THE WEATHER CLASSROOM®

WEATHER & PEOPLE

This lesson addresses the following National Standards:

Science as Inquiry
- Abilities necessary to do scientific inquiry
- Communicate scientiic procedures & explanations
- Understanding about scientific inquiry

Physical Science
- Motions & forces
- Transfer of energy

Life Science
- Populations & ecosystems

Earth & Space Science
- Structure of the earth system
- Earth's history

Science in Personal & Social Perspectives
- Populations, resources, & environments
- Natural & human-induced hazards
- Technology in society

Language Arts
Make written & oral presentations, write paragraphs

Visual Arts
Illustrate pamphlets; build models

Geography
Places & regions; environment & society

History
Impact of weather on historical events

Preview

People are intimately affected by weather, without a doubt. Throughout human history and prehistory, many innovations have been developed in direct response to weather events. Living organisms need food, water, and shelter to survive and weather directly affects each of these.

Food availability is contingent upon precipitation, sunlight, and temperature. Fresh water, necessary for almost all life functions, is made available by precipitation and surface storage. Natural or artificial, clothing or buildings, shelter is essential for protection from weather extremes. The innovations we have developed to cope with weather in order to ensure that our basic needs are met are as many and varied as there are types of weather. Some of these have even changed the weather.

Weather Fact

Did you know that the sun powers Earth's climates and weather? The atmosphere also absorbs heat, resulting in the gas molecules that move faster as they absorb the sun's energy. Their collision with other molecules results in a general chaotic movement. This movement takes on more direction as it is influenced by Earth's rotation about its polar axis. Thus, our prevailing wind currents develop. As the air moves, it encounters surface features, such as mountains, that propel the air upward and around the obstacles. This movement helps to create a greater mixing of the air, allowing for the development of atmospheric phenomena such as thunderstorms.

The sun's heat energy also evaporates water from land and sea. As wind, air picks up and moves dust particles, pollen, and other particulate matter. The water vapor formed from evaporation will condense around the cooler dust, pollen and other particulates, forming microscopic water droplets. These droplets accumulate into clouds and, eventually, produce precipitation. The combination of the varying wind patterns and water vapor produce the weather we experience every day.

Weather Terms

All glossary terms can be found at http://www.weatherclassroom.com
ultraviolet
radiation
ozone layer
environment
greenhouse effect
pollutant
hypothermia

WEATHER & PEOPLE

Q & A

Start Talking

Weather is a common influence on all humans. Explain.

Answer: Weather affects what crops can be grown, what food animals can survive, how goods and people travel, what energy is needed to heat and/or cool buildings, how much water is available for domestic and industrial use, what clothing is necessary for comfort and survival, and other aspects of living.

Historically, humans are a tropical and subtropical species. How, then, are we able to live in almost every climate?

Answer: We construct artificial shelters out of many materials and in many designs, produce different types of clothing for varying climates; our dietary needs can be met by a huge variety of foods; and, we can learn from past weather events to predict and plan for future happenings.

Going Further:

How has weather and climate change affected human history? Consider the following: What do paleontologists consider a major force in the development of human ancestors?

Answer: Drier climates in Africa reducing forest and spreading grasslands, promoting bipedalism

What innovation allowed human ancestors to move into cooler climates?

Answer: Taming of fire

What behavior did living in cooler climates motivate?

Answer: Wearing clothing

What slowed migration into Europe?

Answer: Ice Ages

What allowed migration from Asia to the Americas?

Answer: Ice Age created land bridge across Bering Strait

Why are there different human races?

Answer: For survival, certain physical characteristics are more favorable in different climates

Why has the human population grown so much in temperate rather than in tropical environments?

Answer: Major food crops grow better in temperate climates; parasitism and disease are more varied and prevalent in tropical climates.

Teaching Note: Challenge the students to discover the answers on their own. You may also want to add more questions and elaborate on the answers provided. Check People and Weather Resources to discover more information about how weather and climate change has affected human history.

Q & A

How are exothermic and endothermic animals different?

Answer: Exothermic (literally "outside temperature") refers to animals who obtain most of their body heat from their external environment. Only about 10% of their food energy is used to generate internal body heat. Therefore, as the environmental temperatures change, so do the temperatures of the animal. This is known as poikilothermy. Fish, amphibians and reptiles* are exothermic animals.

