ITQ ARTS AND SCIENCE INTEGRATION
GRADE 5
DANCE AND EARTH SCIENCE

THUNDERSTORMS, WIND, AND RAIN, OH MY!
Wind and Weather
Lesson #3

- *FOSS California,* Grade 5, *Water Planet*, Investigation 4, Part 4, and Investigation 5, Part 2.
- Complete this lesson in conjunction with Lesson #2, Energy Transfer Dance.
- Teacher Note: This lesson will be most effective if done over three to five days to allow creation of the dances, revision of the dances, class discussion, peer feedback and assessment using the performance rubric.

CONTENT STANDARDS

Dance Grade 5

2.2 Invent multiple possibilities to solve a given movement problem and analyze problem-solving strategies and solutions.

2.5 Demonstrate cooperation, collaboration, and empathy in working with partners and in groups (e.g., leading/following, mirroring, calling/responding, echoing, opposing).

3.1 Use dance vocabulary to identify and support personal preferences for dances observed or performed.

Science Grade 5

ES4a Students know that uneven heating of the earth causes air movements (convection currents).

ES4c Students know the causes and effects of different types of severe weather.

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

- Where does wind come from?
- What is the difference between an air front and an air mass?
- How do I use the elements of dance to create movement for wind and weather?

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

- identify, distinguish between, and demonstrate wind and weather in group exercises through applying the dance elements.

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

- **Feedback for Teacher**
  - Student answers to inquiry
  - Student performance
  - Performance Rubric
  - Student science notebook entry
  - Exit Questions
- **Feedback for Student**
  - Response from teacher
  - Performance
  - Performance Rubric
  - Peer Feedback
  - Video

WORDS TO KNOW

Dance

- **Contrast:** To set side by side. To emphasize differences. Changes in energy, space, relationship, and time all contribute to contrast of movement.
- **Shape:** The positioning of the body in space: curved, straight, angular, twisted, symmetrical, or asymmetrical.
- **Space**: immediate spherical surrounding of the body in all directions. Use of space includes **shape**, width, direction, pathway (curvature), **level, relationship** (the position of dancers to each other and to objects), symmetry and asymmetry.
- **Spatial relationship:** the position of dancers to relation to each other and to objects (e.g. side-by-side, mirror, shadow, above, below, connected, etc.).
- **Time:** An element of dance involving rhythm, phrasing, **tempo** (fast and slow), accent, and duration.

Science

- **Atmosphere:** The layer of gases that surrounds a planet or star.
- **Density:** The relationship between the mass (amount of stuff) of an object and its volume (the space it occupies).
- **Front**: The leading edge of a moving air mass.
- **Mass**: The amount of material in something.
- **Uneven heating:** The result of different amounts of energy being transferred to adjacent surfaces.
- **Weather:** The condition of the atmosphere around us. Heat, moisture, and movement are the three important variables that describe weather.
- **Wind:** Air in motion.

MATERIALS

- CD Player
- Music
- *FOSS California,* Grade, 5 Science Resources, pp 240-241
- Table-top labels: Cool Ocean and Warm Land (included)
- "Weather – Problem Solving Worksheet" (included)
- Science Notebooks (1/student)

RESOURCES

- *FOSS California,* Grade 5, *Water Planet*, Investigation 4, "Heating Earth", Part 4, and Investigation 5, "Weather", Parts 2 and 3
- Internet:
  - Winter Storms: http://www.weatherwizkids.com/weather-winter-storms.htm
  - Weather Front: http://encyclopedia.kids.net.au/page/we/Weather_front
  - How do Tornadoes Form: http://www.weatherwizkids.com/weather-tornado.htm

PREPARATION

- Rehearse Uneven Heating and Energy Transfer dances from lesson #2
- Watch the video on weather fronts located at http://www.phschool.com/atschool/phsciexp/active_art/weather_fronts/
- Teach *FOSS California,* Grade 5, *Water Planet*, Investigation 4, Part 4, and Investigation 5, Part 2.
- One copy each of "Weather – Problem Solving Worksheet" #1-4 (included)
- Table-top signs: Warm Land, Cool Ocean (included)
- Ample space with enough room to move safely.

