Curriculum Development
In the Fairfield Public Schools

FAIRFIELD PUBLIC SCHOOLS

FAIRFIELD, CONNECTICUT

GRADE 6 SCIENCE

Board of Education Approved 6/27/2006

Grade 6 Curriculum Committee

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FAIRFIELD PUBLIC SCHOOLS
K-12 SCIENCE VISION STATEMENT

The Fairfield Public Schools believe that science education should promote essential understandings of the natural world and should nurture students' abilities to apply scientific knowledge to make informed and logical judgments about personal and societal issues. As such, this education requires that the fundamental approach to science be a creative and logical process for investigating, reasoning, critiquing and communicating about ideas, not just a static body of facts to be memorized. Understanding the interconnections between science and technology and their shared impact on the environment and societal issues is essential for all students.

We should foster the development and assessment of scientific literacy in all students and motivate students to pursue careers in science, technology and engineering. In the view of Fairfield's science educators, science literacy is a combination of understanding major science concepts and theories, using scientific reasoning, and recognizing the complex interactions among science, technology and society. All students must demonstrate scientific literacy as outlined by the Connecticut State Science standards.

Upon graduation a scientifically literate person is one who

- understands and applies basic concepts, principles and theories of biology, chemistry, physics, earth and space science and their interrelationships
- recognizes and participates in evidence-based scientific endeavors and uses inquiry skills that lead to a greater understanding of the world
- differentiates between scientific explanations of the natural world and popular ideas that are not supported by scientific data
- identifies and solves problems through scientific exploration, including the formation of hypotheses, design of experiments, use of technology, analysis of data and drawing of conclusions
- selects and uses appropriate laboratory technology, equipment and materials, including measuring and sensing devices
- understands and uses existing and emerging technologies that have an effect on society and the quality of life, including personal, academic and work environments
- analyzes the possibilities and limits of science and technology in order to make and defend decisions about societal issues
- understands how scientific knowledge is formulated in order to assess the validity of that knowledge
- determines the reliability of information sources in all formats, based on evaluative criteria
- documents information sources using appropriate scientific format

(adapted from the CSDE Position Statement on Science Education June 2004)

The Fairfield Public Schools plays an essential role in ensuring a quality educational program in science by:

- providing all students with developmentally appropriate, coordinated, meaningful and engaging scientific experiences to support their development of scientific literacy
- providing all teachers and all students with necessary science instructional resources including time, lab space, equipment and materials, technology, textbooks and easy access to electronic resources
- setting a context for scientific learning that is relevant to students
- engaging students in extended, developmentally appropriate scientific investigations that increase effort and interest in scientific learning
- communicating the goals and importance of studying sciences to students and parents
- encouraging students to pursue the study of advanced science and science-related careers

GRADE 6 SCIENCE

Statement of Purpose: Grade 6 Science is the study of Environmental Earth Science. It is concerned with the relationship between earth's systems and all living things. An understanding of these concepts is essential for individuals to make informed choices with regard to the environment and advancing scientific technology.

Audience: Grade 6 Science is a full year course designed for all 6th grade students.

Prerequisites: None

Design and Description: This course meets five periods per week. The main topics are weather, the formation and destruction of landforms, ecosystems, and water quality.

Course Objectives: *
Students will be able to:

1. Describe the effect of heating on the movement of molecules in solids, liquids and gases.
2. Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.
3. Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.
4. Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.
5. Explain how glaciation, weathering and erosion create and shape valleys and floodplains.
6. Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.
7. Describe how abiotic factors such as temperature, water and sunlight affect plants' ability to create their own food through photosynthesis.
8. Explain how populations are affected by predator-prey relationships.
9. Describe common food webs in different Connecticut ecosystems.

* Core Science Curriculum Framework
Approved CT State Department of Education 2005

THE STATE OF CONNECTICUT CONTENT AND PERFORMANCE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.

