COURSE OF STUDY GUIDE
LOWER CAPE MAY REGIONAL SCHOOL DISTRICT

TITLE OF COURSE: EARTH AND PHYSICAL SCIENCE

DEPARTMENT: SCIENCE **DATE REVISED: July 2016**

GRADE: 8 **Revised by: Liza Smith, Susan Noble, and Anna Shustack**

I. COURSE ORGANIZATION

Length: ONE YEAR Credits:N/A

Periods Per Week: 5 Weighted: N/A

Prerequisite: LIFE SCIENCE

II. COURSE DESCRIPTION

8th Grade Science at RMT encompasses Earth and Physical Sciences. This year long course is aligned with Next Generation Science Standards, and prepares students to take the required state assessment in Science. The design of this course includes Skills of a Scientist, Careers, Measurement, Technology, Chemistry, Structures of the Earth, Oceanography, Forces of Motion, and the Earth Moon Sun Relationship.

III. COURSE MISSION

Earth and Physical Science will provide RM Teitelman Scientists with the skills and content to make informed decisions regarding the world around them.

IV. DEPARTMENT MISSION

The mission statement for RM Teitelman Science is to endow all learners with the power and potential of science in their lives. It is a lifelong journey where science plays an important role in their everyday lives.

VI. COURSE LEVEL ASSESSMENTS & BENCH MARKS

BENCHMARK 1: 8th Grade Scientists will analyze and demonstrate the skills necessary in science; qualitative and quantitative observations, graphing, hypothesizing, and analyzing facts vs. myths.

BENCHMARK 2: 8th Grade Scientists will use metric measuring tools to accurately measure object

BENCHMARK 3: 8th Grade Scientists will identify the five branches of Earth Science.

BENCHMARK 4: 8th Grade Scientists will identify & describe the three major groups of rocks.

BENCHMARK 5: 8th Grade Scientists will describe the characteristics of Earth's crust, mantle & core and explain how stresses in the Earth's crust changes Earth's surface.

BENCHMARK 6: 8th Grade Scientists will describe how Earth's water is distributed.

BENCHMARK 7: 8th Grade Scientists will describe the causes of waves, currents, and tides.

BENCHMARK 8: 8th Grade scientists will describe how the marine organisms are classified.

BENCHMARK 9: 8th Grade Scientists will describe what effects are caused by the motion of the Earth and its moon in relation to the sun!

BENCHMARK 10: 8th Grade Scientists will accurately describe matter by its physical & chemical properties.

BENCHMARK 11: 8th Grade Scientists will identify the structure of the modern model of the atom.

BENCHMARK 12: 8th Grade Scientists will explain how the periodic table relates to the atomic structure of the elements.

BENCHMARK 13: 8th Grade Scientists will describe how the reactivity of elements is related to valence electrons in atoms.

BENCHMARK 14: 8th Grade Scientists will demonstrate an object's motion using Newton's Laws of Motion.

Earth Science Benchmarks

#1. Scientists will analyze and demonstrate the skills necessary in science; qualitative and quantitative observations, graphing, hypothesizing, and analyzing facts vs. myths. End of 1st Marking Period, teacher made assessments)

#2. Scientists will use metric measuring tools to accurately measure objects. (End of 2nd Marking Period, teacher made assessments)

#3. Scientists will describe what effects are caused by the motion of the Earth and its moon in relation to the sun. (End of 3rd Marking Period, teacher made assessments)

#4. Scientists will accurately describe matter by its physical and chemical properties. (NJASK)

Anna Shustack, Liza Smith, Susan Noble, Heather Shagren

VII. POSSIBLE ASSESSMENT TASKS

Written	Science Poetry/Limericks	Project Presentations	Smart Board/Mimeo Board
Lab Conclusion questions	Oral	Visual	Science World Magazine
Tests & Quizzes	Exit Questions	Lab Experiments	Newspaper Articles
Benchmarks	"Pop Smarties"	Bill Nye/Eyewitness/Discovery	Science Field Trips
Science World Magazines	Lab Procedures	Video	