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

(5 minutes)

- Review **uneven heating** and energy transfer dances from lesson #2.
  Ask:
  - *Recall our investigations, what causes air, land, and water to become warmer?* [We have seen

from our investigations that air, land and water absorb heat from the Sun.] *Let's review.*
    - *Which heats and cools more quickly, land or water?* [Land]
    - *What makes the air warm?* [Solar energy from the Sun transfers heat energy to the land which warms the air. this is called energy transfer]
    - *What do we know about warm air?* [Warm air rises because it is less **dense** than cooler air.]
    - *What do we know about cold air?* [Cold air sinks toward the Earth's surface because it is **denser** than warm air.]
- *Ask: Where do you think **wind** comes from?* Pair share
- *Say: The **uneven heating** of the Earth by the Sun creates temperature differences that make air in the **atmosphere** move. **Wind** is air in motion.*

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

- Teach the **wind** chant:
  ***Wind** is rushing air*
  *filling open **space**.*
  *Warm, less **dense** air rises up*
  *Cold **dense** air takes its place.*
- Movements for the chant:
    - Line 1: Roll the arms
    - Line 2: Reach up and open arms wide, return to sides
    - Line 3: Raise left arm, elbow bent, arm parallel to floor to head height
    - Line 4: Shoot right arm under and through left arm
- Have students record this chant in their science notebooks.

Uneven Heating Wind Dance

- Return the class into their four groups from lesson #2's Energy Transfer dance.
- Place table-top labels (Cool Ocean on the students' left side of the space {teacher's right}, and Warm Land on the students' right side of the space {teacher's left}.)
- *Say: We just learned that cold air takes the place of warm air when it rises creating **wind**. We're going to use our Energy Transfer Dance to show how **wind** is created. Everyone is going to be air molecules in the **atmosphere**.*
    - *If you were part of the land group, you will now be joining the air over land group. You will now be called the warm land air group.*
    - *If you were part of the water group, you will now be joining the air over water group. You will now be called the cool ocean air group.*
- Have both groups demonstrate the warming part of the dance for eight beats.
- Freeze the dance.
- *Say: Hold your **shapes** and listen to me say the chant once again. **Wind** is rushing air, filling open space. Warm, less dense air rises up. Cold dense air takes its place.*
    - *The warm, less **dense** air has risen over here* (point to the warm land air group). *What will the cool ocean air group do to create **wind**?* [The cool air will have to move to fill the space that the warm air created.]
- Have the cool ocean air group move toward the warm land staying at their middle level. Students will gradually spread out as they move to fill in an open space.
    - *Say: The cool **dense** air moves in and pushes the warm less **dense** air up even higher and out of the way.*
    - *Ask* (to the warm land air group) *Where will you go?* [We will move to the ocean.]
- Have the warm land air move to the cool ocean side of the space.
    - *Say/Ask: Now we have warm air over the cool ocean and cool air over the warm land. What will happen next?* [The cool air will warm up and become less **dense** and the warm air will cool down becoming **denser**.]
- Show this through movement. The students over the warm land should now rise and spread out. The students over the cool ocean should sink to a low level in a tight group **shape**.
- *Say: This process happens at the same time. I will give you eight beats to change sides and another*

eight beats to change your level.

- Practice the two, eight-beat phrases several times.
- Note: This exercise demonstrates convection current. You may want to stop and discuss if desired.

