Lesson Plan Title
Whoomp, There It Is: Exploring States of Matter with Movement

Grade Level
5th Grade

Subject Area
Science

MSCCRS
P.5.5A.1 - Obtain and evaluate scientific information to describe basic physical properties of atoms and molecules.

P.5.5A.2 - Collect, analyze, and interpret data from measurements of the physical properties of solids, liquids, and gases (e.g., volume, shape, movement, and spacing of particles).

P.5.5A.3 - Analyze matter through observations and measurements to classify materials (e.g., powders, metals, minerals, or liquids)
based on their properties (e.g., color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, solubility, or density).

P.5.5A.4 - Make and test predictions about how the density of an object affects whether the object sinks or floats when placed in a liquid.

Conceptual Understanding:
Matter can be segregated into tiny particles that are too small to see but can be detected by the other methods. These tiny particles are referred to as atoms, which can be combined to form molecules. Substances exhibit specific properties that can be observed and measured.

Art Form
Dance

MSCCR Creative Arts Standards
DA: Cr2.1.5 Organize and develop artistic ideas and work.
a. Manipulate or modify a variety of choreographic devices to expand choreographic possibilities and develop the main idea. Explain reasons for movement choices.
b. Develop a dance study by selecting a specific movement vocabulary to communicate a main idea. Discuss how the dance communicates non-verbally.

Enduring Understanding:
The elements of dance, dance structures, and choreographic devices serve as both a foundation and departure point for choreographers.

Essential Questions:
What influences choice-making in creating choreography?

DA: Pr4.1.5 Select, analyze, and interpret artistic work for presentation.

a. Integrate static and dynamic shapes and floor and air pathways into dance sequences. Establish relationships with other dancers through focus of eyes and other body parts. Convert inward focus to outward focus for projecting out to far space.
b. Dance to a variety of rhythms generated from internal and external sources. Perform movement phrases that show the ability to respond to changes in time.
c. Contrast bound and free-flowing movements. Motivate movement from both central initiation (torso) and peripheral initiation (distal) and analyze the relationship between initiation and energy.

Enduring Understanding:
Space, time, and energy are basic elements of dance.

Essential Questions:
How do dancers work with space, time, and energy to communicate artistic expression?

DA: Re7.1.5 Perceive and analyze artistic work.
a. Find meaning or artistic intent from the patterns of movement in a dance work.
b. Describe, using basic dance terminology, the qualities and characteristics of a style used in dance from one's own cultural movement practice. Compare them to the qualities and characteristics of style found in a different dance genre, style, or cultural movement practice, also using basic dance terminology.

Enduring Understanding:
Dancers use the mind-body connection and develop the body as an instrument for artistry and artistic expression.

Essential Questions:
What must a dancer do to prepare the mind and body for artistic expression?

Duration
2 - 60-minute sessions

Materials
Samples of different tempos of music
Video clips showing the movement of molecules in different states of matter in resources below.
Laminate vocabulary words.

Objectives
Identify the major states of matter.
Choreograph a group dance to imitate the movement of particles in the different states of matter
Determine and demonstrate whether an example of matter is a solid, liquid, gas, or plasma.
List characteristics of the volume, shape, and molecular distribution of each state.

Science Vocabulary
Atom
Molecule
Matter
Solid
Liquid
Gas
State

Property
Condensation
Boiling
Freezing
Melting
Physical
Chemical

Dance Vocabulary
Elements of Dance
Dance Structures
Rhythm
Space
Time
Energy
Bound Movements
Free Flowing Movements

[TTW move furniture and provide a place for students to move later in the lesson.]

Lesson Description

1. TTW say, "Today we are going to learn a new science concept, but first we are going to get our bodies warmed up so we are ready to learn." TTW play Kidz Bop Kids "Whoomp, There It Is" Dance Along video: https://www.youtube.com/watch?v=LgPtJ0pTutc&feature=youtu.be

2. TSW stand, spread out, and dance along to the video.

   Upon the completion of the dance-along video, TTW ask, "*How do dancers work with SPACE to communicate artistic expression?"*

   TSW respond.

   TTW ask, "How do dancers work with TIME to communicate artistic expression?"

   TSW respond.

   How do dancers use ENERGY to communicate artistic expression?"

   TSW respond.

3. TTW ask students to "Sit and pay close attention to this video": https://youtu.be/wyRy8kowyM8 [23 minutes in length, so the teacher may only want to show a few minutes].

