

Falmouth Kids Global Climate Change Institute Climate Topics, Frameworks, and Activities
Pat Harcourt, WBNERR July, 2007

Climate Topic	Framework	Suggested Lessons (Just a few ideas; see also lesson plans included on resource CD)
Climate definition	<p>Earth and Space Science Grades 3–5</p> <ul style="list-style-type: none"> • Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time. • Differentiate between weather and climate. 	Discuss with class definition of weather and climate; climate is average conditions over 30 or more years.
Climate factors	<p>Earth and Space Science Grades 3–5</p> <ul style="list-style-type: none"> • Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time. • Give examples of how the cycling of water, both in and out of the atmosphere, has an effect on climate. <p>The Earth in the Solar System Grades 3-5</p> <ul style="list-style-type: none"> • Explain how the tilt of the earth and its revolution around the sun result in an uneven heating of the earth, which in turn causes the seasons. (Seasonal amounts and angles of sunlight determine whether ice sheets and glaciers grow or melt) <p>States of Matter Grades 3-5</p> <ul style="list-style-type: none"> • Compare and contrast solids, liquids, and gases based on the basic properties of each of these states of matter. • Describe how water can be changed from one state to another by adding or taking away heat. 	<ol style="list-style-type: none"> 1. Have students draw a diagram of the climate system on earth, showing factors that influence climate such as sun, oceans, mountains, and atmospheric gases. 2. Have students test the effect of different angles of light on temperature. 3. Show an animation or have students physically act out annual cycle of earth's orbit, with attention to the tilt of the axis.
Water cycle and heat exchange between land, atmosphere, and oceans	<p>Earth and Space Science Grades 3–5</p> <ul style="list-style-type: none"> • Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere. 	<ol style="list-style-type: none"> 1. Model the water cycle using hot water in a container with a container of ice on top. 2. Have students make a diagram of the water cycle
Global circulation of atmosphere and oceans	<p>Earth and Space Science Grades 3–5</p> <p>Describe 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.</p>	Show diagram or video clip of prevailing winds and ocean circulation and have students explain what causes the patterns.

Falmouth Kids Global Climate Change Institute Climate Topics, Frameworks, and Activities
Pat Harcourt, WBNERR July, 2007

Climate Topic	Framework	Suggested Lessons (Just a few ideas; see also lesson plans included on resource CD)
Energy transformations and heat transfer in the climate system	<p>Heat Transfer in the Earth System Grades 6-8</p> <ul style="list-style-type: none"> • Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere. <p>Heat Energy Grades 6-8</p> <ul style="list-style-type: none"> • Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system. • Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium. 	<ol style="list-style-type: none"> 1. Show diagrams of different types of heat transfer (radiation, convection, conduction) 2. Have students suggest examples for each type of heat transfer, including examples from earth systems.
Structure of atmosphere (gases)	<p>States of Matter Grades 3-5</p> <ul style="list-style-type: none"> • Compare and contrast solids, liquids, and gases based on the basic properties of each of these states of matter. 	Collect CO ₂ from carbonated soda (or a reaction with baking soda & vinegar) and pour the CO ₂ to put out a candle flame. CO ₂ is heavier than the surrounding air.
Greenhouse gases	<p>Elements, Compounds, and Mixtures Grades 6-8</p> <ul style="list-style-type: none"> • Recognize that there are more than 100 elements that combine in a multitude of ways. • Differentiate between an atom and a molecule. 	CO ₂ tag; greenhouse experiments: make temp as different as possible by changing one variable
Greenhouse effect	<p>Heat Energy Grades 6-8</p> <ul style="list-style-type: none"> • Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system. 	Have students model the greenhouse effect (and other heat trapping conditions) using clear boxes or bottles by changing one factor to make one container warmer than the other.
Carbon cycle	<p>Energy and Living Things Grades 6-8</p> <ul style="list-style-type: none"> • Recognize that producers (plants that contain chlorophyll) use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. 	On-line game: Carbo the carbon atom; carbon cycle game with dice