Grades 6-8 Core Scientific Inquiry, Literacy and Numeracy * *How is scientific knowledge created and communicated?*	
Content Standards	**Expected Performances**
SCIENTIFIC INQUIRY ♦ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. ♦ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation. ♦ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists. **SCIENTIFIC LITERACY** ♦ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. ♦ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media. **SCIENTIFIC NUMERACY** ♦ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.	**C INQ.1** Identify questions that can be answered through scientific investigation. **C INQ.2** Read, interpret and examine the credibility of scientific claims in different sources of information. **C INQ.3** Design and conduct appropriate types of scientific investigations to answer different questions. **C INQ.4** Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment. **C INQ.5** Use appropriate tools and techniques to make observations and gather data. **C INQ.6** Use mathematical operations to analyze and interpret data. **C INQ.7** Identify and present relationships between variables in appropriate graphs. **C INQ.8** Draw conclusions and identify sources of error. **C INQ.9** Provide explanations to investigated problems or questions. **C INQ.10** Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

* Core Science Curriculum Framework, Approved CT State Department of Education

<u>Overall Essential Question</u> – How Do The Dynamics of the Earth's System Affect Living Things? *

<u>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems</u> **6.1 Variation in the amount of the sun's energy hitting the Earth's surface affects daily and seasonal weather patterns.** • Local and regional weather are affected by the amount of solar energy the area receives and proximity to a large body of water.	1. Describe the effect of heating on the movement of molecules in solids, liquids and gas es. 2. Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water. 3. Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.

Energy In the Earth's Systems – How do external and internal sources of energy affect the Earth's systems? **6.2 Landforms are the result of the interaction of constructive and destructive forces over time.** • Volcanic activity and the folding and faulting of rock layers during the shifting of Earth's crust affect the formation of mountains, ridges and valleys. • Glaciation, weathering and erosion change the Earth's surface by moving earth materials from place to place.	4. Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust. 5. Explain how glaciation, weathering and erosion create and shape valleys and floodplains. 6. Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.
Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems? **6.3 An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.** • Populations in ecosystems are affected by biotic factors such as other populations and abiotic factors such as soil and water supply. • Populations in ecosystems can be categorized as producers, consumers and decomposers of organic matter.	7. Describe how abiotic factors such as temperature, water and sunlight affect plants' ability to create their own food through photosynthesis. 8. Explain how populations are affected by predator-prey relationships. 9. Describe common food webs in different Connecticut ecosystems.
Science and Technology in Society-- How do science and Technology affect the quality of our lives? **6.4 Water moving across and through earth materials carries with it the products of human activities.** • Most precipitation that falls on Connecticut eventually reaches Long Island Sound.	10. Explain the role of septic and sewage systems on quality of surface and ground water sources. 11. Explain how human activity may impact water resources in Connecticut such as local ponds, rivers and the Long Island Sound ecosystem.

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Information and Technology Standards—used in all units of study*

Technology Use
Students will operate and use computers and other technologies as tools for productivity, problem-solving and learning across the content areas.

Students will operate school hardware and demonstrate the ability to use the school network to access and utilize school software.

Students will use content-specific technology tools.

Students will demonstrate the ability to independently use personal productivity software and multimedia to create products in a wide range of formats.

Students will demonstrate the use of technological resources to help plan, coordinate and complete group projects.

Responsible Use
Students will demonstrate the responsible, legal and ethical use of information resources, computers and other technologies.

Students will demonstrate responsible and ethical use and care of print, non-print and digital information resources, computers, other technologies and networks.

Students will apply established citation standards for giving credit for information or ideas used.

Students will adhere to the district's acceptable use and copyright policies.

Definition and Identification of Information Needs
Students will define their information needs and identify effective courses of action to conduct research and solve problems.

Students will identify, locate and use an array of print, non-print and digital resources available through the library media center independently, and with assistance, access resources outside the school.

Students will determine an appropriate course of action for addressing the essential question.

Information Strategies

Students will understand and demonstrate information skills and strategies to locate and effectively use print, non-print and/or digital resources to solve problems and conduct research.

Students will use additional features of online catalog records and demonstrate the ability to locate information from all areas of the library media center, such as fiction, nonfiction and reference.

Students will use additional organizing features of print, non-print and digital materials (e.g., menus, bibliographies and hyperlinks) to locate and use information.

Students will select and use appropriate resources and/or equipment to accomplish a given task.

Students will demonstrate ability to take notes, print out or record selected information from a wide range of sources of information.

Students will demonstrate the ability to identify and use a variety of features to locate information using an Internet search engine or directory.

Students will identify key words for searching information sources, with minimal assistance.

