



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
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The Hows and Whys of our Connecticut Weather

Curriculum Unit 94.05.06
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I believe that children are constantly learning even when they are not consciously aware of it. I am very fortunate to be teaching first grade. The children are very open and eager to learn about new areas. By choosing to do a unit on weather, I feel I have a wealth of observational and hands-on materials at my fingertips. Weather affects everyone on an on going basis. Weather may determine different things for different people. It may determine how we will dress, what activities we will participate in, our mode of transportation, where we will spend our leisure time and to some extent our moods and schedules.

My philosophy of teaching is that children love to be successful, and feel that they have learned new things. They love to share their new found knowledge. They enjoy boasting about the expansion of their own bank of information and abilities. I feel my job is to make every child feel successful. Children come to school with varying degrees of readiness.

My unit extends out over much of the first grade year. The early activities don't depend on reading skills. The beginning of the first grade is a very big adjustment period for children. It takes weeks, if not months to get the children to understand the daily routines, rules, goals and expectations. The bulk of the unit begins around November. In September and October observations of daily weather will be discussed in a very nonchalant way. I will elicit children's observations and reactions about weather on a daily basis , only to keep them at bay. Children will anxiously await discovering the answers to their questions on their own, later in the year. I feel the unit must be ongoing. It has to be capitalized on as the weather situation warrants. I think it is great to utilize the situation as it occurs, fortunately in first grade this can occur.

Lessons can be as short as 5 minutes or as long as 45 minutes. The important thing is that children's interests are maintained and that they can come away with something new. I hope that as a result of this unit the children will be actively engaged in weather experiments, and that they will want to find out more and more. My ultimate goal is that I can create a classroom of children that will see science in general as a fascinating, fun subject area. I want them to think of science as a real life game .

In working on this unit it has gone through a lot of changes. At first , I wanted to cover disastarous weather because I thought it would be fascinating for the students. As I read and researched more on weather I found that every day weather is just as fascinating. Children can relate better and I have the materials outside my window.

My unit The Hows and Whys of our Connecticut Weather is related to the four seasons cycle. My first objective

is :

1. To develop basic earth science, weather awareness.
2. To discover and understand in simple concepts the causes of weather: Sun, Sea, and Air.
3. To further develop awareness and knowledge of air, and it's properties. Integrating compass directions.
4. To understand the concept of evaporation, cloud formation and precipitation.
5. Children will be able to identify the different types of clouds. They will be able to relate altitude to their daily living.
6. Children will be able to read and understand simple weather maps and information. They will recognize different weather fronts . They will be able to graph and interpret weather information.
7. To create a "Classroom Weather Center", utilizing hands on meteorological maps, data and instruments.
8. To be able to prepare written reports of weather and broadcast over P.A. through the use of prediction and critical thinking.
9. Children will understand in simple terms the nature of thunderstorms, hurricanes and tornadoes.
10. Culminating activity: Children will take part in a field trip to a nearby weather station to see first hand, real weather forecasting and reporting. Consider possible career choices in meteorology.

1) In order to introduce and develop the children's awareness of earth science and weather I intend to do a number of activities:

When children come into class in the morning we will discuss what types of clothes they have chosen to wear, and why. What does the sky look like today? Was it windy or calm when you came to school? Is the sun shining? Is it raining or snowing? And any other appropriate questions. A month to month weather graph is filled out on a daily basis. The elements of weather that are on it are: sun, cloud, rain, snow, wind, fog and hot and cold temperatures . Daily we will discuss what we are filling in on our classroom weather graph, and why we choose those elements. As the year progresses the children are given their own weekly weather graphs and are eager to fill them out as they arrive in the morning. We compare the monthly classroom graphs. We look at the differences from month to month. These differences can be easily related to the seasons. Children will a compare and contrast their weekly graphs on a bi-weekly or monthly basis.

In the beginning of the year, I ask if anyone has seen or heard the weather report for the day (prediction) ? If not I share tidbits of interesting information. As the year progresses, children are asked to listen to or look at the weather forecast in the paper. Sample opening weather awareness activity in lesson plans below.

2) To discover and understand in simple concepts, the causes of weather: Sun, Sea (water droplets, ice, and vapor), and Air.

