Day 1: School in the Woods

Activities

Respect Circle

Muddy Sneakers is built on 3 main principles for a successful day in the woods: Safety, Learning and Fun. This activity will help students understand how they reach all three goals by committing to acting respectfully to the environment, each other, and to ourselves.

Student Leadership

Working with a small group in the outdoors is an ideal setting for students to develop leadership skills. Students may work with a partner to take on leadership roles including navigating, practicing leave no trace, accounting for all group members, watching for safety hazards, and observing wildlife.

Trail Navigation: Map and Compass Skills

An important way to develop leadership among students throughout their Muddy Sneakers year is to give them the responsibility for trail navigation. In order to lead the group as the trail navigator on any expedition, students will learn how to use a compass and how to read a trail map of the expedition site.

Safety on the Trail

* Staying safe during a learning expedition is the top priority of Muddy Sneakers. Students will learn to respond appropriately to safety situations that could arise during a day outdoors: encountering poison ivy, bees, and snakes. Students will also learn the importance of staying together in a group; and will practice trail etiquette, including sharing their outdoor “classroom” with hikers, bikes and dogs.

Taking Care of Yourself on the Trail

* Sometimes, expedition sites do not have a public bathroom available. Students will learn how to use the bathroom outdoors in a way that respects their safety, sanitation, and privacy, should it become necessary. Students will also learn the importance of staying hydrated while spending a day outdoors.

Day 1: School in the Woods

Leave No Trace

* Students should leave their first Muddy Sneakers expedition with an understanding of how to leave their outdoor classroom as good or better than they found it. They will practice traveling through the ecosystem in a low-impact way, and may be introduced to nationally recognized “Leave No Trace” principles.

Observations: “I Notice, I Wonder, It Reminds Me of…”

* In this activity, students will learn skills to make detailed, objective observations, have meaningful discussions with their classmates, and make connections to prior learning.

Scientific Inquiry

As field scientists, students will engage with the scientific method and hypothesis testing by conducting an experiment. This activity is designed to introduce students to the practices of using the outdoors as a learning environment and closely observing their surroundings. In addition, it aims to acclimate students to sitting in the woods, writing in their field journals, and listening to their field instructor while taking notes.

Scientific Inquiry:

- *Does moss always grow on the north side of a tree?*
- *(Other questions may be explored instead at the instructor’s discretion)*

Aquatic Ecosystems

Note: This expedition uses macroinvertebrate bioindicators to test the health of a stream or river ecosystem. However, this design may not be appropriate in all eco-regions. In cases where schools do not have access to a free-flowing, freshwater stream, Muddy Sneakers will adapt the expedition curriculum to correlate with locally-available ecosystem bioindicators.

Activities

Habitat Observation (*Objective 5.L.2.1*)

* Students observe the differences between terrestrial and aquatic ecosystems, noting biotic and abiotic factors along the trails they hike to reach their aquatic study site. This includes discussion of how abiotic factors including water, light and oxygen all shape the aquatic ecosystem.

Pond or Wetland Study (*Objectives 5.L.2.1, 5.L.2.2*)

If an accessible pond or wetland is available, students explore the aquatic ecosystem and the adjacent riparian area. They record observations and discuss the relationship between these two contiguous ecosystems.

Stream Study (*Objectives 5.L.2.1, 5.L.2.2, 5.L.2.3*)

* Students learn to identify common macroinvertebrate species in a stream ecosystem, referring to field guide sheets and playing a matching game with illustrated cards. They use dip nets and seine nets to capture live specimens from the stream, and count and categorize these macroinvertebrates to calculate a Stream Health Index value.

Scientific Inquiry:

- *How healthy is this stream ecosystem?*
- *How many species of macroinvertebrates live in this stream?*

Web of Life Game (*Objectives 5.L.2.2, 5.L.2.3*)

Acting out species found during the stream study and others inferred by observation (raccoon tracks, fishing line, crayfish burrows, etc.), students use ropes to create a model of a food web for the aquatic ecosystem they have just studied.

Aquatic Ecosystems

Reflection: "If I were a Stream, Pond, or Wetland"

Practicing creativity and empathy, students imagine themselves in the place of the ecosystem they have explored, or one of the organisms that lives within it, and create a poem or written reflection.

NC Essential Standard and Clarifying Objectives

5.L.2 Understand the interdependence of plants and animals with their ecosystem.