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

- Teacher Note: This portion of the lesson will be most effective if done over three to five days to allow creation of the dances, revision of the dances, class discussion, peer feedback and assessment using the performance rubric.
- *Say:*
  - *We just demonstrated how the movement of air in the **atmosphere** causes **wind**. In our exercise we showed how many cold air molecules took the place of many warm air molecules. We call these groups of molecules an air **mass**. Air molecules in an air **mass** all have the same temperature and amount of moisture.*
  - Point to the students on the ocean side of the space and *say: you are called a cold air **mass**.*
    - Have students on the ocean side of the space use the gesture of arms extended in front of body with palms together on a medium-low level. Have students make the gesture as you say cold air **mass**.
    - *Say: You all look the same. You have the same temperature (cold) and moisture.*
  - Point to the students on the land side of the space and *say: you are a warm air **mass**.*
    - Have students on the land side of the space use the gesture of arms rounded in front of body with hands overlapping on a high level. Have students make the gesture as you say warm air **mass**.
    - *Say: You all look the same. You have the same temperature (warm) and moisture.*
  - ***Mass** is the amount of air molecules in a space that have the same temperature and moisture content. Air **masses** don't always move over each other smoothly and nicely like when we showed **wind**. Sometimes they crash into each other and we get rain, snow, sleet, tornados and hurricanes. We call this condition of the **atmosphere weather**.*
  - *The area where cold and warm air masses meet is called a **front**.*
- Select eight students to demonstrate a warm and cold air **front**.
  - Arrange students in two opposing lines. The cold air **mass** will stand shoulder to shoulder at a medium-low level, arms extended. The warm air **mass** students will stand two to three feet apart with arms in a curved **shape**.
  - Have the two groups walk toward each other. When the two groups meet, freeze movement and *say: where these two air **masses** meet, we have what is called a **front**. This is where **weather** happens. There's a change in the **atmosphere**.*
- *Say: You will be creating **weather** dances to show how different **weather** is formed from cold and warm air **masses** and **fronts**. In your small groups, read over the description of how the **weather** is formed and decide how you will show colliding air **masses** and **fronts** through movement.*
- Distribute a "Weather – Problem Solving Worksheet" to each group.
- Students will refer to their FOSS Science Resources Book, pp 240 and 241.
- Problem Solving: The **Weather** Dance*:*
  1) Thunderstorms: A strong, quickly moving cold air mass approaches a non-moving warm air mass. The colder air, being denser, crashes into and cuts a wedge under the less dense warmer air, lifting it up and finally overtaking it. At the boundary of the front, thunderstorms form bringing clouds, lightening, and heavy rain.
  2) Tornadoes: A strong, quickly moving cold air mass crashes into a slow moving warm air mass. The colder air, being denser, cuts a wedge under the less dense warmer air, spinning the warm air around and around, lifting it higher and higher until a tornado is formed. Most tornadoes form from thunderstorms.
  3) Warm Front: A warm air mass slides over a cold air mass. The warm air cools and we get clouds and light rain for a long time.
  4) Stationary Front: When a warm air mass and a cold air mass meet and stop moving, this is called a Stationary Front. Neither is strong enough to overtake the other but stationary fronts can wobble back and forth, pushing each other forward and backward for some time.

- Divide the class into four groups. Each group must divide into two smaller groups representing a warm and cold air **mass**.
- Allow five minutes to create movement for the problem.
- Have video camera ready to tape.
- After each demonstration, ask the following questions:
  - *How could you identify the cold air **mass**?*
  - *How could you identify the warm air **mass?***
  - *What kind of **weather** did you see created at the **front** and what movements did they use to create that **weather**?*
  - *Where did you see **contrast** in the dance exercise?* [speed, level, shape, relationship]
- Videotape each performance.
- Use the "Performance Rubric" to assess student achievement.