First graders are aware that the sun is a source of heat and light for us. They feel the sun when they are out on the playground, near a window, in a car, etc.

Air can't be detected unless it is moving=wind. What makes the wind blow? The sun heats the earth and water , some more so than others. The warm air rises from the land and the cooler air from above the water takes it place and eventually warms and rises itself (sea breeze). This also happens at the equator-warm air rises, the cooler air from the poles move in to take it's place. Air-wind will be further developed in objective #3 below. All air has some amount of water vapor in it. As the warm air rises, it meets the cooler air. Condensation occurs (formation of water droplets).

3) To further develop awareness and knowledge of air and it's properties, integrating compass direction.

The permanent part of the atmosphere(air) is made up of: 78% Nitrogen, 21% Oxygen, 1% Argon. There is also a varied amount of greenhouse gases. Without air their would be no life on earth, no clouds, rain, or sound. Earth would cease to exist as we now know it.

Air can't be seen so how are first graders going to understand weather? I would start my discussion with the big book story "Wind" by Ron Bacon. After the story discussion which will include a list of the action verbs used to describe the wind (ex. blowing, whipping, stirs, chasing, flinging, etc.), we will do a water color painting of a windswept scene. Pinwheels may also be made at this stage. Blowing up a balloon and popping it or simply flapping the pages of a book will show air. Children will begin to understand that air cannot be seen unless it is moving fast enough-or we observe the affects it is having on other things.

The reason air moves: the sun heats the ground, causing the air to rise because it is lighter and thinner. The air cools as it rises, and becomes heavier and sinks to the ground. Air is constantly in motion.

Possible experiment: need 2 glass bottles, (one cold, the other in very hot water) , thick fluffy cord 1 ft. long. Light the cord, drop into cold bottle, put warm bottle over cold. Smoke will stay in bottom of bottle because cold air is heavier. Turn bottles over . Cold air and smoke will drop to the bottom (heavier) and push warm air up.

Hot air balloons work because a fire is burned under the open balloon= hot air rises=balloon stays up until the hot air cools. Now balloons are filled with a gas that is lighter than air. Air covers the earth=Atmosphere. It is all around us, even in water (fish breath air that is dissolved in the water) Experiment: fill glass with water-wait 1 hour, bubbles will appear inside glass=air coming out of the water. The atmosphere is full of clouds, which are blown by the wind. Troposphere-layer of atmosphere closest to the earth, has water vapor. This is where weather happens, and where most of the pollution is. It is warm, living things exist, and it gets colder further away from the earth. It is approximately 5-8 miles high. The altitude can be related to the children for example by the number of school buildings on top of each other, familiar street distances, etc.

The Stratosphere is above the Troposphere. The air is thinner, not enough for life, and there are not many

clouds. The ozone layer is in the troposphere. I think it is important to talk to the children about the ozone layer because they hear about it in their lives. The ozone layer keeps the heat close to the earth. The fact that the ozone layer shields us from the near UV radiation of the sun, is important for the children to understand. I think children need to be more aware of the harmful effects of the sun, and how to prepare. I don't think I would get into the bad side of the ozone layer, other than just mentioning that there is one. It would be too difficult for first graders to sort out the two.

The properties of air should be shown and demonstrated: breathing, wind(air in motion), sound transmission(bell in jar-vacuum air out-won't hear bell), air drag(drop feather), air lift(airplane, birds), blue light sky(light scattered out of sun beam by air). Air has weight, experiment: 2 inflated balloons tied with elastic, attached to extended coat hanger with paper clips. Tie string in middle and balance(may have to use tape to secure position). Pin prick one balloon.

I pose most of my lessons on questions, eliciting responses from the children. It is important that they want to figure out how and why, not just that I can tell them. They will remember it much better if they can see and do themselves. I now introduce compass directions. An easy wind vane, and anemometer can be made at this point.

Wind Vane: materials needed: compass, poster board, scissors, tape, brick, knitting needle, marker, white contact paper, pen top, clay.