Endothermic (literally "inside temperature") refers to animals that obtain most of their body heat from the metabolism of food. About 80% of their food energy is used to generate internal body heat. Therefore, as environment temperatures change, their body temperatures remain relatively unchanged. This is known as homoiothermy. Birds and mammals are endothermic animals.

*** Note:** Some sharks and snakes are known to rapidly contract their muscles, thereby raising their body temperature a few degrees above the temperature of their environment.

Plants need sunlight for photosynthesis. Why do animals need sunlight?

Answer: Animals need sunlight for energy and several metabolic processes. Sunlight enables the production and use of Vitamin D, necessary for calcium uptake in the intestines. Higher light levels increase the amount of serotonin, preventing lethargy, sleep disorders and depression. Low light levels allow the release of melatonin, a hormone shown to be necessary for restful sleep and a general feeling of well-being. However, long periods of low light—especially in the winter months—may cause depression, lethargy and lower mental acuity and is called Seasonal Affective Disorder (SAD). Low sunlight levels also decrease the production of melanin, the skin pigment that helps protect animal tissues from UVA radiation. Sunlight is necessary for some organisms to gain heat energy for survival. All organisms use the sugars that plants produce from photosynthesis for energy.

Teaching Note: Check People and Weather Resources for further exploration of Seasonal Affective Disorder.

Is sunlight dangerous?

Answer: In addition to the visible spectrum, there is a wide range of electromagnetic radiation that is emitted by the sun. The most dangerous of these to life on Earth is ultraviolet radiation of which there are three types: UVA, UVB and UVC. Ultraviolet radiation is powerful enough to penetrate animal tissues where it can damage the DNA in the cells, resulting in cell death or damage that could cause certain forms of cancer. UVC is the most dangerous, but less than one photon of this radiation per century penetrates the atmosphere. UVB is mostly absorbed by the ozone layer, and what filters through is stopped completely by glass. Much of the UVA penetrates to the Earth's surface, but skin pigments, hair, feathers and other body coverings prevent major tissue damage. Sunscreens, clothing (hats, long sleeves, pants) and reduction of outside activity during peak exposure hours help prevent damage from ultraviolet radiation.

Q & A

What happens if humans get too much or too little sunlight?

Answer: Too much exposure to sunlight can result in damage to skin cells. This damage could be as benign as wrinkled, dried skin, or as deadly as melanomas (lethal skin cancer). People who have fair skin (relatively little melanin production) are at the most risk. Also, intense exposure to the eyes without some protection can damage the retina of the eyeball, possibly resulting in some degree of blindness. Too little sunlight prevents adequate production of Vitamin D, essential for calcium uptake in the intestines. Calcium is necessary for proper bone growth and skeletal muscle activity. Also, light levels affect the production of serotonin and melatonin, neurotransmitters that affect sleep, moods, attentiveness and thinking processes.

How can exposure to light be controlled?

Answer: The easiest way would be to stay inside a shelter during the daylight hours and be active at night. But, since humans are a diurnal species, this would be neither good nor normal. So, over time, humans have produced several innovations to limit exposure to direct sunlight, including various articles of clothing and shelters. In recent years, chemists have developed topical creams and ointments that help prevent damage to skin by direct sunlight.

Weather Classroom Break

What are the basic needs of life?

Answer: Water, food, and shelter. All organisms must have these in some amount and form for survival.

Going Further:

Are the basic needs of life the same for all organisms? Select a number of plants, animals, fungi, protists and/or prokaryotes. Challenge students to investigate the basic needs of these organisms and how they are met. Have students compare and contrast the organisms.

Teaching Note: Correlate how the basic needs of organisms are met with the climates in which they live.

What is hypothermia? Why is it dangerous?

Answer: Hypothermia is a condition in which the body's core temperature falls below survivable temperatures. Initially, heat is kept mainly within the head, chest, and abdominal region, where the major organs necessary for sustaining life are located. As heat is directed away from the extremities (fingers, toes, ears and nose), they all begin to feel colder. Although most heat is directed away from these body parts, mainly by restricting blood flow, heat is still lost to the environment. In time, more heat is lost than can be generated by normal metabolism and the body's core temperature falls. Eventually, there is not enough energy to operate vital organs, the person loses consciousness and may perish.

Teaching Note: Check People and Weather Resources for more information about hypothermia.

Q & A

Why is water an enemy of survival in cold weather?