DEBRIEF & REFLECT *(Identify problems encountered, ask and answer questions, discuss solutions and learning that took place. Did students meet outcomes?)*
(5 minutes)

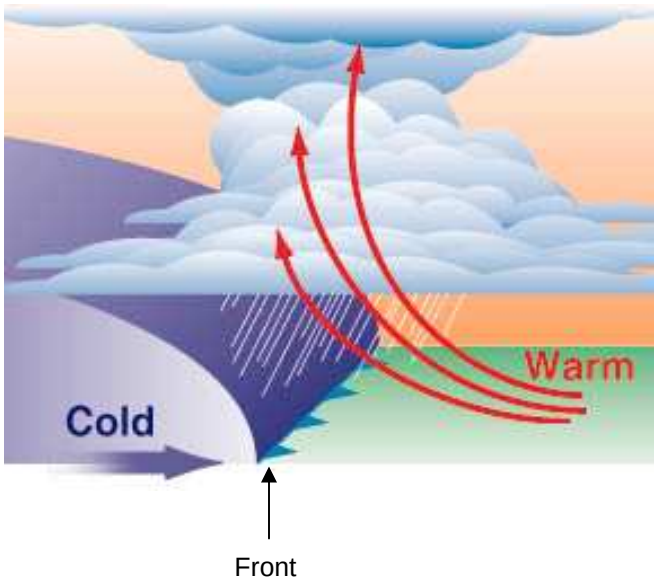
- Have students respond to the following exit questions in their science notebooks:
  - How does **uneven heating** cause **wind**?
  - How do moving air **masses** create **weather?**
  - Use dance vocabulary to describe how dance helped you understand **wind** and **weather**? Include the words **contrast**, **shape**, level, speed in your description.
  - Record the chant from the warm up section.

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

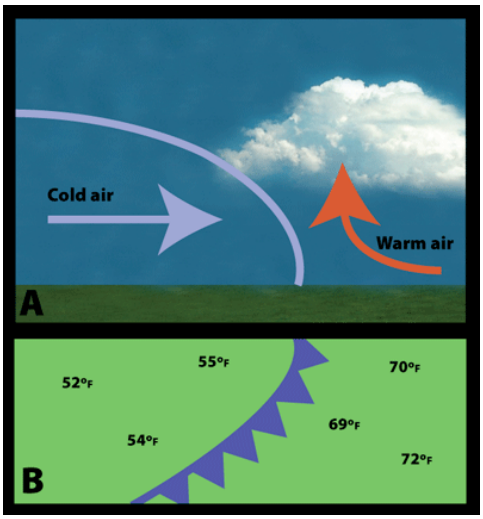
- Have each group watch their video so that they can assess their performance. Discuss what was clear about the performance and make suggestions for improvement.
- Revise and perform **weather** and severe **weather** dances. Use the rubric to assess the understanding of weather, performance and collaboration.
- Write a **weather** report and perform dances before a live audience.

THUNDERSTORMS – Cold Front

A strong, quickly moving cold air mass approaches a non-moving warm air mass. The colder air, being denser, crashes into and cuts a wedge under the less dense warmer air, lifting it up and finally overtaking it. At the area where the two air **masses** meet, the **front** will cause thunderstorms to form bringing clouds, lightening, and heavy rain. Refer to your Science Resources Book, page 240.



Front



Show all the following in your dance:

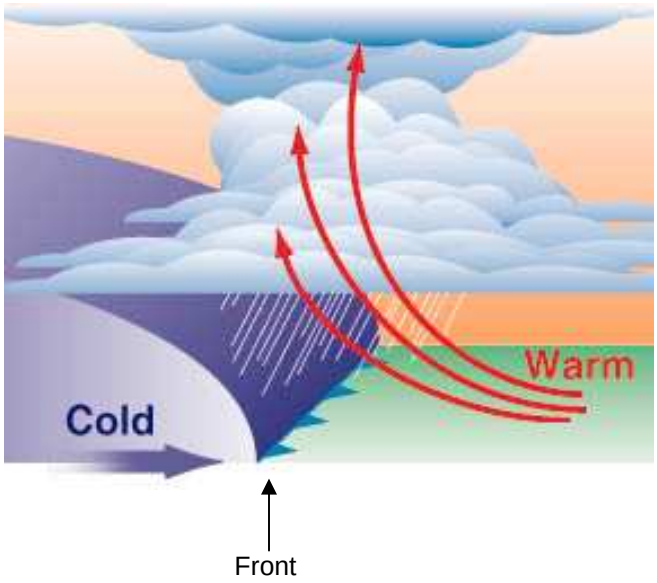
1. speed of each air mass, cold and warm
2. density of each air mass, cold and warm
3. level and movement of each air mass and how they relate to each other (cold cuts a wedge and moves under the warm air)
4. define the air mass with the appropriate shape
5. show the resulting weather (clouds, lightening and rain)