- cut arrow from poster board-tape pen cap to middle
- put piece of clay at arrow point, attach needle to brick with clay-slide pen top over needle.
- cut out 4 pieces adhesive paper N,S,E,W
- take outdoors, with compass, place in open area, higher up
- attach directions to brick by using the compass as a guide.
- observe many times during the day. The arrow will point in the direction the wind is blowing.

Easy Anemometer: materials needed: 3 small yogurt containers, 3 knitting needles, large cork, pole(broomstick), hammer, nail(longer than cork), 2 washers, stopwatch.

- paint one container a bright color
- make 2 holes on opposite sides of each container(1 1/4" from top).Push knitting needle through holes, then push into cork(evenly space around cork)
- make hole through center cork-push nail through, put washers at end of nail. Hammer nail into pole(so cork spins around easily)
- stick pole in an open space outside when wind blows, count the number complete turns in 10 seconds(painted containers).

The weight of air pushes down on us=pressure(wt. above us). The higher up we go-less air above us. The earth's gravity keeps molecules close to the ground, so pressure is always greater. A simple Barometer can be made to show the changes in pressure.

Barometer:

materials needed:

wide mouth glass jar, balloon, scissors, drinking straw, strong rubber band, tape, piece cardboard, marker, ruler.

- cut neck off balloon, stretch rest tightly over top jar, secure with rubber band.
- cut one end straw into a point-secure other end with tape to middle of balloon.
- place outside out of the sun
- put a piece of cardboard behind the point of the straw-tape it in place on the jar.
- mark where the straw intersects the cardboard 5, and continue increments up and down.
- check same time each day
- change in pressure will cause straw to move slightly.

Air pressure is directly related to density of air molecules and temperature. If one changes the other two usually do. Lower pressure usually means poor weather. Often higher pressure means good weather. As warm air rises it cools and the molecules have room to expand, they also move much slower= lower temperature. As warm air sinks the molecules become more dense and move faster=higher temperature.

4) To understand the concepts of evaporation, cloud formation and precipitation.

All air has some amount of water vapor in it. Warm sinking air can hold more water vapor than cool air.(summer humidity). It inhibits cloud formation. Cool air that is rising holds less water vapor and enhances cloud formation. As air rises and cools, water vapor condenses= clouds. Clouds also form when cold heavy air flows below warm air and lifts it up. Experiment: boil water in a pan-hot air rises, when it cools it turns back into tiny water droplets=clouds. Similarly, when the sun heats the earth/sea the warm air rises and it eventually cools-the vapor changes back into liquid droplets, or ice crystals. When there are enough droplets/crystals and they have something to adhere to(dust, pollen, ice, ocean salts) they begin to form clouds. In the summer time they melt as they fall into the lower warmer air. They join other droplets and sometimes form rain. In the winter they stay as snow.

Water vapor is in the air from a number of sources(lakes, oceans*, plants, wet clothes, puddles, etc). The sun takes the water vapor into the air.Experiment: after a sun shower , have children go outside and draw circles around the puddles with chalk. After several hours of sun-observe how the puddles have changed. The sun heats the water which evaporates back into water vapor.

5) Children will be able to identify the different types of clouds. They will be able to relate altitude to their daily living.

I am going to introduce the cloud types to the children in as simple of a way as possible. There are many variations to the basic types of clouds. I know this will be much too overwhelming for first graders to handle.

There are mainly 3 types of clouds: Cumulus, Stratus, and Cirrus. Cumulus-fluffy piles cotton, generally flat bases, do not generally bring rain. Their cloud height is low to middle-with altitude anywhere from 1-4 miles high. They form where warm moist air is rising quickly. If they get, lower, darker rougher shaped and move together=cumulonimbus, which usually mean rain. A thunderhead is a cumulonimbus cloud that is very tall with a flat bottom. Their altitude can be 8+ miles . Stratus-sheet clouds-spread out across the sky-low altitude clouds, ranging from 1-3 miles high. They are usually gray in color. They are formed when warm air is lifted slowly. If they get darker and thicker, drizzle may fall. Cirrus-streak clouds, look like white wisps. They are high altitude clouds, which are made up of ice crystals. They are about 4 to 6 miles above the ground. The only cloud that is higher is the thunderhead.