5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands.
5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors).
5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.

Key Terms

Ecosystem - All the living and non-living things in a specific area
Aquatic - Water-based
Organism - One individual living thing
Population - Organisms of the same species that live in the same area
Community - Different species of organisms (i.e. populations) that live in the same area
Biodiversity - Different types or species of living things

Other Relevant Terms

Abiotic factors - Parts of the environment that have never been alive
Biotic factors - Parts of the environment that are alive or were once alive
Habitat - The place occupied by an organism or population that provides essential resources: food, water, shelter, space
Insect - A six-legged animal with three main body parts (head, thorax and abdomen) and an exoskeleton
Macroinvertebrate - An animal, without a backbone, large enough to be seen with your eyes
Metamorphosis - A distinct change in form from one stage to the next in the life history of an organism

Energy & Heat Transfer

Activities

Conduction, Convection, Radiation Basics (*Objective 5.P.3.1, 5.P.3.2*)

* Students will review, or be introduced to, the 3 types of heat transfer:
  - Conduction: Heat moves between objects that are touching
  - Convection: Heat moves through a current in liquid or gas
  - Radiation: Heat moves across a space through rays or waves

Conduction: Rock Pass (*Objective 5.P.3.1*)

Students will observe heat transfer via conduction by playing a sensory awareness game with small rocks collected along the trail.

Plant Perfumes and Forest Flavors (*Objective 5.P.3.1, 5.P.3.2*)

* Instructors will guide students in making either a plant perfume, natural dye or a foraged pine (or other wild edible) tea. In the process, students will observe how to safely use a backpacking stove, and will draw and label the 3 types of heat transfer as water comes to a boil.

Radiation Box (*Objective 5.P.3.1*)

Students will conduct an experiment to observe the combined effect of solar radiation and reflective surfaces on a container of water. They may use insulating materials and/or airtight coverings over the reflective box to prevent heat transfer via conduction or convection, isolating radiation as a means of heat transfer for their experimental design.

Scientific Inquiry:

- *How much will the temperature of water change when placed in a reflective box (for a set time)?*
- *Will the temperature of water increase more in an open container or in a reflective box? By how much?*

Nest Scavenger Hunt (*Objective 5.P.3.1., 5.P.3.2*)

Students will look for nests, burrows, or other animal shelters in the outdoors, making observations of what designs and materials animals use to insulate themselves from the elements.

Energy & Heat Transfer

Insulators: Test the Nests (*Objective 5.P.3.1, 5.P.3.2*)

* Students will conduct an experiment by using natural objects to build an insulating nest for a container of hot water. They will record starting and ending temperatures over a defined time period (e.g. 20 minute) to calculate the change in temperature. They will compare the insulating properties of different materials and/or designs, and discuss heat loss.

Scientific Inquiry:

- *Will the water temperature increase, decrease, or stay the same?*
- *How much will the water temperature change over (20) minutes?*
- *What materials do the best job of insulating a container of hot water?*

Bare Hands (*Objective 5.P.3.2*)

Students will use the insulating seat-pad in their Muddy Sneakers backpack to understand the role of insulators in heat transfer.

NC Essential Standard and Clarifying Objectives

5.P.3 Explain how the properties of some materials change as a result of heating and cooling.

5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures (conduction, convection or radiation).

5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.

Key Terms

Energy - The ability to make things move or change
Thermal energy (Heat energy) - The energy of all moving particles that make up all matter
Temperature - The measurement of an object's average heat energy (In general use: how warm an object is)
Heat transfer - The movement of heat from a warmer object or area to a cooler one

3 types of heat transfer:
Conduction - Heat moves between things that are touching
Convection - Heat moves through currents in a liquid or gas
Radiation - Heat moves across a space, through rays or waves (electromagnetic waves)

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Forces & Motion

Activities

Motion in Water (*Objectives 5.P.1.1, 5.P.1.2, 5.P.1.4*)

* After defining motion as a change in position over time, students build boats out of natural materials and float them in a stream to measure the speed of the flowing water. Where no stream is present, this experiment can be conducted to measure the speed of students running, objects rolling down a hill, etc.