Answer: Water is able to absorb heat energy. As a result, if water comes in contact with a person's skin, water will absorb the body's heat energy and create a cooling effect. Therefore, some type of clothing that absorbs water away from the skin and helps create a thermal barrier (insulator) is best for preventing hypothermia.

Shelter is a basic need of life. It protects us from the "elements," better known as weather. What are some weather considerations that must be taken into account when erecting a building or other type of shelter?

Answer: How much precipitation occurs? What type (rain, snow, etc.)? What are the annual and/or seasonal temperatures? From which direction does the weather most often come? What are the chances of dangerous weather phenomena (tornado, hurricane, large hail, flooding, drought, etc.)? Once these questions are answered, materials and designs can be made that best withstand the conditions.

Going Further:

Different styles of buildings are constructed in different climates. Using examples, show how these different styles are best suited for these areas.

Teaching Note: Provide pictures of different buildings from around the world. Challenge students to postulate as to what type of climate they are most suited. Consider materials, shape, unusual features, orientation to the sun and the environmental surroundings.

Weather Classroom Break

How have people attempted to control weather?

Answer: Ritual dances, prayers and offerings to religious deities, rain cannons and cloud seeding are perhaps the best known. Although none of these methods have proven effective, coincidence and a lack of more concrete methods enable these practices to persist. Cloud seeding underwent scientific experimentation in the middle of the 20th century. Planes fly through an area and disperse silver iodide powder. The chemical acts as a nucleus for the condensation of water vapor and forms water droplets. In some instances, especially when the chemical was sown in rather dense clouds, some precipitation was produced. So far, however, the effort has not proven to be either very effective or cost worthy.

Teaching Note: Check People and Weather Resources to discover some methods used to control or influence the weather.

Q & A

Going Further:

There have been stories, poems, books, and movies that involve tales, trials and tribulations from the effects of weather on the human condition, and in which the weather provides the setting or backdrop of the tale. In fact, one famous tale begins with the line, "It was a dark and stormy night." Have students read/watch one or more creative works and report on the weather facts and fiction in these tales. Consider: The Rainmaker, The Grapes of Wrath, The Old Man and the Sea, Robinson Crusoe, The Perfect Storm and The Wizard of Oz.

Teaching Note: Challenge students to brainstorm a list of other books, stories, poems, and movies that depict weather events. Have students discuss the literary importance of including weather in these works, especially in light of how weather affects people.

People do have an effect on weather although, generally, it is "not on purpose." Explain how and why this is so.

Answer: This has been accomplished mainly by the burning of fossil fuels. When coal, oil, natural gas and their derivatives are burned for the release of trapped energy, many pollutants are released. These include carbon dioxide, nitrogen oxides, sulfur dioxide, carbon monoxide, particulate matter and many more. These pollutants have created ground-level ozone, photochemical smog, depletion of the stratospheric ozone layer and global warming.

What is the current status of the ozone layer?

Answer: Current data seems to indicate the ozone layer may be stabilizing after almost two decades of decline. However, the chemicals that have done the most harm—chlorine and bromine compounds—are expected to persist at current levels for up to 50 years. This means that, although the ozone layer may not suffer the great recent effects, damage will likely continue for some time.

Going Further:

What is going on with the ozone layer? Have students study current and past ozone fluctuations.

Teaching Note: Check Hurricane Resources to discover more stories from the hurricane hunters.

Why is the world's weather so notoriously difficult to predict accurately?

Answer: There are so many influences on our weather: geography, ocean currents, topography, particulate matter, temperature gradients, and microclimatic zonation. Exactly how they all will work together is nearly impossible to determine accurately. Although there are general patterns to the weather, it is constantly changing and chaotic. Even historical and prehistorical patterns don't help enough to predict the future. Accurate weather data barely dates back a century, so we are still learning much about how the Earth's climatic systems operate. However, computer technology, satellite information and improved instrumentation have made today's predictions a lot more accurate than they have ever been.

Q & A

What are urban heat islands?

Answer: Urban heat islands are cities in which concrete and metal absorb much more heat and offer fewer cooling effects than forests and other vegetated areas. Therefore, cities are much warmer than surrounding areas that have more forest and aquatic habitats, creating an island effect.

Teaching Note: Check People and Weather Resources for information and maps about heat islands.

How can city dwellers help to alleviate the heat island effect?