I will need to see how the class responds to this basic information. If I see that they are doing really well with it, I will introduce more information. Weathermen basically use 10 types of clouds. The cloud names are combined with other words, describing their altitude ex: alto-high, nimbus-rain. High altitude clouds: cirrostratus, cirrocumulus and cirrus. Middle altitude clouds: altocumulus and altostratus. Low altitude(base)clouds: nimbostratus, stratocumulus, stratus, cumulus, cumulonimbus(all are composed of water droplets).

Fog is a cloud. Water droplets are held in the air close to the ground instead of higher up. Must be no wind(Titanic).

The children will create cloud booklets-see lesson plan below. Children will have a difficult time understanding altitude, so I will relate it to their neighborhoods, or familiar objects.

6) Children will be able to read and understand simple weather maps and information. They will recognize different weather fronts. They will be able to graph and interpret weather information.

Children will contribute to classroom weather graph on a daily basis. We will watch the weather channel or the 12:00 weather report, as often as possible. Our class will receive the New Haven Register for one month. We will look at the weather map and forecast.

There are fronts, highs and low pressure areas and temperatures on the weather maps we will be looking at. (see map and information below). First graders are amazed to compare the different temperatures across the united states. I relate the temperatures to something that they already know. This can be season related. It is great for math. They can compare the numbers more or less. Compass direction is easily incorporated. A temperature graph can be created with outside temperatures.

Large bodies of air are called air masses. They bump and push together where they meet is called a front. Weather changes as cold or warm fronts approach. Warm front-warmer temperature of the coming air mass. Shown on weather maps as a red line with half circles, pointing in the direction the front is moving. They flow over the cool air mass=drizzly rain-long time damp cloudy weather. Cold Front-cooler temperature of the coming air mass. Shown on weather map as blue line with triangles, that point in the direction that the front is moving. They push warm air upward=heavy rain-short time, cool clear weather. Stationary front-warm front

and cold front are at an impasse. Weather usually stays the same. Shown on weather maps as a blue and red line with the symbols pointing in the direction that the warm and cold fronts are headed. One of the air masses pushes the other out of the way.

To explain the high and low pressure on weather maps to children would be very difficult. It would be too much for them to comprehend. There is no easy way for a teacher to put it. I am going to leave it that H high pressure often means sunny fair , clear weather and L low pressure often means change in weather. There are so many other points that are interesting but I have to draw the line somewhere. Knowing the attention level of my students, and their learning capacity, I am choosing not to develop clouds and how they relate to fronts.

The children will contribute to a classroom weather map daily. They will also graph weather information on charts throughout the classroom.

7) To create a "Classroom Weather Center", Utilizing hands on meteorological maps, data and instruments.

The weather map that we will be contributing to daily will be utilized. We will have in our weather center a classroom thermometer, which we will have outside. We will also have the weather instruments which we will have made(barometer, anemometer, wind vane, and a rain gauge). A number of data collection sheets will be available at the center(blank maps, graphs, charts).

The children will be asked to keep individual simple weather journals-logs, which will be checked every other day. The logs will be a combination of graphs and journals of pictures of weather with descriptions underneath.

8) To Be able to prepare written reports of weather and broadcast over the P.A. through the use of prediction and critical thinking.

We will be using different weather instruments from our "Classroom Weather Center". This activity will be conducted for the month that we receive the "New Haven Register". The children will look at the data that we have collected for the day in our weather center. We will refer to the newspaper, and weather reports observed.

The children will have to use their prediction and critical thinking skills to prepare written weather reports. The children will work in groups of 4-5. One child will be the reporter, and first report to the class, and then to the school. This will be done by filing in a form that tells the temperature, wind direction and speed, pressure, and amount of precipitation(if any). They will also tell if a front is approaching. This will take place at the end of the day. The purpose will be to inform the rest of the school of the weather conditions currently outside.

9) Children will understand in simple terms the nature of thunderstorms, hurricanes, and tornadoes.

To begin the discussion on severe weather I am going to show a video for motivation. We will then get into a simple discussion of severe weather.