WEATHER - PROBLEM SOLVING WORKSHEET #2

TORNADOES – Cold Front

A strong, quickly moving cold air mass crashes into a slow moving a warm air mass. The area where the two air masses meet is called a front. The colder air, being denser, cuts a wedge under the less dense warmer air, spinning the warm air around and around, lifting it higher and higher until a tornado is formed. Most tornadoes form from thunderstorms.

Refer to your Science Resources Book, page 240

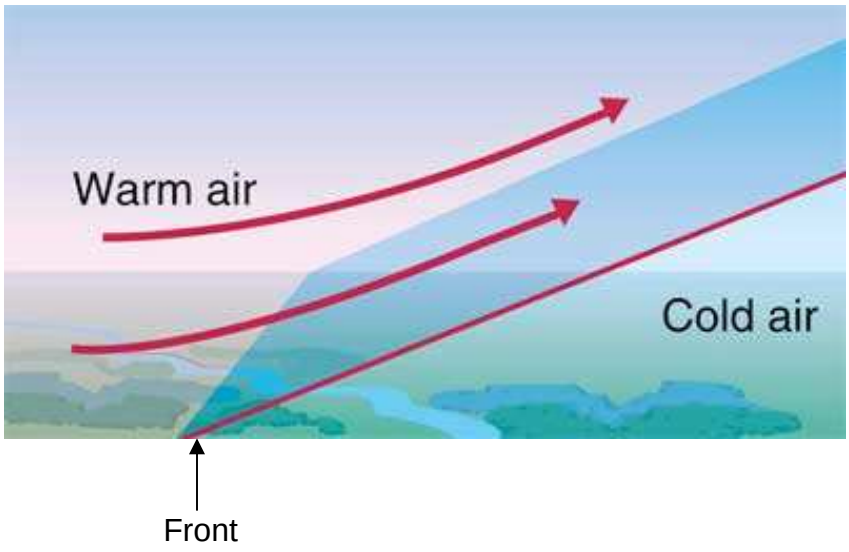


Show all the following in your dance:

1. speed of each air mass, cold and warm
2. density of each air mass, cold and warm
3. level and movement of each air mass and how they relate to each other (cold cuts a wedge and moves under the warm air)
4. define the air mass with the appropriate shape
5. show the resulting weather (clouds, wind, and spinning air)

WEATHER - PROBLEM SOLVING WORKSHEET #3

LINGERING CLOUDS AND LIGHT RAIN – Warm Front
A slowly moving warm air mass slides over a slow moving cold air mass. The area where the two masses meet is called a front. The warm air rises and cools slowly and we get clouds and light rain for a long time.
Refer to your Science Resources Book, page 240



