



Project Essential Questions

- How do the molecules move in the three states of matter?
- How do the processes of melting, freezing, condensation/evaporation, and boiling change how the molecules move in matter?
- How can I write a comparison paragraph comparing the movement of molecules in solids, liquids, and gases?
- How can I use locomotor and non-locomotor movement to demonstrate how the molecules move in a solid, liquid, and gas?

PROJECT DESCRIPTION

In this project, students will be up on their feet moving and dancing with atoms! They will apply their previously taught knowledge of how molecules move in the three states of matter to represent the movement of the molecules in each state of water. Students should also be able to determine that these changes in matter are physical changes. This particular project goes deeper into analyzing how molecules move using dance integration strategies.

LEARNING TARGETS

“I Can...”

- Analyze how the molecules move inside of the three states of matter (solid, liquid, and gas)
- Use locomotor and non-locomotor movement to display how the molecules move in a solid, liquid, and gas
- Write a compare and contrast paragraph for the movement of molecules in each state of matter

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Units provide differentiated ideas and activities aligned to a sampling of standards.

The units do not necessarily imply mastery of standards, but are intended to inspire and equip educators.

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Cherokee County (GA) School District and ArtsNow, Inc.

DURATION: 1-2 days

Project Description	Learning Targets
<p>In this project, students will be up on their feet moving and dancing with atoms! They will apply their previously taught knowledge of how molecules move in the three states of matter to represent the movement of the molecules in each state of water. Students should also be able to determine that these changes in matter are physical changes. This particular project goes deeper into analyzing how molecules move using dance integration strategies.</p>	<p>“I Can...”</p> <ul style="list-style-type: none"> Analyze how the molecules move inside of the three states of matter (solid, liquid, and gas) Use locomotor and non-locomotor movement to display how the molecules move in a solid, liquid, and gas Write a compare and contrast paragraph for the movement of molecules in each state of matter

ESSENTIAL QUESTIONS

<ul style="list-style-type: none"> How do the molecules move in the three states of matter? How do the processes of melting, freezing, condensation/evaporation, and boiling change how the molecules move in matter? How can I write a comparison paragraph comparing the movement of molecules in solids, liquids, and gases? How can I use locomotor and non-locomotor movement to demonstrate how the molecules move in a solid, liquid, and gas?

STANDARDS

Curriculum Standards	Arts Standards
<p>S5P2 Students will explain the difference between a physical change and a chemical change.</p> <p>b. Recognize that the changes in state of water (water vapor/steam, liquid, ice) are due to temperature differences and are examples of physical change.</p> <p>ELAW.5.2.</p> <p>a. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p>	<p>DSCO.4 Demonstrates an understanding of dance as it relates to other areas of knowledge.</p> <p>D5FD.1 Identifies and demonstrates movement elements, skills, and terminology in dance.</p> <p>c. Demonstrates accuracy, focus, control, and coordination in performing and creating a spectrum of locomotor sequences performed to music that includes a range of tempos, rhythms, and qualities.</p> <p>d. Performs smooth transitions when connecting movements.</p> <p>M5GM.4 Improvising melodies, variations, and accompaniment.</p> <p>a. Improvise rhythmic patterns using a variety of sound sources and answers to given rhythmic questions.</p>

KEY VOCABULARY

Content Vocabulary
<ul style="list-style-type: none"> Molecules Solids Liquids Gases

- Melting
- Freezing
- Condensation
- Boiling
- Evaporation
- Comparison
- Physical change

Arts Vocabulary

- Locomotor: movement that travels through space
- Non-locomotor: movement that does not travel through space
- Pathway: designs traced on the floor as a dancer travels across space; the designs traced in the air as a dancer moves various body parts
- Shape: an interesting and interrelated arrangement of body parts of one dancer; the visual makeup or molding of the body parts of a single dancer; the overall visible appearance of a group of dancers
- Vibratory: a quality of movement characterized by rapidly repeated bursts of percussive movements, like a jitter
- Legato: smooth, connected sounds (articulation)
- Marcato: stressed or accented sounds
- Ostinato: a repeated pattern
- Pitch: refers to the highness or lowness of sound
- Staccato: short, detached sounds
- Tempo: speed of the beat
- Unison: single melody; all instruments or voices sing/play the same notes

