

DARIEN PUBLIC SCHOOLS

CURRICULUM GUIDE

6th Grade Life Science

DARIEN PUBLIC SCHOOLS

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SECTION I - Course Information

STATEMENT OF PHILOSOPHY

MMS Science Department Philosophy:

Our middle school science program is based on a framework of scientific inquiry, exploration, and application of learned content. Using state standards as a guide, students across all grades will be expected to conduct hands-on experiments, collect and analyze data, and use correct scientific language in formulating conclusions. Learning will be enhanced by readings, current events, writing, class discussions, proper note-taking, use of technology, and special projects.

PROGRAM GOALS

In alignment with the **Core Science Curriculum Framework**, students will “develop basic *explanations* for natural phenomena, and the ability to ask good questions and apply experimental procedures to collect and analyze data.” In addition, with the consideration of all learning needs, our students will continue to develop as scientifically literate individuals.

Scientific literacy “requires that a person have an essential understanding of key science ideas, along with a fluency in the language and terms used to describe them. Scientific literacy requires the ability to apply critical thinking skills when dealing with science-related issues. A scientifically literate person is able to transfer knowledge of the academic theories and principles of science to practical applications in the real world” (State of Connecticut Science Curriculum Framework).

OVERVIEW

This program is designed to meet all the needs of the students enrolled at MMS. The aim is to promote and integrate scientific inquiry, literacy, and numeracy throughout the middle school experience.

6th Grade:

- Introduction to Scientific Method
- Structure and Function of Organisms
- Heredity and Evolution
- Science & Technology: Technology used to Improve Food Production and Preservation
- Properties of Matter

7th Grade:

- The Changing Earth: Earthquakes, Volcanoes, Glaciation, Weathering, and Erosion
- Abiotic Factors Influencing Long Island Sound: Temperature, Wind and Water
- Biotic Factors Influencing Long Island Sound: Food Webs and Photosynthesis
- Science & Technology: Human Impact on Long Island Sound

8th Grade:

- Motion, Forces and Energy
- Earth in the Solar System
- Electricity and Magnetism
- Science Exhibition Project
- Science & Technology: Space Exploration and Bridge Technology

ESSENTIAL QUESTIONS

- How do science and technology affect the quality of our lives?
- How is the scientific method used to answer questions about the world around us?
- How is the human body structured to ensure efficiency and survival?
- What are the processes responsible for life's unity and diversity?
- How does the structure of matter affect the properties and uses of materials?

PROCESS SKILLS

All of the following skills will help continue to develop a scientifically literate individual:

- Reading (Comprehending)
- Reading (Analyzing)
- Writing and Language Mechanics
- Speaking
- Listening
- Viewing
- Using Maps and Globes
- Studying
- Reasoning and Reflecting
- Using Learning Resources and Technology
- Working Independently and Collaboratively
- Inventing
- Designing
- Creating
- Debating
- Performing
- Quantifying
- Understanding Number Operations
- Using Formulas
- Problem Solving
- Graphing
- Data Analysis
- Applying Probability and Statistics
- Applying Scientific Method

STUDENT PERFORMANCE SUMMARY

- ◆ Narrative, Expository or Persuasive Essay/Short Answer, Letter or Article
- ◆ Research Report
- ◆ Lab Report
- ◆ Demonstration
- ◆ Oral Presentation with Visuals (story board, overhead transparencies, PowerPoint, whiteboard, LCD projector, Internet site, etc.)
- ◆ Notebook
- ◆ Model with Written Explanation
- ◆ Debate
- ◆ Exhibition
- ◆ Cooperative Learning
- ◆ Computer-Based Lab Work
- ◆ Foldable (graphic organizers)

GRADING GUIDELINES

Grades are determined based on the number of points earned divided by the possible points. The number of test, quizzes or projects varies each quarter. Each grade has a numerical value, which is averaged at the end of the quarter. Listed below are typical point values for each type of assessment:

Type of Assessment	Point Value	Assessment Definition
Written Work	5-20 points	Class activities & homework
Notebook	5-30 points	Organizing and maintaining all written work
Labs	25–75 points	Based on Lab Report Format
Tests	100 points	Various Formats
Quizzes	10-50 points	Various Formats
Projects	10-200 points	Various Formats with a rubric provided
Final Assessment	100-200 points	Performance tasks, written responses and selected responses

Class Participation: There is not a separate participation grade. Participation is reflected in the successful completion of tasks, labs and activities during class time. Students that do not finish labs or activities in class should promptly ask for an appointment outside of class time. The lab set-up will be disassembled within a few days. It is essential that students complete the labs, as these skills cannot be acquired through homework. The lab and activity grades can include participation, proper use of the facilities, equipment and clean up.