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VIII. CONTENT/SUGGESTED INSTRUCTIONAL TIME

Content Pacing Guide & Standards

Unit Title: Introduction To Earth Science		
Content: ***What Is Science*:** Identify the skills and attitudes that scientists use to learn about the world. Explain what Scientific Inquiry involves, and differentiate between a scientific theory and a scientific law. ***Study of Earth Science:*** Explain the Big Ideas, or main concepts of Earth Science. Explain the 5 Branches of Earth Science. Explain what a model is in Science and why models are important in Earth Science. ***The Nature of Technology:*** Describe the goal of technology, Explain how technology differs from Science. Describe how technology affects society. ***Safety In the Science Lab:*** Explain why preparation is important when carrying out Scientific Investigations in the lab and in the field. Describe what you should do if an accident occurs. ***Labs:*** Good Eye Lab, Educated Guessing Lab, Having a Ball In Science Lab, Observation Fun Lab, Lab Safety Rules Review Rotation	**NJCC Standards** 5.1.8 A-D **21st Century Standard** **9.1.12.A.1** **CRITICAL THINKING** **9.1.4.C.1 GROUP WORK** **COMMON CORE READING** RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 **Common Core Writing** WHST.6-8.2.A-F WHST.6-8.4 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9	Time Frame 6 weeks And year-long application

Physical Science	Life Science	Earth & Space Science	Engineering, Technology, & The Application of Science
☐ **PSI: Matter & Its Interactions** ___ PS1.A: Structure and Properties of Matter ___ PS1.B: Chemical Reactions ___ PS1.C: Nuclear Processes ☐ **PS2: Motion and Stability: Forces & Interactions** ___ PS2.A: Forces and Motion ___ PS2.B: Types of Interactions ___ PS2.C: Stability and Instability in Physical Systems ☐ **PS3: Energy** ___ PS3.A: Definitions of Energy ___ PS3.B: Conservation of Energy & Energy Transfer ___ PS3.C: Relationship Between Energy and Forces ___ PS3.D: Energy in Chemical Processes and Everyday Life ☐ **PS4: Waves & Their Applications in Technologies for Information Transfer** ___ PS4.A: Wave Properties ___ PS4.B: Electromagnetic Radiation ___ PS4.C: Information Technologies and Instrumentation	☐ **LSI: From Molecules to Organisms – Structures and Processes** ___ LS1.A: Structure and Function ___ LS1.B: Growth and Development of Organisms ___ LS1.C: Organization for Matter and Energy Flow in Organisms ___ LS1.D: Information Processing ☐ **LS2: Ecosystems: Interactions, Energy And Dynamics** ___ LS2.A: Interdependent Relationships in Ecosystems ___ LS2.B: Cycles of Matter and Energy Transfer in Ecosystems ___ LS2.C: Ecosystems Dynamics, Functioning and Resilience ___ LS2.D: Social Interactions and Group Behavior ☐ **LS3: Heredity: Inheritance & Variation of Traits** ___ LS3.A: Inheritance of Traits ___ LS3.B: Variation of Traits ☐ **LS4: Biological Evolution: Unity and Diversity** ___ LS4.A: Evidence of Common Ancestry and Diversity ___ LS4.B: Natural Selection ___ LS4.C: Adaptation ___ LS4.D: Biodiversity and Humans	☐ **ESSI: Earth's Place in the Universe** ___ ESS1.A: The Universe and Its Stars ___ ESS1.B: Earth and the Solar System ___ ESS1.C: The History of Planet Earth ☐ **ESS2: Earth's Systems** ___ ESS2.A: Earth Materials and Systems ___ ESS2.B: Plate Tectonics & Large-Scale System Interactions ___ ESS2.C: The Roles of Water in Earth's Surface Processes ___ESS2.D: Weather and Climate ___ESS2.E: Biogeology ☐ **ESS3: Earth and Human Activity** ___ ESS3.A: Natural Resources ___ ESS3.B: Natural Hazards ___ ESS3.C: Human Impacts on Earth Systems ___ESS3.D: Global Climate Change	☐ **ETSI: Engineering Design** ___ ETS1.A: Defining and Delimiting an Engineering Problem ⊗ ETS1.B: Developing Possible Solutions ___ ETS1.C: Optimizing the Design Solution ☐ **ETS2: Links Among Engineering, Technology, Science and Society** ⊗ ETS2.A: Interdependence of Science, Engineering, and Technology ___ ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

CROSSCUTTING CONCEPTS

⊗ **Patterns**
Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.