Scientific Inquiry:

- *How fast will your object travel down a measured section of a stream?*
- *On average, how fast is the water in the stream moving?*
- *Which section of the stream is moving fastest?*

Rope Haul (*Objectives 5.P.1.1, 5.P.1.4*)

* Using teamwork and problem-solving skills, students construct a pulley system to raise a load up to a tree limb. They analyze all of the forces (friction, gravity, pushing, pulling) that affect the pulley system, and discuss which ones make the work require more or less force.

Motion Graphs (*Objective 5.P.1.3*)

Students learn to plot distance and time on a line graph and act out different movements as they are drawn on a graph. They may also graph the motion of objects or organisms from their surroundings, or from a facilitated storytelling session.

Nature Walk: Looking for Motion (*Objectives 5.P.1.1, 5.P.1.4*)

While hiking, students observe motion and evidence of motion in the natural world. Students may discuss observations and record them in their notebooks, describing motion and the force or forces that may have caused it.

Supplemental Activities (*Objectives 5.P.1.1, 5.P.1.2, 5.P.1.4*)

Supplemental activities including rolling objects down a hill to illustrate friction, mass, and resistance; and having a footrace to explore the relationship between inertia, momentum, and mass.

Reflection: ***What if there were no motion?***

Students engage in creative writing based on their science exploration, considering how the natural world would be different without motion.

Forces & Motion

NC Essential Standard and Clarifying Objectives

5.P.1 Understand force, motion and the relationship between them.

5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.
5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel.
5.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time.
5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object.

Key Terms

Force - A push or pull on an object
Motion - A change in an object's position over time
Speed - A measure of how fast an object is moving (distance over time)
Gravity - The force of attraction among matter
Friction - A force that opposes motion between surfaces that are touching
Mass - The quantity of matter an object contains (In general use, synonymous with "weight")

Other Relevant Terms

Position - An object's location relative to another object (a reference point)
Direction - The course or path that an object is moving
Velocity - Rate of change of an object's position in a particular direction with time (In general use, synonymous with "speed")
Acceleration - A change in velocity (In general use, means "an increase in speed")
Deceleration - In general use, means "a decrease in speed"
Balanced Forces - Forces that are equal in strength but opposite in direction (Net force = zero)
Unbalanced Force - A force that does not have another force of equal magnitude and opposite direction off-setting it (Net force ≠ zero)
Inertia - The tendency of an object in motion to stay in motion, or of an object at rest to stay at rest, unless acted upon by an outside force

Inheritance & Adaptation

Activities

Origins of Traits (*Objectives 5.L.3.1, 5.L.3.2*)

As field scientists, students will observe examples of inherited and acquired traits in their environment and record data in their notebooks.

Relay Race (*Objective 5.L.3.2*)

* In two teams, students will run to choose a card with a trait described and place it in the appropriate category: Inherited or Acquired.

Classifications (*Objective 5.L.3.2*)

* Using Venn Diagrams and dichotomous keys, these activities allow students to describe and classify organisms based on their unique traits, and give them an opportunity to apply this practice to native plants they encounter during the expedition.

Pine Tree Traits (*Objectives 5.L.3.1, 5.L.3.2*)

This activity allows deeper exploration of the traits of a native plant through scientific inquiry.

Scientific Inquiry:

- *Do all pine trees (of a given species) grow by the same amount each year?*
- *At any chosen age are all pine trees (of a given species) also the same height?*

Traits through the Generations (*Objective 5.L.3.2*)

* Set up as a scientific model, this activity teaches students the basics of how traits are inherited between generations, and why offspring do not exhibit exactly the same traits as their parents.

Scientific Inquiry:

- *Will children look identical to (have the same traits as) their parents?*
- *What fraction of each grandparent's traits will the "kid" inherit?*

Selection and Adaptation Game (*Objective 5.L.3.2*)

Representing a population of a chosen species, students will play a game that illustrates how natural selection can affect the inheritance of traits, and how adaptations can be crucial to an organism's survival.

Camouflage (*Objective 5.L.3.2*)

This fun activity connects inherited and acquired traits to the relationships of predators and prey.

Inheritance & Adaptation

Build a Bird (*Objective 5.L.3.2*)

Students will create a bird choosing various adaptations for beak, feathers, feet, etc. that affect what and how it eats and where it lives.

NC Essential Standards and Clarifying Objectives

5.L.3 Understand why organisms differ from or are similar to their parents based on the characteristics of the organism.

5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism.