Extra Credit: Extra Credit is not available.

SECTION II – Units of Study

SUMMARY OF UNITS

<u>Unit Title</u>	<u>Duration (Weeks)</u>
Unit 1: Introduction to Scientific Method	Ongoing through all units
Unit 2: Structure and Function	10 weeks
Unit 3: Heredity and Evolution	14 weeks
Unit 4: Science and Technology in Society	3 weeks (incorporated throughout)
Unit 5: Properties of Matter	10 weeks

UNIT 1 Scientific Method

How is the scientific method used to answer questions about the world around us?

- How do scientists generate questions about the world around us in order to drive investigations?
- How do scientists gather evidence to answer questions?
- How do scientists design a controlled experiment?
- How do scientists record information or experimental data?
- How do scientists report their findings to larger communities?

RELATED DARIEN AND CONNECTICUT STANDARDS

CT State Science Standards addressed:

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 analysis, 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.

Connecticut State Science Expected Performances addressed:

- 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.

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding

Students will **name** the steps in the scientific method according to the Middlesex Middle School lab format sheet.

Developing and Interpretations

Students will **collect** data and present it in a variety of graphs and charts.

Making Connections

Students will **arrange** data to form conclusions and reported to peers.

Taking a Critical Stance

Students will use forensic strategies to **solve real life problems** presented in the FRAUD! module.

VOCABULARY

Application to real world
Bar Graph
Conclusion
Data
Data Table
Dependent variable
Discussion
Experiment
Experimental Plan
Further Investigation
Graph
Hypothesis

Independent variable
Introduction
Line Graph
Materials
Measurement
Observation
Problem
Procedure
Qualitative
Quantitative
Science
Scientific Method

ACTIVITIES

Teachers will choose from the collection of activities below

Rainforest Researchers

Hurricane Tracking

Ongoing Labs throughout the year

** Activities will be updated and revised as needed*

ASSESSMENT

Homework

Quizzes

Tests

Labs

Class activities

Class discussions

Special projects

Group projects

Performance assessments

CAREER AWARENESS

Archeologist

Biologist

Botanist

Chemist

Ecologist

Environmentalist

Forensic Scientist

Genetic Engineer

Geneticist

Meteorologist

Microbiologist

Paleontologist

Physicist

CORE TEXT FOR STUDENTS

Middlesex Middle School Lab Format Sheet
Interactive Computer Simulation Program:

Rainforest Researchers. Watertown, MA: Tom Snyder Productions, 1996.

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

Rainforest Researchers Booklet

The use of foldables as study and teaching tools:

Zykes, Dina. Big Book of Science: For Middle School and High School. San Antonio, TX: Dina-Might Adventure, LP, 2001.

Websites:

<http://www.nhc.noaa.gov>

<http://www.nasa.gov>

<http://observe.arc.nasa.gov/nasa/earth/hurricane/intro.html>

MATERIALS AND SUPPLIES

Related labs throughout the curriculum

Atlantic Hurricane Tracking Sheet

Scissors

Glue

Construction paper

Markers

INTEGRATED TECHNOLOGY

Use of Internet for research and demonstration

Word processing programs

Graphing

Labs

Handhelds with probes

Simulated demonstrations

UNIT 2 Structure and Function

How is the human body structured to ensure efficiency and survival?

- How does the skeleton provide a framework that supports and protects the body?
- Why do skeletal muscles work in pairs?
- How do the three types of muscles in the body function in survival?
- What general functions are carried out by the digestive system?
- What are the functions of the respiratory system?
- What is the function of the cardiovascular system?
- How do the respiratory and cardiovascular systems rely on each other to function?

RELATED DARIEN AND CONNECTICUT STANDARDS

Connecticut State Science Content Standards addressed:

7.2 Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.

- ◆ All organisms are made up of one or more cells; each functions more or less independently.
- ◆ Multicellular organisms need specialized structures and systems to perform basic life functions.

Connecticut State Science Expected Performances addressed:

- C. 16** Describe the structures of the human digestive, respiratory, and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials.
- C. 17** Explain how the human muscular and skeletal systems support the body and allow movement.

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding

Students will **recognize** the parts of each of the following systems: muscular, skeletal, digestive, circulatory and respiratory.

Developing an Interpretation

Students will **identify** the structures in each of the following systems: muscular, skeletal, digestive, circulatory and respiratory.

Students will **describe** the functions of the following systems: muscular, skeletal, digestive, circulatory and respiratory.