Answer: Planting trees and roof gardens help a bit. They not only help beautify a city and add oxygen while absorbing carbon dioxide and other gaseous pollutants, they also help to modify temperatures by providing shade and by absorbing the sun's energy for sugar production, rather than radiating it back out into the atmosphere as heat. Roof gardens can actually lower energy costs by modifying the effects of the radiant heating of the building while, at the same time, helping to decrease the heat island effect locally.

How do humans pay a price for our activities?

Answer: Many, if not most, of our activities are based on burning fossil fuels for energy and the conversion of these resources into materials for the production of thousands of products. Gasoline and diesel are used in our family cars, trucks, and trains that deliver goods, planes and boats that take us and our goods around the globe, motorcycles, 4-wheelers, mopeds, lawnmowers, weed trimmers, and so many other devices. Natural gas is burned in our homes and businesses and even in some newer vehicles. Coal is burned to generate electricity and provide heat. Oil is processed into many products and used directly for heat energy in some places. Practically everything that we do today depends either directly or indirectly on fossil fuels. However, the more of these finite resources we use, the more we produce air, ground, and water pollution. This pollution poisons entire ecosystems, produces ground-level ozone, releases particulates that damage living and nonliving things, creates acid rain and causes global warming with greenhouse gases.

Hands On

Weather and History

Discuss how weather may have influenced important human historical events and, then, brainstorm a list of these events. During what seasons did these occur? What are the most likely weather patterns during that time of year in that area? Have students speculate on how the people involved in these events coped with the weather.

Probable Responses: Several responses are possible, depending upon the events listed. The outcome of the following events were greatly affected by weather: Destruction of the Chinese Fleet in 1281, defeat of the Spanish Armada in 1587, Battle of Waterloo in 1815, Irish Potato Famine in the 1830s, the Dustbowl of the 1930s, and D-Day: June 6, 1944.

Consider the following topics on how people coped with the weather: historical time period, culture, transportation, food, shelter, weapons effectiveness, etc.

Begin with the list of important historical events identified above—both student responses and suggested events.

1. For each event, identify what happened, when, and how the weather may have influenced the outcome.
2. Divide the class into groups of 3-5. Distribute the Student Handout: Weather and History to student groups. Assign at least one event to each group.
3. Challenge groups to speculate whether or not their particular event would have changed if the weather had been different.
   a. If a group determines that the events would have changed, have them postulate both the long- and short-term effects on world and/or local history.
   b. If a group determines "no," direct them to report on why the weather did not have significant effects, and/or assign a different event.
4. Have each group develop a presentation on their event. This presentation could be done in class, before other social studies classes and/or as a standing display in the school.

Going Further:

Have each student choose an event whose outcome was influenced by the weather. Ask students to change the weather conditions and, then, rewrite the conduct and outcome of the event as a paragraph in a history book. Have students share their paragraphs in class.

Would different weather have affected these and other historical events?

Answer: Answers will vary but the events probably would have turned out differently. How they might have changed, and the effects of those changes, will foster further discussion, brainstorming and speculation.

If the weather did not change, what actions might have been taken to alter the outcome of the events?

Answer: Answers will vary but challenge students to think of how the participants in the events could have changed their actions, thus affecting the outcome.

Extension: Weather forecasting was not available—or reliable—prior to the 20th century. Challenge students to deliberate on how the events studied above might have been altered, delayed, or prevented if forecasts had been available then. Ask students to develop scenarios on how history could have changed as a result of accurate weather forecasting.

To Wear or Not to Wear

As a class, discuss all types of clothing. Are the same types worn throughout the world? Are clothes made of the same materials? When choosing clothes to wear, what do students consider to be the most important factor(s)?

Probable Responses: Although styles differ around the world, wearing clothes meets certain basic needs. Especially important is protection from exposure to the sun and weather. Heads, torsos, legs, arms, hands, feet—all need to be protected from injury and exposure. Materials used for clothing range from natural skins and plant fibers to artificial materials such as nylon, rayon and plastic. Although weather is a prime factor in the decision on what to wear, students may also mention style, activities and peer pressure.

Divide the class into research groups of 3-5 students and distribute the Student Handout: What to Wear, What to Wear! to student groups.