5.L.3.2 Give examples of likenesses that are inherited and some that are not.

Key Terms

Trait - A physical characteristic or a behavior of an organism
Inherited trait - A characteristic that an organism gets from its parents or ancestors
Acquired trait - A characteristic that an organism gets during its lifetime
Learned behavior - A skill that an animal develops during its lifetime. A learned behavior is a type of acquired trait.

Other Relevant Terms

Organism - One individual living thing
Species - A particular type of organism; members of the same species share certain traits and are able to interbreed
Population - A group of organisms of the same species, living in the same place
Community - All of the populations of different species living in the same place
Adaptation - A trait that helps an organism live within its habitat or find mating partners

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Living Systems

Activities

From a Cell to an Organism (*Objective 5.L.1.1*)

* Students will play a game based on "Rock-Paper-Scissors" that models how a multicellular organism consists of cells, tissues, organs, and organ systems.

Overview of the Body's Systems (*Objectives 5.L.1.1, 5.L.1.2*)

* Students will be introduced to the human body's circulatory, digestive, muscular, respiratory, skeletal, and nervous systems; the functions of each system; and body parts or organs that belong to them. They may record descriptions in the Muddy Sneaker Field Journal, play charades, build models, or otherwise creatively describe and interpret each system.

Pulse Experiment: Measuring the Circulatory System (*Objectives 5.L.1.1, 5.L.1.2*)

* Students will conduct an experiment in which they choose 3 activities to perform, and then measure their heart rates after each activity. Instructors will guide students in analyzing this data to learn more about the human circulatory system and its connections to their respiratory system.

  Scientific Inquiry:
  - *After which activity will I have the highest heart rate?*
  - *How long will it take for my pulse to return to its resting rate after a specific activity?*
  - *After which activity will my pulse return to its resting rate most quickly?*

Circulatory System Activities (*Objectives 5.L.1.1, 5.L.1.2*)

Students will build a model of a human circulatory system, and compare its function to that of the xylem and phloem in a tree.

Muscular and Skeletal System Activities (*Objectives 5.L.1.1, 5.L.1.2*)

Students will try various activities in which they will be able to observe the functions of these two systems.

Digestive System Models and Observations (*Objectives 5.L.1.1, 5.L.1.2*)

Students will learn that field scientists observe scat as an important clue about the animals that share the ecosystem, and perform a rap or build a model of the forest's digestive system.

Nervous System Models (*Objectives 5.L.1.1, 5.L.1.2*)

Students will connect sounds and smells of nature to the functions of various body systems.

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Living Systems

Forest Metaphors (*Objectives 5.L.1.1, 5.L.1.2*)

This activity encourages students to connect their knowledge of human body systems to the environment around them by understanding the forest itself as a "system."

NC Essential Standards and Clarifying Objectives

5.L.1 Understand how structures and systems of organisms (to include the human body) perform functions necessary to life.

5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive.

5.L.1.2 Compare the major systems of the human body (digestive, respiratory, circulatory, muscular, skeletal, and cardiovascular) in terms of their functions necessary for life.

Key Terms

Unicellular - Made up of one cell (e.g. bacteria)
Multicellular - Made up of more than one cell (e.g. plants, animals)
Cell - The basic building block of all known living things; the smallest unit of life that is classified as a living organism
Tissue - A group of cells in an organism that have a similar structure, function, and origin
Organ - A collection of tissues joined together to perform a certain job
Organism - One individual living thing

Body System	Organs/Parts	Functions
Circulatory	Heart, veins, arteries	Circulates substances, esp. oxygen, throughout the body
Digestive	Mouth, esophagus, stomach, large & small intestines	Breaks down food so it can be used by the body; eliminates waste
Muscular	Muscles and ligaments	Allows body to move
Respiratory	Nose, mouth, trachea, lungs, diaphragm	Allows gas to be exchanged; takes in oxygen & releases carbon dioxide
Skeletal	206 bones	Gives body structure & support
Nervous	Brain, spinal cord, nerves	Controls other body systems; sends & receives messages

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Matter

Activities

States of Matter: Review *(Objective 5.P.2.2)*

* Students will review the differences between solids, liquids, and gasses by playing a game in which they act out the bonds between molecules.

Water Cycle (*Objective 5.P.2.1*)

* Students will review the water cycle with a game of water cycle tag, or by building a natural materials model to demonstrate how water cycles through their creation.