4. TTW introduce the students to the concept of matter by defining matter for the students (i.e., everything that takes up space/everything you see). TTW say, "What is matter anyway? Why does it matter so much?"

   TSW listen and respond to the teacher's questions.

TTW continue, “The stuff of life is matter, students! Today we are going to move through phases of matter! "Phase" describes the **physical** state of matter. The keyword to notice is "physical". Matter only moves from one phase to another by physical means. If energy is added (increasing the **temperature**) or if energy is taken away (freezing something), you can create a physical change.

TTW ask, “Is a chair a liquid or solid?”

TSW answer, “A solid.”

TTW ask, “Is the water in a fishbowl a liquid or a solid?”

TSW answer, “A liquid.”

TTW ask, “Is fruit punch a liquid or a solid?”

TSW answer, “A liquid.”

TTW ask, “Is a robot a liquid or a solid?”

TSW respond, “A solid.”

TTW ask, “What about the air inside a balloon?”

TSW respond, “A gas!”

TTW say, “Great job students. Now we are going to play a little game that helps us explore the states of matter even more.”

5. TTW explore states of matter with students.
    a. TTW say, “Listen closely to my instructions.”

    b. TTW say, “In a moment, I am going to ask for some volunteers to help me organize states of matter with words and images. Then, we are going to move to help allow us to understand these states of matter in their most basic state.”

    c. TTW ask for a student volunteer.

    d. TTW ask the student volunteer to “display the states of matter” by first posting *the names* of 4 states of matter (solid, liquid, plasma, gas) on the board or allowing 4 different students to hold laminated signs.

    e. TTW then ask the student volunteer to *display an image* representative of each word (or 4 additional students hold laminated signs). TTW ask the student volunteer to match the image with the states of matter. If the student correctly matches all of the states of matter, the teacher will say, “Whoomp, there it is!” (and do the coinciding movement). If the volunteer does not correctly match all of the states of matter with the correct image, the teacher can allow the student to make corrections. When the student correctly matches all eight signs, the teacher will say, “Whoomp, there it is!” and encourage the class to say it together, “Whoomp there it is!”

f. TTW ask students to name and match other forms of matter. When the student correctly names other objects and their form, the teacher will respond, “Whoomp there it is!” (and movement) and point to the class, and the students will copy, saying, “Whoomp there it is!” (with movement).

g. Pause to ask questions during appropriate moments. P.S. You may include other states of matter (*i.e., Bose-Einstein condensates, colloids, or other non-classical, low-temperature, or high-energy states*) if you feel your class is ready, but it isn't discussed in the above resources (TTW check out Chem4Kids for more information).

h. TTW explain the way the molecules for each state differ. TTW continue, “Let’s say you have a glass of water (H2O). When the temperature of the water goes up, the molecules get more excited and bounce around a lot more. If you give a liquid water molecule enough energy, it escapes the liquid phase and becomes a gas. The extra energy allows the molecules to change states.”

   i. TTW say, “Solids are closely packed and organized molecules/atoms with a stable, definite shape and volume. Ceramic bowls are a great example of a solid. Did you know that pieces of pottery make up many of the items found from ancient civilizations? Ceramic materials are usually made from soft clay that is heated up and then slowly cooled. The clay becomes very hard because water (H2O) is removed and the chemical bonds inside the clay change.”

      1. TTW say, “Solids have the lowest amount of energy. Their particles move back and forth. They have both a definite shape and a definite volume. Can you show me a movement that makes you think of a solid?”
      2. TSW will respond with a movement that is symbolic of the characteristics of a solid.
      3. TTW ask a student to justify his/her movement. If the justification is on point, the teacher will say, “Whoomp! There it is!” and encourage the students to respond the same way in an echo!

   ii. TTW say, “Liquids have incompressible fluid but touching molecules/atoms with a constant volume, but a shape defined by its container. There are many liquids around you. Oceans, lakes, and rivers are good examples of liquid water (H2O). Planetary scientists are looking for other planets that have liquid water, but planets require very specific conditions to have water as we know it.”

      1. TTW say, “Liquids have MORE energy than solids. They are able to flow and have a definite volume. Interestingly, they have no definite shape as they take the shape of their container. Can you show me a movement that makes you think of a liquid?”
      2. TSW will respond with a movement that is symbolic of the characteristics of a liquid.