1. Assign each group one of the following climates: Arctic, Sub-Arctic, Temperate Forest, Desert, Tropical Rainforest, Temperate Grassland, Alpine/Mountain.
2. Challenge each group to research types of clothing and materials used by people—past and present—in their assigned climate.
   Note: Direct students to find information from different cultures in similar climates around the world.
3. Each group will create a pamphlet on the weather and indicate appropriate clothing for that weather, typified by what is worn in their area. (If seasonal changes are part of their climate, appropriate clothing for those times of the year would be a necessary component of their products.)
4. Share the pamphlets with different classes and/or local civic organizations.
5. Optional Evaluation: Challenge each group to provide actual or facsimile articles of clothing for their climate.

What are the similarities and differences in the clothing among the climates?

Answer: Similarities may include hats, shirts, coats, pants, shoes and other articles. Differences may include materials used, design and when and in what amount worn.

Are there clothes that could be worn in more than one climate?

Answer: Answers will vary. However, some obvious responses could be that clothes worn by the Inuit (aka Eskimo) would not be appropriate for a tropical area, and vice versa; clothes that repel water would not be appropriate in desert climates; grassland apparel would not be appropriate for alpine regions. Many cultures in different climates have some type of undergarment.

Extension A: Following similar directions as above, have students re-search buildings, foods and/or methods of transportation for each climate.

Extension B: For either the primary activity or Extension A, have students build models or use actual items to construct displays illustrating how weather has influenced the development of different cultures and styles.

The Layered Look

Many considerations must be made when deciding what clothes to wear on any particular day in any particular place. This is especially true on cool and wet days. For many people, the answer to the problem of coping with lower temperatures and wet weather is to wear several layers of clothing. Often, these layers are of different materials. Why might it be necessary to wear layers of clothing? Why are different materials used?

Probable Responses: Wearing multiple layers of clothing aids the insulation effect, thus reducing the loss of body heat. Generally, the more layers that are worn, the warmer a person will feel. Clothing worn next to the skin should be made of a material that "wicks" moisture (sweat) away from the skin, as water will readily absorb body heat. Outer layers should be water and wind proof and have high insulation properties to minimize environmental effects and reduce the loss of body heat.

Divide the class into laboratory groups and distribute the Student Handout: The Layered Look to each. Provide each group with a thermometer and samples of materials used to manufacture clothing. Materials may include cloth swatches (cotton, wool, hemp, nylon, rayon, etc.), leather, fur (real and/or imitation) and plastic. Each group should have a unique mix of materials, with some groups receiving only one to two samples.

1. Have groups use their thermometers to measure the temperature of the room. Instruct each student to record the reading in their notebook/logbook
2. Then, have each group wrap its thermometer in the materials provided. (Materials should be layered as they would normally be worn; or, you may have students vary the arrangement to provide different results.)
3. Place the wrapped thermometers in warm (oven, incubator) and cold places (refrigerator, freezer). Place an unwrapped thermometer in each experiment area to act as the control.
4. Periodically, have groups check the temperature of their experiment and of the control. (Data gathering intervals will depend on how long you want to continue the investigation. You can increase the time between temperature checks for longer investigations.)
5. Students will record each temperature reading in their notebooks/logbooks. At the end of the investigative period, have groups record their data on the chalkboard and have each student record the class data in is or her notebook/logbook.
6. Using the class data, instruct each student to construct a graph of the readings. (Temperature will be the Y axis, and time the X axis.) Have students use different colored pencils/markers for the control and for each experiment.

Was there a difference between the experimental readings and the control readings? Explain.

Answer: There should be! The more layers used should produce a great variance between the control and experiment.

Did the material used present a difference in readings?

Answer: Yes. Thinner materials with wider weave allow more heat to be transferred between the interior and exterior. Thicker, tighter weave materials allow less.

Extension: To simulate body heat loss, place the thermometer in a plastic bag filled with water—representing human skin. Heat the bag to 98°F/37°C (normal human body temperature) in an incubator or water bath. Wrap the thermometers immediately in different materials as above. Place heated and wrapped thermometers in warm/cold areas as above. Check the temperature periodically and record the readings. Compare this experiment with the previous one.

Cool Concrete or Pretty Plants?

"Heat Island" is a term used to describe urban areas, which are built, usually, out of concrete and metal. Urban construction subsequently destroys and removes forests, grasslands, and wetlands. Why are these areas called heat islands? Are there natural heat islands? Why does removing natural plant cover create a temperature problem? Does the atmosphere have an effect?