⊗ **Cause and Effect: Mechanism and Explanation**
Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

☐ **Scale, Proportion, and Quantity**
In considering phenomena, it is critical to recognize what is relevant at different measures of size, time and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

⊗ **Systems and System Models**
Defining the system under study – specifying its boundaries and making explicit a model of that system – provides tools for understanding and testing ideas that are applicable throughout science and engineering.

☐ **Energy and Matter: Flows, Cycles, and Conservation**
Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.

☐ **Structure and Function**
The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

☐ **Stability and Change**
For natural and build systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

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SCIENTIFIC AND ENGINEERING PRACTICES

Asking Questions and Defining Problems
A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.
Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world.
Both scientists and engineers also ask questions to clarify the ideas of others.

Planning and Carrying Out Investigations
Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.
Engineering investigations identify the effectiveness, efficiency, and durability of deigns under different conditions.

Analyzing and Interpreting Data
Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools-including tabulation, graphical interpretation, visualization, and statistical analysis-to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.
Engineering investigations include analysis of data collected in the tests of designs. This allows comparison of different solutions and determines how well each meets specific design criteria-that is, which design best solves the problem within given constraints. Like scientists, engineers require a range of tools to identify patterns within data and interpret the results. Advances in science make analysis of proposed solutions more efficient and effective.

Developing and Using Models
A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.
Modeling tools are used to develop questions, predictions and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineered systems. Measurements and observations are used to revise models and designs.

Constructing Explanations and Designing Solutions
The products of science are explanations and the products of engineering are solutions.
The goal of science is the construction of the theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories.
The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints.

Engaging in Argument from Evidence
Argumentation is the process by which explanations and solutions are reached.
In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits.
Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to identify strengths and weaknesses of claims.

Using Mathematics and Computational Thinking
In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships.
Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Statistical methods are frequently used to identify significant patterns and establish correlational relationships.

Obtaining, Evaluating, and Communicating Information
Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.
Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models and equations as well as orally, in writing, and through extended discussions.
Scientists and engineers employ multiple sources to acquire information that is used to evaluate the merit and validity of claims, methods, and designs.

Unit Title: Properties of Matter		
Content: ***What is Physical Science:*** Explain what physical science involves. Identify skills that scientists use to lean about the natural world. ***Describing and Measuring Changes in Matter:*** Identify the properties used to describe matter. Define elements and explain how they relate to compounds. Describe the properties of a mixture. Differentiate between weight and Mass. Identify the units used to express the amount of space occupied by matter. Describe how the density of a material is determined. Describe what a physical change is. Describe what a chemical change is. Explain how changes in matter are related to changes in energy. ***Atomic Structure:*** Explain how atomic Theory Developed and changed. Describe the modern model of the Atom. Explain how the reactivity of the elements is related to valance electrons in atoms. ***Organize the Elements By Properties:*** State what the Periodic Table tells you about Atoms and the properties of Elements. Explain how Mendeleev discovered the pattern that lead to the Periodic Table. Tell what information about elements is found in the Periodic Table. Explain how elements are created in stars. List the physical properties of Metals. Explain how the reactivity of Metals changes across the Periodic table. Explain how the elements that follow Uranium are produced. Describe the Properties of Nonmetals. Tell how Metalloids are useful. ***Ionic and Covalent Bonding:*** Describe Ions and explain how they are form bonds. Explain how the formulas and names of Ionic Compounds are written. Identify the properties of ionic compounds. State what holds Covalently bonded atoms together. Explain how unequal sharing of electrons occurs and how it affects molecules. ***Chemical Change and Reactions:*** State how matter and changes in matter can be described. Explain how you can tell when a chemical change has occurred. ***Labs:*** Physical Properties of Matter Lab (Cookie ID Lab), Molecules on the Move Lab, Reading the Periodic Table of Elements Lab, Building Molecules Internet Lab, Gummy Molecule Lab, Teach Me How to Lewis Dot Lab, Secret Agent Periodic Table, Balancing Chemical Equations, Element Celebration Lab, Color Coding the Periodic Table Elements Groups.	Standards 5.2.8 A-E **COMMON CORE READING** RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 **Common Core Writing** WHST.6-8.2.A-F WHST.6-8.4 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9	Time Frame 10 Weeks