ASSESSMENTS

Formative	Summative
<ul style="list-style-type: none"> ● Teacher Observation of Student activity: Teachers will observe students throughout the molecule movement activity to check for understanding ● Quick Write Compare and Contrast of how the molecules move in a solid, liquid, and gas 	<ul style="list-style-type: none"> ● Compare and Contrast Writing Rubric (see Downloads)

MATERIALS

Paper, pencil (for activating strategy and compare/contrast quick write), **Fictional Water Stories** (See Downloads)

Activating Strategy

- Students will work individually to complete a 3-minute Brainstorming Session competition. Students will be given one minute to list as many solids as they can. This can be done in small groups of 3-5 students and on one large piece of chart paper given out to each individual group.
- Once completed, the students will then share with the class. The group who has the most solids listed correctly will win the competition! The class will then repeat this process with liquids and later gases. (You could also split the classroom into 3 groups and give each group a different state of matter to speed up this activity, if needed).

- Remind students throughout that they will need to listen for accuracy of their classmates lists.

Main Activity**Part 1**

- Review the dance vocabulary that will be used in this particular project.

Part 2

- The students will be split into various heterogeneous leveled teams where they will demonstrate the movement of molecules in solids, liquids, and gases.
- The teacher will then instruct the students that they are to use movement to express molecules within a solid. The solid molecules will be close together and demonstrate vibratory, non-locomotor movement.
- The teacher should be consistently reminding the students throughout of the definitions of locomotive, non-locomotive, vibratory, and other dance vocabulary.
- The teacher will then instruct the students to act like the molecules in a liquid. The liquid molecules will move slightly farther apart using locomotive, fluid movement. Be sure to remind students to use whole body movements during the liquid and gas phases.
- The teacher will then instruct the class to become the molecules in a gas. The gas molecules will move quickly, bouncing off of each other and the walls, moving very far apart.
- After the students have mastered the movement of the molecules in each of the states of matter, the teacher will then instruct the students to begin moving between the states of matter as they are called out. For example, as the teacher yells "Melting!" the students must transition from the solid to the liquid.
- Once this is demonstrated by multiple student groups, the students will then add a sound to their transitional movement. The students may use body percussion (i.e. using mouth, claps, pats, clicks, stomp) to demonstrate the transitions between phases and the tempo, as related to the molecule movement. (allegro = fast tempo = gas; moderato = medium tempo = liquid; adagio = slow = solid)

Part 3

- The students will be instructed to write a compare and contrast quick-write, comparing how the molecules move inside of a solid, liquid, and gas, and their transitional states.
- Also, students will compare and contrast the different movements used to act out the atoms in a molecule and include these in their writing.
- Students will be assessed through a **Compare and Contrast Writing Rubric** (see Downloads).

Classroom Tips:

- Teachers should make sure that there is enough wide open space in the classroom where students can form groups and move around as needed.

REFLECTION**Reflection Questions**

- *How did my body movements help me to display the way that molecules move inside of a solid, liquid, and gas?*
- *How did the sounds that I made help me to understand how molecules move inside of a solid, liquid, and gas?*

DIFFERENTIATION**Remedial/EL Students:**

- In the Activating Strategy of this project the teacher could use the technique of “Inspiration of Ideas” by using smaller groups, table groups, or pairs for remedial/EL to brainstorm together without the pressure of being timed. Perhaps you do this a day prior to the relay race.
- During the Reflection part of this project the following modifications could be made: place students in small groups, assist with Guided writing, provide sentence starters, provide graphic organizers, a word bank based on content vocabulary, a paragraph frame, or modify the length/writing assignment based on student needs.