Making Connections

Students will **develop** a connection between muscular and skeletal systems, circulatory and respiratory, circulatory and digestive systems.

Taking a Critical Stance

Students will **support** their opinion on which organ of the digestion system is most valuable.

Students will form **conclusions** using scientific method based upon selected labs.

VOCABULARY

Absorption	Force	Periosteum
Alveoli	Gallbladder	Peristalsis
Aorta	Heart	Phalanges
Artery	Hemoglobin	Pharynx
Asthma	Hemoglobin	Plasma
Atrium	Humerus	Pressure
Bile	Joint- ball-and-socket, pivot,	Radius
Blood cells-red and white	hinge, gliding	Rectum
Blood pressure	Large intestine	Respiration
Blood vessels	Larynx	Ribs
Bronchi	Ligament	Saliva
Capillary	Liver	Scapula
Cardiac Arrest	Lungs	Skull
Cardiovascular system	Marrow	Small intestine
Carpals	Mechanical digestion	Spongy bone
Cartilage	Metacarpals	Sternum
Chemical digestion	Metatarsals	Stomach
Cilia	Mucus	Tarsals
Clavicle	Muscle-	Tendon
Compact bone	Involuntary	Tibia
Coronary artery	Voluntary	Trachea
Diabeties	Cardiac	Ulna
Diaphragm	Smooth	Valve
Digestion	Skeletal	Vein
Diffusion	Striated	Ventricle
Enzyme	Osteoporosis	Vertebra
Epiglottis	Outer membrane	Vertebral column
Esophagus	Pancreas	Villi
Femur	Patella	Vocal cords
Fibula	Pelvic girdle	

ACTIVITIES

Teachers will choose from the collection of activities below:

Newspaper print skeletal student drawing (pre-test)
Human Proportion Activity- DaVinci
Digestive System Foldable – Part I and II
Digestive Organ Election**
Bile Demo
Blood Type Activity **
Riddle of the Sphincter- Peristalsis Lab
Acid in your Stomach- Lab
As the stomach churns- Lab
Debate- Nutrition and Advertising
Demo: Cooked meat
Writing Interview on broken bones
Foldable- 4 chambers
Heart Beat, Health Beat**
Respiratory Foldable
Do you exhale carbon dioxide?
A breath of Fresh Air
Villi and Surface Area
What's in my lunch bag...really?

** Activities will be updated and revised as needed*

*** Core Labs that all students will complete*

ASSESSMENT

Homework
Quizzes
Tests
Labs
Class activities
Class discussions
Special projects
Group projects
Performance assessments

CAREER AWARENESS

Medical doctor	Physical Therapist	Microbiologist
Nurse	Dietician	Veterinarian
EMT	Nutritionist	Respiratory Therapist
Cardiologist	Occupational Therapist	Neurologist
Radiologist	Speech and Language	Orthopedist
Medical technician	Pathologist	

CORE TEXT FOR STUDENTS

Science Explorer: Human Biology and Health. Upper Saddle River, NJ: Prentice Hall, 2002.

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

<http://www.nasa.gov/>

<http://www.innerbody.com>

National Geographic Edventure: Human Body GeoKit I and II

Ortleb, Edward P., The Human Body. St. Louis, MO: Milliken Publishing Co., 1986.

<http://www.americanredcross.org>

<http://www.aabb.org>

MATERIALS AND SUPPLIES

Antacids	Dilute hydrochloric acid	Plastic stirrers
Baking soda	Dixi Cups	Potassium hydroxide
Beakers	Eye Droppers	Scissors
Beans	Glue	Stethoscope
Brown paper bag	Graduated cylinders	Stopwatch
Calculator	Iodine	Straws
Candy	Litmus paper	Tape
Centimeter graph paper	Measuring spoons	Test tube rack
Construction Paper	Meter stick	Test tubes with stoppers
Copper sulfate solution	Mirror	Vegetable Oil
Corrugated cardboard	Newspaper print	Vinegar
Cotton balls	Paper cups	Water
Crackers	Paper towels	
Cubes of boiled egg	Pepsin	

INTEGRATED TECHNOLOGY

Use of internet to research and demonstration
Word processing programs
Graphing using spreadsheet program
Simulated demonstrations

UNIT 3 Heredity and Evolution

What are the processes responsible for life's unity and diversity?

- ◆ What is cell theory?
- ◆ How does the function of the organelles contribute to cell performance?
- ◆ How do diffusion and osmosis aid in the transport of oxygen, other gases and nutrients in and out of cells?
- ◆ How does the structure of DNA and DNA replication allow for diversity?
- ◆ How did Mendel's plant experiments open understanding to the role of parents and offspring?
- ◆ How do genes determine the traits of an organism?
- ◆ How does chromosome imperfection cause genetic disorders?