Probable Responses: These areas are called heat islands because their temperatures often average several degrees warmer than surrounding countryside. Open fields are warmer than forested areas, and rock outcrops are considerably warmer. Plants tend to absorb much of the sun's energy for photosynthesis before the ground can absorb that energy. Plants also contain water and help retain water in soil. One of the primary properties of water is that it can absorb a lot of heat energy and release it much slower than solids, such as rocks, or concrete. Therefore, plants hold the heat energy longer and the air doesn't become as warm. Gases and particulate matter in the atmosphere absorb and release heat energy, thus slowing its escape back out into space. This is called the greenhouse effect. The more particulates and certain human-generated gases, especially from the combustion of fossil fuels, the greater this effect.

Construct three containers of sufficient size to hold potted plants, pieces of concrete and other items. Containers should be transparent—glass, Plexiglas or plastic wrap, at least on the top. The transparent material covering the container transmits heat poorly; so, more heat energy remains inside warming up the air, much like the natural greenhouse effect of the atmosphere.

1. Place some potted houseplants in the first container, turf grass in the second container, and concrete/metal or other human-made building materials in the third.
2. Place a thermometer in each where it can easily be read without disturbing the experiment.
3. Place the containers in an appropriate setting in the laboratory. Shine a light source on each container. (Note: You must use the same type of light source for each.)
4. Periodically during the lab, check the temperature of each container. Record this information in your notebook or laboratory logbook.

5. After completing the experiment and using the temperature data, construct a graph illustrating the temperature readings in each container—temperature on the Y axis, time on the X axis.

Which container had the greatest temperature increase? Why?

Answer: The container with concrete/metal should have had the greatest increase, with grass second, and plants the least. Concrete and metal absorb heat readily and quickly, but also release it quickly, warming the air faster. The transparent material covering the container transmits heat poorly, so the energy remained inside heating up the air, much like the natural greenhouse effect of the atmosphere. The plants, grass and soils, and especially the water in them, absorbed the heat but did not release it quickly, so the air didn't heat as much. The plant container should be cooler than the grass because the larger leaves shaded the lower part of the container and prevented heat absorption. The grass blades are much more exposed to the light's heat energy, thereby absorbing more and then having more to release.

If you were a businessperson and discovered that your workplace was a heat island, what could you do to change the environment and create a cooler microclimate?

Answer: Depending upon the situation, you could plant trees and bushes in bare and grassy areas. You could also plant them where they would provide shade over walkways, parking areas and windows.

Extension: Discover heat islands in your area. Place thermometers or temperature gauges in different local habitats. Read and record the temperatures a few times a day over a week, month or longer period of time. Graph and compare the readings. Report your findings in class, the local paper or other appropriate venue. When possible and necessary, offer solutions to remedy the situation.

Student Handout 1:

Weather and History

How have people coped with the weather throughout history? Working as a group, consider whether or not your assigned historical event would have changed if the weather had been different.

About the Event…

Event Name: Date:

Where did it take place?

What happened?

Why is it significant historically?

About the Weather…

How did the people cope with the weather?

FOOD	SHELTER	TRANSPORTATION

Describe the weather conditions:

Did the weather influence the outcome of the event? YES NO

If YES, describe possible long- and short-term effects on world and/or local history.

Long-term Effects:

Short-term Effects:

If NO, why do you think the weather did not have significant influence?

Now, use your information to develop a presentation on your event. Include a map showing where the event occurred.

Going Further:

Individually, choose any event whose outcome was influenced by the weather. Change the weather conditions and rewrite the conduct and outcome of the event as a paragraph in a history book. Share your paragraph in class.

Student Handout 2:

What to Wear, What to Wear!

Different climates call for different clothing. Choose two to three different cultures from around the world in climates similar to your assigned climate. As a group, research information about the types of clothing people wear now and have worn in the past—and in what season!

Organize your findings using the chart below. Indicate seasonal clothing with the following letters: **W**inter **SP**ring **S**ummer **F**all

Climate: Characteristics:

What People Wear on Their...

CULTURE	HEAD	TORSO	LEGS	HANDS & FEET
IN _____				
IN _____				
IN _____				

Create a pamphlet on the weather and indicate appropriate clothing for that weather, typical of clothing worn in that area. If different seasons are part of your climate, don't forget to indicate appropriate clothing.