* Information and Technology Literacy Framework
Approved CT State Department of Education 2006

DEVELOPMENTAL ORGANIZATION OF CORE SCIENCE CURRICULUM FRAMEWORK*

PreK-2: Development of *wonder* about the natural world and the ability to observe, describe and apply basic process skills

Grades 3-5: Development of *descriptions* of basic natural phenomena and the ability to perform simple experiments and record accurate data

Grades 6-8: Development of basic *explanations* for natural phenomena, and the ability to ask good questions and apply experimental procedures to collect and analyze data

* Core Science Curriculum Framework
Approved CT State Department of Education 2005

Essential Questions:*

Overall Essential Question – How Do The Dynamics of the Earth's System Affect Living Things?

Scientific Inquiry Unit of Study: How is scientific knowledge created and communicated?

Weather Unit of Study: Energy in the Earth's Systems—How do external sources of energy affect the Earth's systems?

Geology Unit of Study: Energy in the Earth's Systems – How do internal and external sources of energy affect the Earth's systems?

Ecology Unit of Study:
Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems? How do science and technology affect the quality of our local environment?

* Core Science Curriculum Framework
Approved CT State Department of Education 2005

Units of Study

INTRODUCTION TO SCIENTIFIC INQUIRY

Essential Questions:

How is scientific knowledge created and communicated?
How do scientists use scientific inquiry in search of knowledge?

Content Standards:

SCIENTIFIC INQUIRY

- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.
- Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.
- Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.

SCIENTIFIC LITERACY

- Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science.
- Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.

SCIENTIFIC NUMERACY

- Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.

Performance Standards:

(The following standards will be introduced in the Inquiry Unit and then applied and extended in units subsequent.)

- Identify questions that can be answered through scientific investigation.
- Conduct appropriate types of scientific investigations to answer different questions.
- Use independent and dependent variables, and constants in science experiments.
- Use appropriate tools and techniques to make observations and gather data.

- Use mathematical operations to analyze and interpret data.
- Identify and present relationships between variables in appropriate graphs.
- Draw conclusions and identify sources of error.
- Provide explanations to investigated problems or questions.
- Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

Information and Technology Standards
Students will use content-specific technology tools.

Focus Questions:
How does a scientist think?
How does a scientist test his thinking?

Unit Objectives:
The students will:
- identify types of scientific thinking
- identify essential components of the scientific investigation
- participate in a modeled inquiry-based scientific investigation
- participate in a directed inquiry-based scientific investigation.

Content Topics:
Identify the questions that can be answered through scientific investigation.
Identify scientific thinking: observing, inferring, predicting, and communicating.
Identify essential components of the scientific investigation:
- Statement of problem/hypothesis.
- Dependent and independent variables and constants.
- A description of the experiment (procedures).
- The results of the experiment (data, tables, charts, graphs).
- Conclusions (supported by data, sources of error).

Conduct a scientific investigation.

Sample Assessment:
An Inquiry-based Lab: Choosing a Paper Towel Brand

Pacing:
4-5 weeks

WEATHER UNIT

Essential Question: How do external sources of energy affect the Earth's systems?

Content Standards:

Variation in the amount of the sun's energy hitting the Earth's surface affects daily and seasonal weather patterns.

- Local and regional weather are affected by the amount of solar energy the area receives and proximity to a large body of water.

Performance Standards:

1. Describe the effect of heating on the movement of molecules in solids, liquids and gases.

2. Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.

3. Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.

Information and Technology Standards
Students will use content-specific technology tools.

Focus Questions:
How does heating and cooling affect the water molecule in it various states?
What factors contribute to regional weather patterns?

Unit Objectives:
The students will:

- describe the effect of heating on the movement of molecules in solids, liquids, and gases.
- define and demonstrate an understanding of the term heat energy.
- explain how heat can affect the volume of solids, liquids, and gases (thermal expansion).
- create a table comparing convection, conduction, and radiation.
- describe and illustrate solar heating by radiation, conduction and convection through the atmosphere (gas), oceans (liquid) and the soil (solid).
- explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.