RELATED DARIEN AND CONNECTICUT STANDARDS

CT State Science Standards addressed:

8.2 Reproduction is a characteristic of living systems and it is essential for the continuation of every species.

- ◆ Heredity is the passage of instructions specifying traits from one generation to another.
- ◆ Some characteristics of an organism are inherited and some result from interactions with environment.

7.2 Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.

- ◆ All organisms are made up of one or more cells; each functions more or less independently.
- ◆ Multicellular organisms need specialized structures and systems to perform basic life functions.

6.1 Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.

- ◆ Mixtures are made of combinations of elements and/or compounds, and they can be separated using a variety of physical means.
- ◆ Pure substances can be either elements or compounds, and they cannot be broken down by physical means

Connecticut State Science Expected Performances addressed:

- C 1. Describe the properties of common elements such as oxygen, hydrogen, carbon, iron and aluminum.
- C 15. Describe the basic structure of an animal cell, including nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.
- C 25. Explain the similarities and differences in cell division in somatic and germ cells.
- C 27. Describe the structure of the genes on chromosomes, and explain sex determination in humans.

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding

Students will **define** the basic structure of an animal cell.

Students will **describe** the movement of materials across the cell membrane.

Students will **define** genes in terms of chromosomes.

Students will **describe** genes in terms of nucleotides.

Developing an Interpretation

Students will **compare and contrast** mitosis and meiosis.

Making Connections

Students will **illustrate** chromosomal mutations in terms of genetic disorders.

Taking a Critical Stance

Students will **criticize** genetics in terms of plant and animal genetic engineering.

Students will **support** their opinions on genetic engineering.

VOCABULARY

Active transport	Enzyme	Mitosis
Allele	Gene	Molecule
Amino acid	Gene therapy	Multiple alleles
Amniocentesis	Genetic disorder	Mutation
Atom	Genetic engineering	Nucleic acid
Cancer	Genetics	Nucleus
Carbohydrate	Genome	Organelle
Carrier	Genotype	Organic compound
Cell	Golgi body	Osmosis
Cell cycle	Heredity	Passive transport
Cell membrane	Heterozygous	Pedigree
Cell theory	Homozygous	Phenotype
Cell wall	Hybrid	Probability
Chloroplast	Hybridization	Protein
Chromatid	Inbreeding	Punnett square
Chromatin	Inorganic compound	Purebred
Chromosome	Interphase	Recessive allele
Clone	Karyotype	Replication
Codominance	Lipid	Ribosome
Compound	Lysosome	RNA
Cytokinesis	Magnification	Selective breeding
Cytoplasm	Meiosis	Sex-linked gene
DNA	Membrane	Trait
Dominant allele	Messenger RNA	Transfer RNA
Element	Microscope	Vacuole
Endoplasmic reticulum	Mitochondrion	

ACTIVITIES

Teachers will choose from the collection of activities below:

DNA Extraction**	Live Protazoan Lab**
Turn the room into a working cell	Guest Lecturer on Gene Therapy
Examining mitosis posters	Dog heredity activity
DNA mini models	Family Puzzles- Family Case study
Class survey on genetic traits**	Debate on risks/benefits genetic engineering
Probability/ Genetic model making	Punnett squares
Learning to use the microscope	

* *Activities will be updated and revised as needed.*

** *Core Labs that all students will complete*

ASSESSMENT

Homework	Class discussions
Quizzes	Special projects
Tests	Group projects
Labs	Performance assessments
Class activities	Debate

CAREER AWARENESS

Genetic engineering – plant, animal
Chemist
Microbiologist
Genetic counselor
DNA Researcher for pharmaceuticals

Research scientist
Consumer Investigator
FDA Inspector
NASA- Astronaut microgravity genetic experiments

CORE TEXT FOR STUDENTS

Science Explorer: Cells and Heredity. Upper Saddle River, NJ: Prentice Hall, 2000.

Middlesex Middle School Science Lab Format Sheet

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

Websites:

<http://www.science-explorer.phschool.com>

<http://www.cellsalive.com>

MATERIALS AND SUPPLIES

DNA Necklace Kit
Microbe Magazine
Microscopes
Mitosis Slides
Live Protozoan

Mitosis Posters
DNA model kit
Human genetic traits kit
Mitosis Kit

INTEGRATED TECHNOLOGY

Use of internet to research and demonstration
Word processing programs
Graphing using spreadsheet program
Simulated demonstrations

UNIT 4 Science and Technology in Society (Full unit begins 2006-2007)

How does science and technology affect the quality of our lives?