Thunderstorms: Thunderclouds occur on hot summer days. Air above the hot ground rushes up quickly inside the thundercloud-gets larger. The water vapor cools=water droplets and ice crystals, the air gets cooler and they fall. Each droplet/crystal contains electricity that jumps from top to bottom. In the cloud there is a lot of activity-rubbing together=electricity=lightning. Thunder is like popping a balloon, the crowded air rushes to get out with a loud noise. Thunder is the noise that air makes when it is rushing to get somewhere else. The lightning heats the air which enlarges the air to produce thunder. Thunder is heard after lightning because

light travels faster than sound. Example: for light to go to the moon-2 seconds, for sound to get there it would take 2 weeks. It takes 5 seconds for sound to travel 1 mile. Example: count seconds between lightning-thunder, 5 seconds=1 mile.

Experiment: Lightning-need: balloon, fluorescent bulb. darken room, rub balloon on hair-touch to the end of the bulb. The bulb will light up because the balloon was electrically charged and it is transferred to the bulb. Lightning-in thunderstorm=electrical discharge.

Tornadoes and Hurricanes(tropical cyclone)are rotating storms. Both have low pressure in the middle. They both get their speed by conservation of angular momentum(ice skater affect)-rotation rate increases as you move inward. Hurricanes occur without fronts, the water temperature has to be greater than 27 degrees C. They have winds faster than 74MPH. They are fall storms with heavy rain and high tides. If a hurricane moves over land or cooler water it will disipate. Tornadoes occur on hot humid days, usually in the mid-west, but can occur anywhere. They generally occur April-July, and usually between 3 and 9p.m. They are funnels that hang down from thunderclouds.They have whirling wind up to 200 MPH.

10) Culminating activity: children will take part in a field trip to a nearby weather station to see first hand, real weather forecasting and reporting. Consider possible career choices in meteorology.

Glossary of weather related terms:

Air Pressure-pressure(weight, force) of air overhead Anemometer-instrument used to measure wind speed and direction Atmosphere-gases that surround the earth Cirrus-streak clouds 4-6 miles above ground Cold front-edge of cold air mass, next to and beneath a warm air mass

Condensation-act of condensing-ex:reduction gas to liquid

Cumulus-fluffy piles cotton clouds, 1-4 miles high

Dew-condensation formed,result warm air contacting a cool surface

Dew point-temperature at which cooling air becomes saturated and dew forms

Evaporation-change from moisture to water vapor Eye of the storm-center of storm-calm(good weather), before second

part of storm

Frost-icy crystals that form directly on a freezing surface

Hazardous-of or involving chance

High-area of high pressure located at the center of an air mass, usually meaning fair weather

Hurricane-violent tropical cyclone, winds 73

Hygrometer-instrument to measure humidity

Low-area of low air pressure-frontal low when happening along a front-usually means change in weather

Mean temperature-average temperature over a period of time

Mist-large mass of water vapor at or above earth's surface, resembles fog, but less dense

Northeaster-storm or strong wind from the northeast

Precipitation-depositing of rain, snow, sleet, etc.

Saturation-point at which a substance can absorb nothing more

Stationary front-front that is stalled , neither air mass is moving

Stratus-sheet clouds, low altitude, usually gray in color

Tornado-violently whirling column of air-speeds 160-480 km/hr extending downward from a cumulonimbus cloud. Rapidly rotating funnel shaped cloud

Troposphere-lowest layer of earth's atmosphere, contains weather

Warm front-edge of a warm air mass advancing against a colder air mass

Wind-air in motion

Lesson Plans:

1) Opening Weather Awareness Activity:

Objective: children will recognize different hats and be able to match them to appropriate weather conditions.

Preparation: gather a number of different hats ex: rain, stocking cap, wool hat, sun hat-visor, baseball cap, straw hat, etc. into a box or bag. chart paper, marker, drawing paper

Lesson: pull one hat out at a time-1)ask for volunteer to model-does any one know the name of the hat? 2) Discuss with children when one would need to wear a hat like this. 3) List responses on chart paper 4) brainstorm other clothing that may go along with the hat and list on chart: Hat Weather Other appropriate clothing/season 5)what season might this hat be worn in? 6) After going through al the hats have the children choose their favorite, and draw a picture of themselves wearing it outside. Including appropriate weather, share in small groups.

2) Cloud Booklets:

Objective: Children will listen to stories about clouds. They will observe them in the sky. Children will design their own cloud booklets.

