would I create a dance that is interesting for an audience to watch?

### **EXTENSION** (*Expectations created by the teacher that encourages students to participate in further research, make connections and apply understanding and skills previously learned to personal experiences.*)

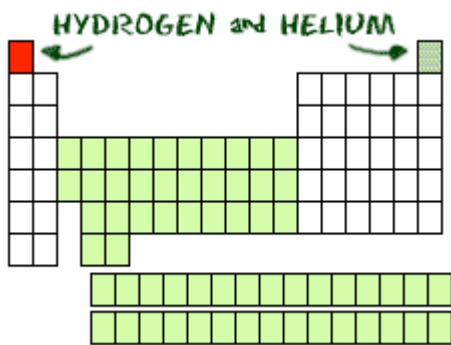
- **Transition metals dance study:** Each student will select and represent a **transition metal** from the **periodic table**. As a group, students will improvise 16 **beats** of movement. Each student must end in such a way as to represent the position (**spatial relationship**) and size of that element according to where it appears on the **periodic table**. Everyone’s shape must show a **contrast** of a common **shape** (e.g., a geometric shape that is at different levels, is tilted or balanced on one foot, faces a different direction, etc.). Everyone ends in **stillness** on **beat 17**
- Distribute three blank **Periodic Table of the Elements** handouts to each student. Have them color code each table according to 1. **period**, 2. **group** and 3. **transition elements**.
- *Ask: What else do we know about the **Periodic Table of Elements** that we can explore through movement?* [Elements are arranged according to their properties, e.g., metals, solids, gasses.]



## THE PERIODIC TABLE OF ELEMENTS – THE BUILDING BLOCKS



### Transition Metals

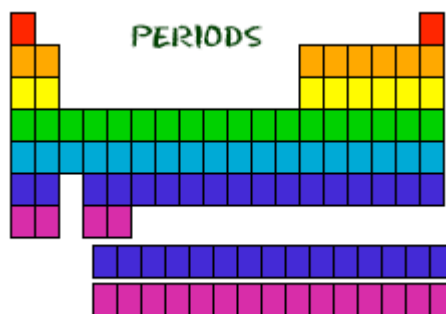


3B	4B	5B	6B	7B	8B			1B	2B
<sup>21</sup> Sc	<sup>22</sup> Ti	<sup>23</sup> V	<sup>24</sup> Cr	<sup>25</sup> Mn	<sup>26</sup> Fe	<sup>27</sup> Co	<sup>28</sup> Ni	<sup>29</sup> Cu	<sup>30</sup> Zn
<sup>39</sup> Y	<sup>40</sup> Zr	<sup>41</sup> Nb	<sup>42</sup> Mo	<sup>43</sup> Tc	<sup>44</sup> Ru	<sup>45</sup> Rh	<sup>46</sup> Pd	<sup>47</sup> Ag	<sup>48</sup> Cd
<sup>57</sup> La	<sup>72</sup> Hf	<sup>73</sup> Ta	<sup>74</sup> W	<sup>75</sup> Re	<sup>76</sup> Os	<sup>77</sup> Ir	<sup>78</sup> Pt	<sup>79</sup> Au	<sup>80</sup> Hg
<sup>89</sup> Ac	<sup>104</sup> Unq	<sup>105</sup> Unp	<sup>106</sup> Unh						

**STUDENT INSTRUCTION SHEET**  
**CREATING MOVEMENT FOR THE PERIODIC TABLE OF ELEMENTS**

## **THE PERIODS**

1. Do a double basic with a clap on beats 4 and 8
2. Do a double basic with a level change (wide step to the side with hands on knees).
3. Do a single basic to the left with a turn beats 1-4, freeze on beats 5 hold 6, change shape on beat 7 hold 8.
4. Do a single basic to the right with a turn beats 1-4, freeze on beats 5 hold 6, change shape on beat 7 hold 8.
5. Move into either a **period** (long line, shoulder-to-shoulder).
6. Create the appropriate shapes showing size from right to left (**period**) or from back to front (**group**). Freeze
7. Make sure elements are arranged and performed in sequence.

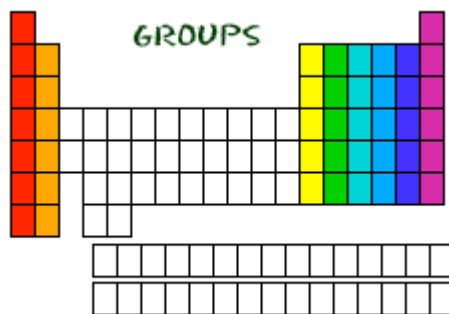




**STUDENT INSTRUCTION SHEET**  
**CREATING MOVEMENT FOR THE PERIODIC TABLE OF ELEMENTS**

**THE GROUPS**

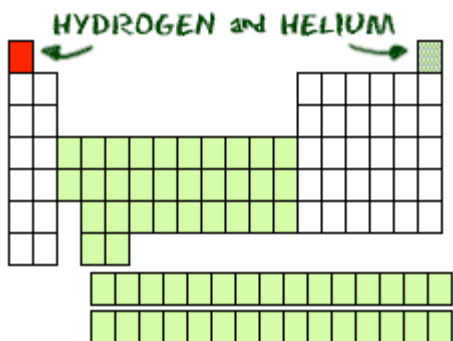
1. Do a double basic with a clap on beats 4 and 8
2. Do a double basic with a level change (wide step to the side with hands on knees).
3. Do a single basic to the left with a turn beats 1-4, freeze on beats 5 hold 6, change shape on beat 7 hold 8.
4. Do a single basic to the right with a turn beats 1-4, freeze on beats 5 hold 6, change shape on beat 7 hold 8.
5. Move into either a **group** (long line, one behind each other)
6. Create the appropriate shapes showing size from back to front (**group**). Freeze
7. Make sure elements are arranged and performed in sequence.



**INSTRUCTION SHEET**  
**CREATING MOVEMENT FOR THE PERIODIC TABLE OF ELEMENTS**  
**EXTENSION**

**TRANSITION METALS**

1. Each performer will select a transition element from the Periodic Table of Elements that they will represent (refer to the diagram below).
2. Determine what will be the common shape for the group. Each person in the group must show a variation or contrast for the common shape. For example, the shape can be tilted, balanced on one foot, on a different level, symmetrical or asymmetrical, done with the whole body or with just a part of the body, face a different direction, etc.
3. As a group, improvise 16 beats of movement. Each person may start anywhere in the space.
4. As you are moving, pay attention to the position of your element in relationship to other the elements. Make sure you end up in the position as the element appears on the Periodic Table. You may have to travel to get to your spot.
5. On beat 17, everyone will end in a still shape. Each person's shape should slightly contrast the others. \*Hint: Select one shape to model. Have everyone in the group create a shape that is slightly different than this first shape.



3B	4B	5B	6B	7B	8B			1B	2B
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