- How does genetic engineering impact our present and future lives?

RELATED DARIEN AND CONNECTICUT STANDARDS

CT State Science Standards addressed:

7.4 Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing population.

C 21. Methods have been developed to prevent food spoilage caused by bacteria.

- How does genetic engineering impact our present and future lives?

Connecticut State Science Expected Performances addressed:

C 21. Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by bacteria.

- Describe how genetic engineering alters fruits and vegetables.

CONTENT KNOWLEDGE OBJECTIVES

Initial Understanding

Students will **apply** their knowledge of bacterial growth to technologies that inhibit food spoilage.

Developing and Understanding

Students will **compare and contrast** different methods for preventing food spoilage.

Making Connections

Students will **design** a plan to educate consumers on the positives and negative of freezing, dehydration, pickling and irritation of food.

Taking a Critical Stance

Students will **appraise** differences genetic engineering vs. traditional technology in preventing food spoilage.

VOCABULARY

Bacteria	Irradiation
Dehydration	Pickling
Fermentation	Plasmid
Freezing	Spoiling
Genetic Engineering	Yeast
Genetic modification	

ACTIVITIES

Genetic Engineering
Literature Research Project (pamphlet)
Debate

ASSESSMENT

Homework
Quizzes
Tests
Labs
Class activities
Class discussions
Special projects
Group projects
Performance assessments
Debate

CAREER AWARENESS

Microbiologist
Genetic Engineer
Nutritionist
Dietician
OSHA
FDA Inspector

CORE TEXT FOR STUDENTS

Science Explorer: Cells and Heredity. Upper Saddle River, NJ: Prentice Hall, 2000.
Science Explorer: Bacteria to Plants. Upper Saddle River, NJ: Prentice Hall, 2000.
Kids Discover: Microbes. New York, NY: Kids Discover, 2000.

Middlesex Middle School Science Lab Format Sheet

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

Websites:

Food and Drug Administration

<http://www.fda.gov>

World Health Organization

<http://www.who.org>

Center for Disease Control

<http://www.CDC.org>

Database:

Student Resource Center (SRC) – Middlesex Middle School

New York Times – science section (online or print)

MATERIALS AND SUPPLIES

Print material such as newspapers and magazines for current events

Internet access

Wireless laptop Lab

INTEGRATED TECHNOLOGY

Use of Internet for research and demonstration

UNIT 5 Properties of Matter

How does the structure of matter affect the properties and uses of materials?

- How does chemistry inform art curators of the authenticity of art work?
- What methods can scientist use to test characteristic properties such as density, magnetism and solubility?

RELATED DARIEN AND CONNECTICUT STANDARDS

CT State Science Standards addressed:

6.1 Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.

- ◆ Mixtures are made of combinations of elements and/or compounds, and they can be separated using a variety of physical means.
- ◆ Pure substances can be either elements or compounds, and they cannot be broken down by physical means.

Connecticut State Science Expected Performances addressed:

C 1. Describe the properties of common elements such as oxygen, hydrogen, carbon, iron and aluminum.

C 2. Describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.

C 3. Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.

CONTENT KNOWLEDGE/PERFORMANCE OBJECTIVES

Initial Understanding

Students will describe the properties of common elements such as oxygen, hydrogen, carbon, iron and aluminum.

Students will describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.

Students will explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.

Developing an Interpretation

Students will **investigate** the difference among elements, compounds and mixtures.

Students will **determine** the pH of different solutions.

Making Connections

Students will **analyze** different metals and fibers in term of chemical and physical composition.

Students will **compare and contrast** magnetic and conductive properties of metals.

Taking a Critical Stance

Students will **design** protocol for testing different materials.

Students will **evaluate** protocols to use as standard methods for testing different materials.

Students will **form conclusions** using scientific method based upon selected labs.

VOCABULARY

Acid	Element
Atom	Melting point
Base	Mixture
Boiling point	Molecule
Chemical activity	Periodic Table of Elements
Chemical bonds	pH
Chemical changes	Physical changes
Chemical properties	Physical properties
Chromatography	Pure substance
Compound	Solubility
Density	Solution
Electricity	

ACTIVITIES

An Event Based Science Module FRAUD! (See below for more information)

- Rusty Elements
- Earn Your pH, Dee
- Fiber Space
- Metal of Honor
- What a mass!