Transpiration Experiment (*Objective 5.P.2.1)*

* Students will conduct an experiment to observe transpiration in plants. The following question will be adapted to consider the season, weather and site.

  Scientific Inquiry:

  - *How can we use the water cycle to observe transpiration?*
  - *What types of leaves will release more water through transpiration?*

Nature Lab (*Objective 5.P.2.2, 5.P.2.3*)

* As field scientists, students will collect various objects from nature and use measuring instruments to record qualitative and quantitative data, before, and after a physical change occurs. If applicable, students can conduct a chemical change on their object as well.

  Scientific Inquiry:

  - *What observations can we make about natural objects? What physical changes can we make to our objects? How does this affect the mass and size of the object?*
  - *What will a chemical change do to our object? Will new material be created? What will stay the same?*

Rotten Log Exploration (*Objective 5.P.2.3)*

Students will explore the woods looking for examples of chemical changes found in nature. Students will examine decomposed logs and other natural matter to find new material that has been created.

Matter

NC Essential Standard and Clarifying Objectives

5.P.2 Understand the interactions of matter and energy and the changes that occur.

5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff).
5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction.
5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred.

Key Terms

Matter - Anything in the universe that has mass and takes up space **Physical change** - A change to matter in which no new materials form
Chemical change - A change to matter which one or more new types of matter form
Qualitative data - Information described in words
Quantitative data - Information measured in units and numbers
Temperature - The measurement of an object's average heat energy; in general use: how warm an object is
Solid - A phase of matter that has a definite mass, volume, and shape; molecules are tightly bound together
Liquid - Phase of matter that has definite mass and volume but takes the shape of its container
Gas - Phase of matter with definite mass, but that takes the volume and shape of its container; molecules don't form permanent bonds

Other Relevant Terms

Molecule - The smallest bit of a material (type of matter) that still has all of the characteristics of that material
Volume - The amount of space that a material fills
Mass - The amount of matter in an atom, object, or substance
Weight - The measure of gravity's pull on an atom, object, or substance
Evaporation - The change of liquid water to a gas (water vapor)
Condensation - The change of a gas to a liquid, such as when water vapor forms small drops of liquid water
Precipitation - Any form of water that falls from the sky
Transpiration - The release of water vapor into the atmosphere by plants

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Terrestrial Ecosystems

Activities

Biotic and Abiotic (*Objectives 5.L.2.2, 5.L.2.3*)

* Students identify biotic and abiotic factors in the ecosystem, listing these observations in a two-column chart.

Producer-Consumer-Decomposer Relay Race (*Objectives 5.L.2.2)*

Students classify organisms into categories based on their energy consumption.

Rotting Log Study (*Objectives 5.L.2.1, 5.L.2.2, 5.L.2.3*)

* Students learn to identify organisms that inhabit the micro-ecosystem of a rotting log, and conduct an experiment to learn more about a given terrestrial ecosystem. They capture live specimens, classifying organisms as producers, consumers, and decomposers.

Scientific Inquiry:

- *Will we find more types of producers, consumers, or decomposers living in a rotting log ecosystem?*
- *How many species can we find living in a rotting log ecosystem?*
- *Which ecosystem has more biodiversity: a fallen log, or standing snag?*

Square Foot of Ground (*Objectives 5.L.2.1, 5.L.2.2, 5.L.2.3*)

Using a variety of possible experimental methods, students closely observe a small study plot on the forest floor. They classify the organisms it contains as producers, consumers, and decomposers.

Scientific Inquiry:

- *How many species of organisms live in our study plot?*
- *Are there more producers, consumers, or decomposers in a study plot?*
- *What are the dominant (most common) species in our study plot?*

Web of Life Game (*Objectives 5.L.2.2, 5.L.2.3*)

Acting out terrestrial species, students use ropes to create a model of a food web for the ecosystem they have just studied.

Energy Pyramid (*Objectives 5.L.2.2, 5.L.2.3*)

Students create a model of an energy pyramid on the forest floor, classifying organisms according to their trophic level.

Terrestrial Ecosystems

NC Essential Standards and Clarifying Objectives

5.L.2 Understand the interdependence of plants and animals with their ecosystem.

5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands.
5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors).
5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.