Falmouth Kids Global Climate Change Institute Climate Topics, Frameworks, and Activities
Pat Harcourt, WBNERR July, 2007

Climate Topic	Framework	Suggested Lessons (Just a few ideas; see also lesson plans included on resource CD)
Past climates	<p>Earth's History Grades 6-8</p> <ul style="list-style-type: none"> Explain and give examples of how physical evidence, such as fossils and surface features of glaciation, supports theories that the earth has evolved over geologic time. 	<ol style="list-style-type: none"> Timeline activity; Timeline on your arm. Relate to natural records: teeth, fingernails, shells, tree rings, scales, pollen Introduce graphs of temp and CO₂, recent & long term graphs
Ozone and ozone reduction success story	<p>Changes in Ecosystems Over Time Grades 6-8</p> <ul style="list-style-type: none"> Identify ways in which ecosystems have changed throughout time in response to physical conditions, interactions among organisms, and the actions of humans. 	Use ozone information handout and diagrams to illustrate ozone problem and solution
Local and global impacts of climate change	<p>Plant Structures and Functions Grades 3-5</p> <ul style="list-style-type: none"> Differentiate between observed characteristics of plants and animals that are fully inherited and characteristics that are affected by the climate or environment. <p>Adaptations of Living Things Grades 3-5</p> <ul style="list-style-type: none"> Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). <p>Changes in Ecosystems Over Time Grades 6-8</p> <ul style="list-style-type: none"> Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions, interactions among organisms, and the actions of humans. <p>Evolution and Biodiversity Grades 6-8 Relate the extinction of species to a mismatch of adaptation and the environment.</p>	Observations and case studies of local plants and animals; sea level rise records (flooding of coastal habitats); change in distribution and seasonal abundance of species.
Arctic impacts of climate change	<p>Adaptations of Living Things Grades 3-5</p> <ul style="list-style-type: none"> Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). 	<ol style="list-style-type: none"> Compare reflectivity of white paper (ice) with reflectivity of black paper (water or land) Have students look up polar bear requirements for survival

Falmouth Kids Global Climate Change Institute Climate Topics, Frameworks, and Activities
Pat Harcourt, WBNERR July, 2007

Climate Topic	Framework	Suggested Lessons (Just a few ideas; see also lesson plans included on resource CD)
Increased storms & severe weather	Matter and Energy in the Earth System Grades 6–8 Explain how the transfer of energy through radiation, conduction, and convection contributes to global atmospheric processes, e.g., storms, winds	Use weather web sites and graphs to investigate relationship between warm air and ocean temperatures and severe weather
Using technology to study environment	Materials, Tools, and Machines Grades 6-8 Appropriate materials, tools, and machines enable us to solve problems, invent, and construct.	Use Hobo data loggers to study school environments and variation
Energy use and emissions	Forms of Energy Grades 3-5 <ul style="list-style-type: none"> • Identify the basic forms of energy (light, sound, heat, electrical, and magnetic). • Give examples of how energy can be transferred from one form to another. 	<ol style="list-style-type: none"> 1. Have students track energy use at home or in the classroom. 2. Have students keep an energy use journal for a day or a week, then make changes to conserve and record energy use again.
Solutions: renewable energy	Matter and Energy in the Earth System Grades 6–8 <ul style="list-style-type: none"> • Explain how the transfer of energy through radiation, conduction, and convection contributes to global atmospheric processes, e.g., winds. • Identify the earth’s principal sources of internal and external energy, e.g., radioactive decay, gravity, solar energy. 	<ol style="list-style-type: none"> 1. Have students measure wind speed and sunlight in various parts of school grounds, and use maps to study best location for wind turbines 2. Students can design and test solar houses and solar cookers 3. have students investigate types of energy and how they are obtained