- read, record and graph measurements of temperature using Fahrenheit and Celsius thermometers.
- explain how air pressure varies with altitude.
- relate a change in air pressure to a change in weather.
- compare humidity and relative humidity.
- give examples of factors that affect temperature, air pressure and humidity.
- explain how the uneven heating of the Earth's surface causes winds and affects the seasons.
- show that the Earth is heated unevenly during the course of a year.
- describe the gas composition of the atmosphere and its protective effects on Earth.
- describe what happens to solar energy that reaches the Earth.
- explain the difference between the greenhouse effect and global warming.
- describe how local geographic features can produce winds.
- explain how changes in the temperature of the atmosphere and the oceans affect the climate.
- compare rainfall and temperature on about the same latitude in a single continent.
- compare real weather rainfall and temperatures in local and regional areas.
- describe the weather as a condition in the atmosphere and discuss the major components that determine weather (light, water, air flow, and land topography).
- name the five layers that make up the earth's atmosphere and identify troposphere as the layer in which weather occurs.
- accurately use a thermometer, wet dry bulb (humidity), barometer, wind, and cloud formations to predict the weather accurately.
- describe the water cycle using the following terms: evaporation, condensation, transpiration, and precipitation.
- identify a variety of states of weather (rain/sleet/snow).
- describe the chemical and physical properties of water and how they influence the weather.
- identify different violent storms and their impact on society.

Content Topics:

How do the characteristics of the atmosphere affect weather?

- Air pressure (low/high)
- Air temperature
- Layers
- Solar energy (radiation, convention, conduction)

How does wind and current affect climate and regional weather patterns?

- Global wind patterns (jet stream, etc.)
- Difference between weather and climate
- Climate regions

What is the hydrological cycle?

- Cloud formation

What are the causes of severe weather?

- Hurricane
- Tornado
- Blizzard
- Heat wave
- Thunderstorm
- Drought

How do humans track weather?

- Weather maps
- Weather tools/instruments/symbols
- US diverse weather pattern
- Predicting/forecasting

How does the human factor affect weather and climate?

- Global warming (greenhouse effect)
- Ozone layer
- Air Pollution (acid rain)
- Deforestation
- Conservation

What is specific heat and how does it affect weather patterns?

What causes the seasons?

- Uneven heating of Earth's surface by the sun
- Earth rotation/tilt

Sample Assessment:

Analysis of Doppler Weather Map: Future Regional Weather Predictions

Pacing:

8-9 weeks

GEOLOGY UNIT

Essential Question(s):
How do internal and external sources of energy affect the Earth's systems?

Content Standards:
Landforms are the result of the interaction of constructive and destructive forces over time.

- Volcanic activity and the folding and faulting of rock layers during the shifting of Earth's crust affect the formation of mountains, ridges and valleys.

- Glaciation, weathering and erosion change the Earth's surface by moving earth materials from place to place.

Performance Standards:

1. Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.

2. Explain how glaciation, weathering and erosion create and shape valleys and floodplains.

3. Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.

Information and Technology Standards
Students will use content-specific technology tools.

Focus Questions:
How does the heat flow and material move within the Earth to create mountains, ridges, valleys and ocean basins?
How does movement of earth, glaciation, weathering and erosion change the Earth's surface over a long period of time?

Unit Objectives:
The student will:
- identify Earth's layers.
- describe the different properties of each layer.
- define the theory of tectonics.
- explain how plates move.

- describe continental drift.
- describe convention currents and how they affect plate tectonics.
- identify and describe parts of the ocean floor--shelf, slope, etc.
- explain the process of seafloor spreading.
- locate the identify the Ring of Fire.
- locate volcanoes and where most of them form.
- list types of volcanoes.
- describe types of eruptions.
- identify landforms resulting from volcanoes.
- describe landforms and how lava creates them.
- describe how magna that hardens creates landforms.
- compare the physical and chemical properties of magna.
- describe the types of rocks and gases released as a result of eruption.
- explain how volcanic eruptions affect earth's land, air, and water.
- describe how folding of rocks can form mountains.
- identify and describe how movement along faults can form mountains.
- describe and define types of mountains, ridges, and valleys.
- identify mountain belts/ranges within your geographical region (northeast).
- explain why earthquakes occur.
- identify where most earthquakes occur.
- describe how rocks move during earthquakes.
- model how movement occurs along the three main types of faults.
- describe how glaciers form and move.
- identify two kinds of glaciers.
- describe how the valley glaciers form and move.
- describe how glaciers shape the land.
- describe how glaciers cause erosion and deposition.
- identify the glacier that formed the US.
- describe how glaciation creates valleys and floodplains.
- explain how weathering and erosion affect the Earth's surface.
- describe what determines how fast weathering occurs.
- compare the causes of mechanical and chemical weathering.
- describe how weathering creates valleys and floodplains.
- explain what processes wear down and build up the Earth's surface.
- compare the different types of mass movement.
- identify and describe the mass movement--landslides, mudflow, slump, etc.
- explain how erosion creates valleys and floodplains.

Content Topics:

Earth's Core: What are the characteristics of the Earth's Core?