Key Terms

Ecosystem - All the living and non-living things in a specific area
Terrestrial - Land-based
Abiotic factors - Parts of the environment that have never been alive
Biotic factors - Parts of the environment that are alive or were once alive
Organism - One individual living thing
Producer - An organism that makes its own food from the sun's energy (Plants are producers.)
Consumer - An organism that gets energy by eating other living things (Many animals are consumers.)
Decomposer - An organism that gets energy by breaking down dead organic matter ("FBI" - Fungus, Bacteria, Invertebrates - are decomposers.)

Other Relevant Terms

Herbivore - A consumer that eats only plants (e.g. deer)
Carnivore - A consumer that eats only other animals (e.g. hawk)
Omnivore - A consumer that eats both plants and animals (e.g. raccoon)
Food chain - A model that shows the path of energy as it flows from one organism to the next in an ecosystem
Food web - A diagram of several connected food chains
Predator - An animal that hunts other animals for food
Prey - Animals that are hunted by other animals
Population - Organisms of the same species that live in the same area
Community - Different species of organisms (i.e. populations) that live in the same area
Biodiversity - Different types of living things

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Weather

Activities

Weather Observations (*Objectives 5.E.1.1, 5.E.1.2*)

* Students fill in a weather log to record observations of the current weather: temperature, cloud type, cloud cover, wind speed, wind direction, and precipitation. They collect data throughout the day, and use it to make predictions about future weather.

Scientific Inquiry:

- *What observations will be different on our weather log in one hour? Two hours? At the end of the day?*

Cloud ID (*Objective 5.E.1.2*)

After an introduction to the 3 basic cloud types (stratus, cumulus, and cirrus), students play a game in which they act out each cloud type.

Water Cycle Tag *(Objective 5.P.2.1)*

Students connect the water cycle to weather through a game of tag.

Acting out Air Masses (*Objectives 5.E.1.1, 5.E.1.2*)

* Students act out the correlation between density and temperature, playing the role of gas molecules in an air mass.

Acting out Air Pressure *(Objective 5.P.2.1)*

Students hold a heavy object in different ways, build a model of a secret room, or use other models physical representations of air pressure.

Oil and Water *(Objective 5.E.1.2)*

Mixing oil and water, students conduct an experiment that reviews the concept of density.

Scientific Inquiry:

- *What will happen when we pour water into a jar of oil?*
- *Which is more dense, oil or water? Which type of air mass is oil most like: a warm, or old air mass?*
- *What is the least dense object in our jar? The most dense?*
- *Do more dense objects sink or rise?*

Weather

Fronts: Air Masses Collide (*Objectives 5.E.1.1, 5.E.1.2*)

* Students model cold, warm, stationary, and occluded fronts. After building a "city" or landscape out of natural materials, they act out the meeting of warm and cold air masses over the city.

Jet Stream *(Objective 5.E.1.3)*

* Students use a globe or printed maps to identify global geographic features (equator, poles, tropics, etc.). On the globe or maps, they draw the Jet Stream as a giant front where polar cold air and subtropical warm air meet. Instructors may guide students to act out the Jet Stream, or create a model of a Jet Stream using natural materials.

Reflection: Weather Poetry

Students enjoy a quiet time to observe the sky and write weather poetry.

NC Essential Standard and Clarifying Objectives

5.E.1	**Understand weather patterns and phenomena, making connections to the weather in a particular place and time.**
5.E.1.1	Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns.
5.E.1.2	Predict upcoming weather events from weather data collected through observation and measurements.
5.E.1.3	Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation.

Key Terms

Weather - The state of the atmosphere at a certain time and place
Climate - Average weather conditions in an area over a long period of time
Cumulus clouds - Fluffy white clouds with flat bottoms
Cirrus clouds - Thin, wispy clouds at high altitudes
Stratus clouds - Low-lying, flat, gray clouds with horizontal layers
Air mass - A large body of air that has a similar temperature and humidity throughout
Fronts - The leading edge of an air mass. (Students will study warm, cold, stationary, and occluded fronts.)
Jet stream - An air current in the high atmosphere that flows from west to east. (One metaphor is a river of wind very high in the sky.)
Meteorologist - A scientist who studies weather

Other Relevant Terms

Humidity - The amount of water vapor in the air
Density - How "packed together" the particles in matter are
Air pressure - The weight of the air over a given area