ASSESSMENT

Homework

Quizzes

Tests

Labs

Class activities

Class discussions

Special projects

Group projects

Performance assessments

CAREER AWARENESS

Chemist

Forensic Scientist

Laboratory Scientist

Director of Conservation Research

Art and Antique Appraiser

Prosecuting Attorney

Paper Conservator

Art Curators

CORE TEXT FOR STUDENTS

An Event Based Science Module FRAUD! Upper Saddle River, NJ: Pearson-Prentice Hall, 2005.

Science comes alive through real-world events! This research and standards-based National Science Foundation program fosters into students' natural curiosity by exploring the scientific concepts behind powerful events. Students explore the content through hands-on activities, newspaper articles, and data collection, while testing out their hypotheses. Working in teams on an authentic task, they assume the roles of professionals working in the field.

Middlesex Middle School Science Lab Format Sheet

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

Science Explorer: Chemical Building Blocks. Saddle River, NJ: Prentice Hall, 2000.

Science Explorer: Chemical Interactions. Saddle River, NJ: Prentice Hall, 2000.

MATERIALS AND SUPPLIES

Candle	Wool yarn	One strip each of steel, copper, aluminum and brass
Metal tongs	Acrylic yarn	Ring stand and clamp or other support
Balance scale	Matches	Timing device
Plastic cups	Microscope or hand lens	Magnet
Plastic spoon	Forceps sheet of aluminum foil	Triple-beam balance
Timing device	1.5 volt battery	Graduated cylinder
Salt	Six inch wires with bare ends	Yarn (cotton, wool, and acrylic)
Sugar	Beaker	Metal foils (iron, copper, aluminum, brass)
Stirrer	Flashlight light bulb with holder	Chromatography paper
Goggles	Paperclip	
Hot plate	Flat pencil eraser	
Scissors	Pencil "lead"	
Cotton yarn		
Periodic Table of the Element -		
Wipe board		
Sand		
Elements List		
Iron wool		
Iron filling		

INTEGRATED TECHNOLOGY

Use of Internet for research and demonstration
Word processing programs

SECTION III - Goals and Standards



Core Science Curriculum Framework

An Invitation for Students and Teachers
to Explore Science and Its Role in Society

Content Standards and Expected Performances

Core Science for Grades 6-8



THE 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
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none"> ◆ 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. <p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none"> ◆ 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. <p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none"> ◆ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas. 	<p>C INQ.1 Identify questions that can be answered through scientific investigation.</p> <p>C INQ.2 Read, interpret and examine the credibility of scientific claims in different sources of information.</p> <p>C INQ.3 Design and conduct appropriate types of scientific investigations to answer different questions.</p> <p>C INQ.4 Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment.</p> <p>C INQ.5 Use appropriate tools and techniques to make observations and gather data.</p> <p>C INQ.6 Use mathematical operations to analyze and interpret data.</p> <p>C INQ.7 Identify and present relationships between variables in appropriate graphs.</p> <p>C INQ.8 Draw conclusions and identify sources of error.</p> <p>C INQ.9 Provide explanations to investigated problems or questions.</p> <p>C INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.</p>

Grade 6

Content Standards	Expected Performances
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>7.2 Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.</p> <ul style="list-style-type: none"> ◆ All organisms are made up of one or more cells; each functions more or less independently. ◆ Multicellular organisms need specialized structures and systems to perform basic life functions. 	<p>MMS: ***Introduction to Scientific Method***</p> <p>C 15. Describe the basic structures of an animal cell, including nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.</p> <p>C 16. Describe the structures of the human digestive, respiratory, and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials.</p> <p>C 17. Explain how the human muscular/skeletal system supports the body and allows movement.</p>
<p><i>Heredity and Evolution – What are the processes responsible for life’s unity and diversity?</i></p> <p>8.2 Reproduction is a characteristic of living systems and it is essential for the continuation of every species.</p> <ul style="list-style-type: none"> ◆ Heredity is the passage of instructions specifying traits from one generation to another. ◆ Some characteristics of an organism are inherited and some result from interactions w/ environment. 	<p>C 25. Explain the similarities and differences in cell division in somatic and germ cells.</p> <p>C 26. Describe the structure and function of the male and female human reproduction system, including the process of egg and sperm production.</p> <p>C 27. Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>7.4 Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations.</p> <ul style="list-style-type: none"> ◆ Methods have been developed to prevent food spoilage caused by bacteria. 	<p>C 21. Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by bacteria.</p>
<p><i>Properties of Matter - How does the structure of matter affect the properties and uses of materials?</i></p> <p>6.1 Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.</p> <ul style="list-style-type: none"> ◆ Mixtures are made of combinations of elements and/or compounds, and they can be separated using a variety of physical means. ◆ Pure substances can be either elements or compounds, and they cannot be broken down by physical means. 	<p>C 1. Describe the properties of common elements such as oxygen, hydrogen, carbon, iron and aluminum.</p> <p>C 2. Describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.</p> <p>C 3. Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.</p>