Student Handout 3:

The Layered Look

Materials:
- notebook/logbook
- thermometers (2/group)
- clothing materials
  cloth, leather, fur, plastic

* oven/incubator
* refrigerator/freezer

Layers are fashionable, but do they affect the temperature?
As a group, experiment to find out if the numbers of layers and the types of material you wear can affect how cold or warm you feel.

Step 1:
List the clothing materials given to your group:

Step 2:
Measure the temperature of the room: **Temperature:** ____°

Step 3:
Check the area assigned: ❑ **Warm** ❑ **Cold**

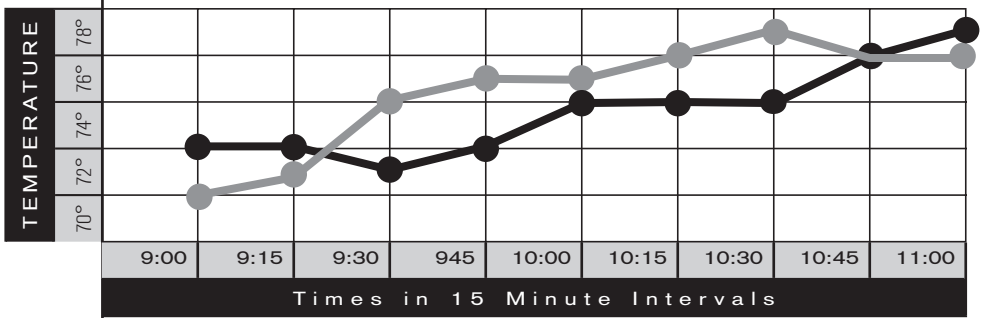
- Gather your thermometers (2).
- Thermometer #1: Wrap in 2 or more materials.
- Thermometer #2: This is your control. Do not wrap.
- Place the wrapped thermometer and the unwrapped thermometer in the area assigned.

Step 4:
- Check the temperatures of both thermometers in 10-15 minute intervals.
- Record each reading:

WRAPPED THERMOMETER	UNWRAPPED THERMOMETER
Time: : Temperature: °	Time: : Temperature: °
Time: : Temperature: °	Time: : Temperature: °
Time: : Temperature: °	Time: : Temperature: °

Step 5:
Record your data on the chalkboard and the class data in your notebook/logbook.

Step 6:
- Use the class data to graph the readings on graph paper following the example below
- Use different colored pencils/markers for the control and for each experiment.



Internet Resources

Hunting Hominids
http://exn.ca/hominids/outofafrica.cfm

The Origin of Bipedalism
http://www.jqjacobs.net/anthro/paleo/bipedalism.html

Institute for Ice Age Studies
http://www.insticeagestudies.com/library/darkcavesbrightvision/

PG News: ***Clothing of figurines may be record of Ice-Age tribe's skills***
http://www.post-gazette.com/healthscience/19990621vvenus2.asp

Purdue University: ***Human-Plant Interaction***
http://www.hort.purdue.edu/newcrop/history/lecture2/lec2l.html

Seasonal Affective Disorder (SAD)
http://www.psycom.net/depression.central.seasonal.html

Hypothermia Prevention, ***Recognition and Treatment***
http://www.hypothermia.org/

Hypothermia
http://www.sarbc.org/hypo.html

Adventure Sports Online: ***Hypothermia***
http://www.adventuresports.com/asap/ski/skihypo.htm

Hypothermia: ***Not Just A Winter Problem***
http://www.lexicomm.com/views/features/hypo.html

Cloud Seeding: FAQs
http://www.xmission.com/~nawc/wmfaq.html

Rain Dance
http://www.ausbcomp.com/redman/rain.htm

NOAA in Space
http://www.photolib.noaa.gov/space/index.html

EPA: 2001 Ozone-Mapping Project Archives
http://www.epa.gov/airnow/ozone.html

NASA: ***Total Ozone Mapping Spectrometer (TOMS)***
http://toms.gsfc.nasa.gov

NASA: ***Ozone and the Atmosphere***
http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/ATM_CHEM/ozone_atmosphere.html

Heat Island Group
http://eetd.lbl.gov/HeatIsland/

Urban Heat Island
http://cimss.ssec.wisc.edu/wxwise/heatisl.html

Cool Communities for a Healthier Planet
http://eande.lbl.gov/HeatIsland/LEARN/CoolCommunity

EPA: The Heat Island Reduction Initiative
http://www.epa.gov/globalwarming/actions/local/heatisland/