Materials: cloud stories(see children's reading list), construction paper, cotton, glue, crayons.

Lesson: 1) read cloud stories 2) brainstorm information learned on chart paper, about each cloud type. 3) Go outside if possible, to see if any clouds are recognizable. 4) relate clouds to information on chart 5) continue this for about 1 week or until children are familiar with the cloud types 6) create cloud booklets, using blue construction paper, cotton, glue, and crayons. Under each cloud a short description should be included.

This project should be extended over a week or two. The clouds will probably have to be created slowly, so that the children don't get overwhelmed and confused.

Surface Weather Maps and Symbols

(figure available in print form)

Increasing Weather Awareness with NOAA Weather Radio

(figure available in print form)

Annotated Bibliography for Teachers

Ahrens- Meteorology Today-undergraduate text, good reference.

Bendick, Jeanne-"Lightning" 1961, Rand McNally and Co.-children's information book.

Cavendish, Marshall, "Weather-more science projects" 1989 Marshall Cavendish Corp. -short descriptions of weather accompanied by experiments that can be conducted with ease(children's book).

Dobson, G.M. -"Exploring the Atmosphere" 1963, Clarendon Press.

Edinger, James G. -"Watching for Wind", 1967, Anchor Books—Children's book.

Feravolo, Rocco-"Weather Experiments", 1963, Garrard Publishing Jr. science book with many simple little material experiments.

Kalina, Sigmund-"Air the Invisible Ocean"-1973, Lothrop, Lee, and Shepard, Co. NY.-older children's book, a few interesting concepts, but some bizarre correlations.

Kohler, Pierre-"Weather" 1988, Barron's Educational Series, Inc.— Resource book explaining earth's atmosphere.

Lambert, David and Hardy, Ralph-"Weather and It's Work"—The world of science 1984,Facts on File Publications, New York, NY-good resource book, excellent pictures to share with class. Contains information on all types of weather in unit.

McMillan, Bruce-"The Weather Sky"-1991, Farrar Straus Giroux NY— More detailed information about weather, excellent pictures and graphs. Shows skies, clouds and relates them to altitude and occurring fronts.

Mason, B.J-"Clouds, Rain, and Rainmaking", 1962 Cambridge Univ. Press.

May, Julian-"The Cloud Book" 1972, Creative Education Society—children's book.

Polgreen, John and Cathy-"Thunder and Lightning", 1963, Doubleday +Co.- children's book explaining thunder and lightning.

Ryan, Martha-"Weather"- 1976, Franklin Watts-New York-easy reading fact book, good pictures, short descriptions.

Simon, Seymour-"Projects with air"-1975, Franklin Watts, New York-good book with simple experiments for children Uman, Martin-"Understanding Lightning", 1971 Bek Technical Publications.

Webster, David, "Snow Stumpers", 1968, Natural History Press—Picture book of different snow formations.

Periodicals:

Primary Mailbox Magazine-April/May 1994-Idea magazine for teachers.

Science News-(weekly) -recent science news.

Weather Wise-Helen Dwight Reed (bi-monthly)-current weather information.

Reading List for Students:

Bacon, Ron-"Wind" 1984 ,Scholastic Inc.—whole language story about thewind containing many action verbs.

Bendick, Jeanne-"How to Make a Cloud" 1971, Parent's Magazine-good information, higher reading level. Brandt, Keith-"What makes It Rain?" 1982, Troll Associates-simple factual information.

Branley, Franklin-"Air Is all around You" 1986, Thomas Y. Crowell, NY-excellent illustrations, with simple text.

Branley, Franklin-"Flash, Crash, Rumble and Roll" 1985, Thomas Y. Crowell-excellent illustrations, with simple text.

Branley, Franklin-"Hurricane Watch" 1985, Thomas Y. Crowell-excellent illustrations, with simple text.

dePaola, Tomie-" The Cloud Book" Holiday House-excellent, clear appropriate grade level information.

Wiesner, David, -"Hurricane" Clarion Books-good illustrations, clear and simple information.

Materials for classroom use:

-large thermometer

-weather graph

-assorted weather instruments to be constructed during unit:

-wind vane

-easy anemometer

-barometer

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