Layers

- Inner/out core
- Mantle
- Crust

Properties of layers

Plate Tectonics: How does the movement of Plate Tectonics affect Earth's land formations?

- Plate boundaries
- Continental drive
- Sea floor spreading
- Plate movement
- Pangaea
- Theory of plate tectonics
- Continental drift
- Convection
- Divergent, convergent, transform boundary
- Ocean basin

Volcanoes: How do volcanoes affect Earth's land formation?

- Types
- Eruptions
- Location
- Magma

Mountain, Valleys, & Ridges: How do the formations of mountains, ridges, and valleys affect Earth's systems?

- Folded mountains
- Fault-block mountain
- Ranges and belts
- Rocks and sediment

Earthquakes: What causes earthquakes?

- Faults
- Waves and energy
- Magnitude
- Measurement -- Richter and Mercalli
- Damage--aftershock and liquefaction
- Tsunami

Glaciers/Weathering/Erosion: How does glaciation, weathering, erosion affect the Earth's landforms?

- Types--continental and valley
- Erosion and deposition
- Mechanical and chemical weathering
- Rate of weathering
- Mass movement
- Erosion/deposition/sediment

Sample Assessments:

Mapping Earthquakes and Volcanoes
Convection Discovery Activity

Pacing:

8-12 weeks

ECOLOGY UNIT

Essential Question(s):
How do different factors, including humans, affect a river basin system?

Content Standards:
An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.

- Populations in ecosystems are affected by biotic factors such as other populations and abiotic factors such as soil and water supply.
- Populations in ecosystems can be categorized as producers, consumers and decomposers

Water moving across and through earth materials carries with it the products of human activities.

- Most precipitation that falls on Connecticut eventually reaches Long Island Sound.

Performance Standards:

1. Describe how abiotic factors such as temperature, water and sunlight affect plants' ability to create their own food through photosynthesis.

2. Explain how populations are affected by predator-prey relationships.

3. Describe common food webs in different Connecticut ecosystems

4. Explain the role of septic and sewage systems on quality of surface and ground water sources.

5. Explain how human activity may impact water resources in Connecticut such as local ponds, rivers and the Long Island Sound ecosystem.

Information and Technology Standards
Students will use content-specific technology tools.

Focus Questions:
How do the biotic and abiotic factors of the estuary interact?
How do humans and the estuary interact?

Unit Objectives:

The students will:

- define and describe an estuary, its location, and label its component parts on a map.
- design a river basin system.
- describe factors of salinity, nutrient flow, and topography and how they determine the variety of habitats in an estuary.
- define photosynthesis.
- describe how abiotic factors affect photosynthesis.
- define producers, consumers, decomposers, predators, and prey.
- examine shared data to determine trends and patterns for the three Fairfield estuaries--salinity, air temp, water temp, fish population count, weather conditions, tide levels, and general observation.
- examine a predator/prey relationship and determine the effects on their populations
- given a food web, classify organisms in the web as producers, consumers, decomposers, predators, and prey.
- given a food web, analyze the impact caused by a change to any part of the web.
- distinguish between temporary and permanent residents of the estuary.
- examine how coastal organisms use the estuary to support their life cycles.
- define point and nonpoint sources of pollution and classify examples representing each.
- given a scenario, predict and evaluate possible effects upon a river system and coastal environments.
- visit an estuary to explore, observe, record and analyze interactions within the system.

Content Topics:

What is an estuary?

Where do estuaries occur?

What is a river basin system?

What are the parts of an estuary and how do they determine habitats?

How do certain variables determine the variety of habitats in the estuary?

- Topography
- Salinity
- Nutrient Flow

How do producers, consumers, and decomposers contribute to estuarine productivity?

- Photosynthesis
- Predator-Prey Relationships
- Food Web

How does estuarine productivity support coastal life?

- Reproduction
- Shelter
- Food

How does human activity impact river systems and coastal environments?

- Point and Nonpoint Source Pollution--sewage systems, run-off, agriculture, & industry
- Development—dams, buildings, roads, etc.
- Usage
    a. Harvesting including aquaculture
    b. Transportation
    c. Recreation

Sample Assessment:

River System Scenario: Given a scenario students will be asked to predict and evaluate possible effects upon a river system and coastal environments.

CT State Embedded Performance Task

"DIG IN" Experiments 1 & 2

Pacing:

9 weeks (April, May, June)