Grade 7

Content Standards	Expected Performances
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p>7.3 Landforms are the result of the interaction of constructive and destructive forces over time.</p> <ul style="list-style-type: none"> ◆ 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 materials from place to place. 	<p>C 18. Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.</p> <p>C 19. Explain how glaciation, weathering and erosion create and shape valleys and floodplains.</p> <p>C 20. Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.</p>
<p><i>Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?</i></p> <p>6.2 An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.</p> <ul style="list-style-type: none"> ◆ 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/decomposers of organic material. 	<p>C 4. Describe how abiotic factors such as temperature, water and sunlight affect plants' ability to create their own food through photosynthesis.</p> <p>C 5. Explain how populations are affected by predator-prey relationships.</p> <p>C 6. Describe common food webs in different Connecticut ecosystems.</p>
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p>6.3 Variation in the amount of the sun's energy hitting the Earth's surface affects daily and seasonal weather patterns.</p> <ul style="list-style-type: none"> ◆ Local and regional weather are affected by the amount of solar energy the area receives and proximity to a large body of water. 	<p>C 7. Describe the effect of heating on the movement of molecules in solids, liquids and gases.</p> <p>C 8. 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.</p> <p>C 9. Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>6.4 Water moving across and through earth materials carries with it the products of human activities.</p> <ul style="list-style-type: none"> ◆ Most precipitation that falls on Connecticut eventually reaches Long Island Sound. 	<p>C 10. Explain the role of septic and sewage systems on the quality of surface and ground water sources.</p> <p>C 11. Explain how human activity may impact water resources in Connecticut such as local ponds, rivers and the Long Island Sound ecosystem.</p>
<p><i>Grade 9: Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>9.8 The use of resources by human populations may affect the quality of the environment. Some materials can be recycled, but others accumulate in environments and may affect the balance of the Earth systems.</p> <ul style="list-style-type: none"> ◆ Accumulations of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution. ◆ New technologies and changes in lifestyles can have positive and/or negative effects on the environment. 	<p>D 25. Explain how land development, transportation options, and consumption of resources may affect the environment.</p> <p>D 26. Describe human efforts to reduce the consumption of raw materials and improve air and water quality. Explain the short and long term impacts of landfill and incineration of waste materials on the quality of the environment.</p>

Grade 8

Content Standards	Expected Performances
<p><i>Forces and Motion – What makes objects move the way they do?</i></p> <p>8.1 An object’s inertia causes it to continue moving the way it is moving unless it is acted upon by a force to change its motion.</p> <ul style="list-style-type: none"> ◆ The motion of an object can be described by its position, direction of motion and its speed. ◆ An unbalanced force acting on an object changes its speed or direction of motion, or both. ◆ Objects moving in circles must experience force acting toward the center. 	<p>C 22. Calculate average speed of a moving object and illustrate the motion of objects in graphs of distance over time.</p> <p>C 23. Describe the qualitative relationships among force, mass and changes in motion.</p> <p>C 24. Describe the forces acting on an object moving in a circular path.</p>
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p>7.1 Energy provides the ability to do work and it can exist in many forms.</p> <ul style="list-style-type: none"> ◆ Work is the process of making objects move through the application of force. ◆ Energy can be stored in many forms and can be transformed into the energy of motion. 	<p>C 12. Explain relationship between force, distance and work; use the relationship ($W=F \times D$) to calculate work done in lifting heavy objects.</p> <p>C 13. Explain how simple machines such as inclined planes, pulleys and levers are used to create mechanical advantage.</p> <p>C 14. Describe how different types of stored (potential) energy are used to move objects.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>8.4 In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.</p> <ul style="list-style-type: none"> ◆ Bridges can be designed in different ways to withstand certain loads and potentially destructive forces. 	<p>C 30. Explain how beam, truss and suspension bridges are designed to withstand the forces that act on them.</p>
<p><i>Earth in the Solar System – How does the position of Earth in the solar system affect the conditions on our planet?</i></p> <p>8.3 The solar system is composed of planets and other objects that orbit the sun.</p> <ul style="list-style-type: none"> ◆ Gravity is the force that governs the motions of objects in the solar system. ◆ The motion of the Earth and Moon relative to the sun causes daily, monthly and yearly cycles on Earth. 	<p>C 28. Explain the effect of gravity on the orbital movement of planets in the solar system.</p> <p>C 29. Explain how the regular motion of the Sun, Earth and Moon explains the seasons, phases of the moon and eclipses.</p> <p>MMS: Explain the latest technology and discoveries made in the field of Space Exploration.</p>
<p>Added from standards for Grades 9:</p> <p><i>Energy transfer and transformations – What is the role of energy in our world?</i></p> <p>9.2 The electrical force is a universal force that exists between any two charged objects.</p> <ul style="list-style-type: none"> ◆ Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force. ◆ Electrical current can be transformed into light through the excitation of electrons. 	<p>D 4. Explain the relationship among voltage, current, and resistance in a simple series circuit.</p> <p>D 5. Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.</p> <p>D 6. Describe the relationship between current and magnetism.</p> <p>D 7. Explain how heat is used to generate electricity.</p>