Accelerated:

- These students could write their own story to demonstrate a drop of water transitioning through the three states of matter from the point of view of the water droplet. The student can write from the point of view of the water droplet and incorporate fine arts movement vocabulary in their story (such as locomotor, non-locomotor, tempo, etc.). See Downloads for examples of **Fictional Water Stories**.

ADDITIONAL RESOURCES**Books**

- *What Are Atoms?* by Lisa Trumbauer
- *Atoms and Molecules* by Molly Alaian

Online Book

- www.storyjumper.com/book/index/13299612/History-of-the-Atom

APPENDIX (See Downloads)

- **Compare and Contrast Writing Rubric**
- **Fictional Water Stories** (Accelerated Extension)

CREDITS

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Dance with Atoms: Compare and Contrast Writing Rubric

TASK: Create a dance that expresses the movement of molecules throughout the three states of matter.

Task	4	3	2	1
Comparing and Contrasting Science Content	Writer compares and contrasts movements of molecules clearly. Writer includes specific examples to illustrate the comparison. Writer includes only information relevant to the comparison.	Writer compares and contrasts movements of molecules clearly, but the supporting information is general. Writer includes only information relevant to the comparison.	Writer compares and contrasts movements of molecules clearly, but the supporting information is incomplete. Writer may include information that is not relevant to the comparison.	Writer compares and contrasts movements of molecules clearly, but does not include both. There is no supporting information, or information is incomplete.
Dance and Science Content Connection	Writer fully justifies how the movements were thoroughly reflective of the molecule movement within solids, liquids, and gases. The student offers a clear explanation of how their movements differ for each of the states of matter.	Writer somewhat justifies how the movements were thoroughly reflective of the molecule movement within solids, liquids, and gases. The student offers a clear explanation of how their movements differ for each of the states of matter.	Writer somewhat justifies how the movements were thoroughly reflective of the molecule movement within solids, liquids, and gases, but the student offers an incomplete explanation of how their movements differ for each of the states of matter.	Writer does not justify how the movements reflective of the molecule movement within solids, liquids, and gases, and the student gives no explanation of how their movements differ for each of the states of matter.
Ensemble Performance	Ensemble performance is coordinated, well-rehearsed and is performed using loud, clear voices, and strong bodies.	Ensemble seems mostly prepared but could have benefitted from more rehearsals. Voices are mostly loud and clear.	Ensemble is somewhat prepared, but it is clear that rehearsal was lacking. Voices are somewhat loud and clear.	Ensemble is not prepared to present. Students often mumble or can not be understood.
Writing Quality	Writer makes no errors in grammar or spelling that distract the reader from the content.	Writer makes 1-2 errors in grammar or spelling that distract the reader from the content	Writer makes 3-4 errors in grammar or spelling that distract the reading from the content	Writer makes more than 4 errors in grammar or spelling that distract the reader from the content.

Total Score: _____

STORY EXAMPLE ONE:

One rainy December day in Acworth, Georgia, Suzy and Cody wanted to play outside. The rain just kept pouring down, all day long. Suzy and Cody decided that they would just play inside for the day. Suzy and Cody played games, drank lemonade, and watched movies. The next morning, Suzy and Cody awoke to find that all the rain from the day before had turned into ice! They quickly put on their ice skates and ran outside to the local pond. They went ice skating all day long. By the end of the day, the sun was coming out from the clouds and the ice was slowly melting. They had such a fun day, even with all the ice!

STORY EXAMPLE TWO:

Heather was trying to decide what to cook for dinner for her family. She decided that she wanted to cook spaghetti. The first thing Heather did was to get water out of the kitchen faucet and put it in a pot. Once Heather put the pot of water on the stove, it quickly became heated and began to boil. Heather watched as the water slowly turned into to steam and left the pot, adding moisture to the noodles and cooking them in the process. Once the noodles were cooked, Heather filled the glasses with ice, set the table for dinner, and served her delicious spaghetti.