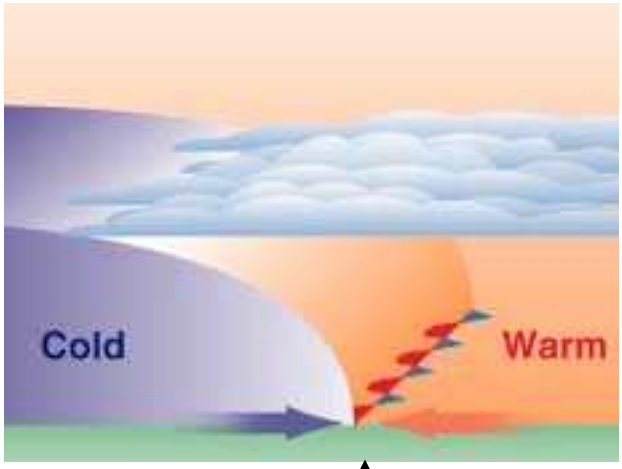
Show all the following in your dance:
1. speed of each air mass, cold and warm
2. density of each air mass, cold and warm
3. level and movement of each air mass and how they relate to each other (warm air slides over cold air in a long slanting wedge)
4. define the air mass with the appropriate shape
5. show the resulting weather (clouds and light rain)

WEATHER - PROBLEM SOLVING WORKSHEET #4

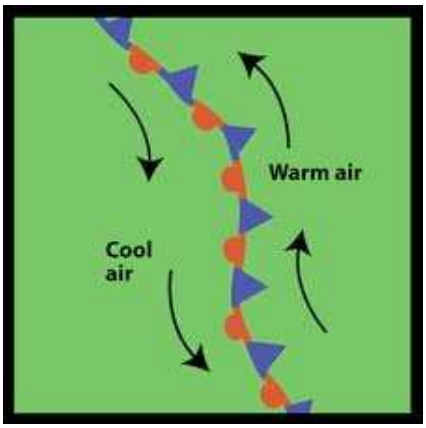
CLOUDS – Stationary Front

When a warm air mass and a cold air mass meet and stop moving, this is called a Stationary Front. Neither is strong enough to overtake the other but stationary fronts can wobble back and forth, pushing each other forward and backward for some time. Clouds are formed when stationary fronts occur.

Refer to your Science Resources Book, page 241.



Front



Show all the following in your dance:

1. speed of each approaching air mass is the same, cold and warm
2. density of each air mass, cold and warm
3. level of the warm air is slightly higher than the cold air, neither moves the other out of the way. Both push each other back and forth.
4. define the air mass with the appropriate shape
5. show the resulting weather (clouds)

Performance Rubric

Category	4 Advanced	3 Proficient	2 Basic	1 Below Basic	0 Not Attempted
Performance	Demonstrates focus by memorizing the dance study, looks to the audience and displays confidence. Performs with appropriate spatial boundaries, maintaining personal space and physical control, shows regard for own and other's safety.	Demonstrates focus by memorizing the dance study, displays confidence most of the time. Performs with appropriate spatial boundaries, maintaining personal space and physical control, shows regard for own and other's safety.	Has most of the dance study memorized, makes a few errors, lacking confidence at times. Performs with appropriate spatial boundaries, maintaining personal space and physical control, shows regard for own and other's safety.	May have to watch others to get through the dance study, displays lack of confidence. May have one or two spatial control problems, shows regard for own and other's safety.	
Solving the Problem *Refer to the student Problem Solving Worksheet for appropriate movement choices for each group*	The group effectively communicates the problem by making appropriate movement choices that are creative and varied. The audience easily identifies and describes the movement and the problem/solution.	The group solves the problem by making appropriate movement choices. The audience identifies and describes the movement and the problem/solution.	The group has some difficulty soling the problem and needs coaching. Movement is basic and students need coaching. Audience has difficulty identifying the problem/solution because the movement is unclear.	Group has difficulty solving the problem without being coached before and during the performance. The audience has difficulty perceiving the problem/solution.	
Group Collaboration and Cooperation	The group is well prepared and rehearsed. All members participate fully.	The group is somewhat prepared. Most members participate fully.	The group is somewhat prepared but appears confused at times. Not all members participate. There may be distraction, giggling, stopping and starting, etc.	The group is not prepared. Group appears timid, confused or unwilling to participate.	

Cool Ocean

Warm Land