SECTION IV – Learning Resources

SUPPLEMENTAL RESOURCES

As listed above for individual units and subject to change as units are more fully developed:

Print Materials:

Middlesex Middle School Lab Format Sheet

National Geographic Edventure: Human Body GeoKit I and II. National Geographic, 1999.

Science Explorer: Human Biology and Health. Upper Saddle River, NJ: Prentice Hall, 2002.

Science Explorer: From Bacteria to Plants. Upper Saddle River, NJ: Prentice Hall, 2002.

Science Explorer: Cells and Heredity. Upper Saddle River, NJ: Prentice Hall, 2000.

An Event Based Science Module FRAUD! Upper Saddle River, NJ: Pearson-Prentice Hall, 2005.

Science Explorer: Chemical Building Blocks. Saddle River, NJ: Prentice Hall, 2000.

Science Explorer: Chemical Interactions. Saddle River, NJ: Prentice Hall, 2000.

Websites:

<http://www.nasa.gov/>

<http://www.nhc.noaa.gov>

<http://www.nasa.gov>

<http://observe.arc.nasa.gov/nasa/earth/hurricane/intro.html>

<http://www.innerbody.com>

<http://www.science-explorer.phschool.com>

<http://commtechlab.msu.edu/sites/dlc-me/zoo/>

<http://www.yucky.kids.discovery.com>

<http://www.users.tpg.com.au/users/amcgann/body/digestive.html>

<http://www.kidskonnnect.com/HumanBody/HumanBody.html>

<http://www.CDC.gov>

<http://www.FDA.gov>

<http://www.ucsus.org>

<http://www.chem4kids.com>

<http://www.chemsoc.org>

<http://www.nationalgeographic.com>

<http://www.whyfiles.com>

<http://www.discover.com>

<http://www.extremescience.com>

<http://www.nih.gov>

<http://www.scienceeducation.nih.gov>

Videos/CD-ROM:

Rainforest Researchers CD-ROM

The Code of life

Elements and compounds

Understanding the power of genes

Human genome

Special Education Resources:

Lessons are differentiated for all students based on individual student needs.

Specifically for special education students, materials are adapted based on needs as indicated by the IEP.

Lab Format Sheet

Independent Variable (IV)	What you are changing/testing in the experiment (only 1 thing changes!!)
Dependent Variable (DV)	What is being measured – this changes based on the independent variable.

Problem

- The question your experiment will answer

Hypothesis

- What do you expect to happen in the experiment
- If Independent Variable then Dependent Variable, because...
- Written in a Statement Form

Introduction

- Background information you have obtained from literature research (Paragraph Form)

Experimental Plan

- List of Materials
- List Procedure in numbered steps – Do not use I, we – write in 3rd person

Discussion = Table, Charts & Results

Title: The effect of the IV on the DV. (All tables & charts need a title!)

Table:

Table with one Trial

IV (units)	DV (units)

Table with repeated Trials

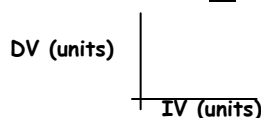
IV (units)	DV (units)			Average DV (units)
	1	2	3	

Chart:

- Title Chart & Axis
- IV on x-Axis
- DV on y-Axis



The effect of the IV on the DV.



Results: A paragraph discussing the results - state information on Table(s) and Chart(s) & discuss trends/patterns of the data

Conclusion

- Write in complete sentences & in paragraph form
- Do Not use I, me, we – write in the 3rd person
- Rephrase the problem as a statement that answers the question
- Explain Hypothesis – data supported or data did not support
- Analyze Results – using scientific concepts from class/research, explain how and why?
- Explain any unavoidable/experimental error - effects of it, and ways to reduce it
- Explain any real-life applications – who would care about the results & why
- Explain how this experiment relates to the topic you are studying in science class

Further Investigations

- Based on this experiment what questions do you now have about this topic.
- List at least 2 questions/problems that you would like to run an experiment on now!