3. TTW ask a student to justify his/her movement. If the justification is on point, the teacher will say, “Whoomp! There it is!” and encourage the students to respond the same way in an echo!

iii. TTW say, “Gas has compressible fluid and fast-moving molecules/atoms with will both conform to the shape of its container and also expand to fill the container. TTW continue, “Balloons aren’t technically gases. They are little pieces of rubber. However, the helium(He) inside the balloon is a gas. Helium is a noble gas that has a very low atomic mass. In its gaseous state, it is lighter than air. The helium atoms have a lower mass than the nitrogen (N2) and oxygen (O2) molecules that fill most of our air. The lower mass and lightness helps balloons to float.”

1. TSW say, “Gasses have more energy and movement than liquids. They have no definite shape or volume. They fill the entire container or room. Can you show me a movement that makes you think of a gas?”
2. TSW will respond with a movement that is symbolic of the characteristics of a gas.
3. TTW ask a student to justify his/her movement. If the justification is on point, the teacher will say, “Whoomp! There it is!” and encourage the students to respond the same way in an echo!

iv. TTW say, “Plasma has no definite shape or volume, like gas, but they are electrically conductive.” TTW continue by saying, “plasmas are highly energized gases that have lost their electrons. Stars, including the Sun, are covered in plasma. Hydrogen (H) and helium (He) ions float around the Sun with their electrons moving freely.”

1. TTW say: “Plasma has the most energy and movement! Can you show me a movement that makes you think of a plasma?”
2. TSW will respond with a movement that is symbolic of the characteristics of plasma.
3. TTW ask a student to justify his/her movement. If the justification is on point, the teacher will say, “Whoomp! There it is!” and encourage the other students to respond the same way in an echo!

v. TTW turn on music: https://youtu.be/P1myW-HFUUI and dance with students. TTW & TSW move to the beat of the music and model solids, TTW encourage students may choose to huddle close and link arms together. They may also walk in place, but they must keep the whole shape. To model liquids, students may hold hands and walk or dance slowly around the room. To model gases, have students move or dance more quickly (but safely) around the room without touching.

vi. TTW allow the music to continue to play as the students are broken into groups.

vii. TTW pause the music and tell the students, “you will have 10 minutes to choreograph a movement sentence that is 60 seconds long or less. This movement sentence should

show each phase and the chemical reaction, thus demonstrating an understanding of these concepts. Remember, you will have to justify why you chose the movements you chose!

viii. TTW loop the instrumental music and allow the students time to perform their one-minute matter movement sentences for the class. TSW perform their movement sentences for the class. The students acting as the audience will give positive feedback (i.e., clapping, etc.) as well as peer assessments like, "I noticed…," or "I like the way you...because,...".

6. After the students have performed and justified their movements, TTW invite the students to sit and discuss their observations.
    a. If matter can be segregated into tiny particles that are too small to see, how can it be detected?
    b. What are the "tiny particles" that are considered matter? (i.e., atoms, molecules, etc.).
    c. Which specific properties can be observed and measured when discussing matter?
    d. *What influences choice-making in creating choreography?*
    e. *How do dancers work with space, time, and energy to communicate artistic expression?*
    f. *What must a dancer do to prepare the mind and body for artistic expression?*

Recommended Resources

- https://www.commonsense.org/education/lesson-plans/the-states-of-matter
- https://www.brainpop.com/science/matterandchemistry/statesofmatter/
- http://www.chem4kids.com/files/matter_states.html
- https://www.youtube.com/watch?v=Aj8JotvMsPg
- https://www.youtube.com/watch?v=wLZbtTzwxwE
- https://youtu.be/LgPtJ0pTutc
- Lesson displays & images for these can be found on Nearpod (for those with tablets)
- Lesson displays and images for these can be found on SMART Exchange (for those with an interactive whiteboard)
- For beginner students use BrainPOP, Jr.; for advanced students use BrainPOP.

Extended Learning Activities

The teacher may consider having the students go from imitating a state of matter to imitating what the molecules do as they move from state to state.

The students may work together on an interactive table activity.

The teacher may consider having students participate in the Matter Sorter Game to assess their understanding. It may require a demonstration in front of the class first. A simplified version could be this BrainPOP Jr. worksheet, which could be done on paper on an interactive whiteboard.

Sources

https://www.commonsense.org/education/lesson-plans/the-states-of-matter

Tips

It helps if you are able to tape boundaries on the floor, or otherwise, to keep kids focused on their group.

Assessment Strategies

Written Response	-	Students will have 60 seconds to give a written response answering the question, *"What do you know about matter?"*
Performance Assessment	-	Students perform a culminating dance that embodies the skills and understandings from a particular unit of study.
Journal	-	Write a personal response about this dance experience.

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