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Unit Title: Motion And Forces		
Content: ***Describing and Measuring Motion:*** Determine when an object is in Motion. Describe how Scientists measure distance. Calculate an object's speed and velocity. Determine how to graph motion. Describe the motion of an object as it accelerates. ***The Nature of Forces:*** Describe what a force is. Explain how balanced and unbalanced forces are related to motion. Describe Friction, and identify factors that determine the friction force between two objects. Identify the factors that affect the gravitational force between two objects. ***Newton's Laws of Motion:*** State Newton's First law of Motion. State Newton's Second Law of Motion. State Newton's third Law of Motion. Explain how an object's momentum is determined. State the law of Conservation of Momentum. Explain how a rocket lifts off the ground. Describe the forces that keep a satellite in orbit. ***Labs:*** Balloon Rocket Lab, Domino Dash lab, Newton's Laws of Motion Rotation Lab, Helicopter Lab, Amusement Park Physics Internet Lab	Standards: 5.1.8 A-D 5.2.8 E1-E2 **COMMON CORE READING** RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 **Common Core Writing** WHST.6-8.2.A-F WHST.6-8.4 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9	Time Frame 4 Weeks

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Unit Title: Earth Moon And Sun		
Content: ***Earth In Space:*** Demonstrate how Earth moves in Space. Explain what causes the cycle of Seasons on Earth. Explain what causes the Cycle of Day and Night on Earth. ***Gravity and Motion:*** Identify what determines the strength of the force of gravity between two objects. Describe two factors that keep the moon and Earth in Orbit. ***Phases, Eclipses, and Tides:*** Explain what caused the Phases of the Moon. Describe Lunar and Solar Eclipses. Identify what causes the tides. ***Earth's Moon:*** Describe features found on the moon's surface. Identify some characteristics of the moon. Explain how the moon formed. ***Labs:*** Cape May Sunrise/Sunset Lab, Moon Phase Point of View Lab, Birthday Moon Lab, Eclipses & Tides Point of View Lab, Phases/Tides/Season's Rotation Lab	Standards 5.1.8 A-D 5.4.8 A1,A4 **COMMON CORE READING** RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 **Common Core Writing** WHST.6-8.2.A-F WHST.6-8.4 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9	Time Frame 4 Weeks

Physical Science	Life Science	Earth & Space Science	Engineering, Technology, & The Application of Science
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Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

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In considering phenomena, it is critical to recognize what is relevant at different measures of size, time and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

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For natural and build systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

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Unit Title: Universe, Galaxies, Solar System		
Content: ***Expanding Universe:*** State the Big Bang Theory. Explain how the solar system formed. Explain what astronomers predict about the future of the Universe. ***Galaxies:*** Define a star system. Identify the major types of Galaxies. Explain how astronomers describe the scale of the Universe. ***Solar System:*** Identify the Geocentric and Heliocentric systems. Recognize how scientists such as Copernicus, Galileo, and Kepler Contributed to acceptance of the Heliocentric system. Identify the objects that make up the solar system. ***The Sun:*** Name the three layers of the Sun's interior. Identify the three layers of the Sun's atmosphere. Describe features that form on or above the Sun's surface. ***Inner/Outer Planets:*** Describe the characteristics that the inner planets have in common. Identify the main characteristics that distinguish each of the Inner Planets. Describe characteristics that the Gas Giants have in common. Identify characteristics that distinguish each Outer Planet. ***Telescopes:*** Explain what telescopes are and how they work. Identify where most large telescopes are located. Explain the difference between a reflecting and refracting telescope. ***Labs:*** Model Expanding Universe Lab, Orbit of Planets Lab, Galaxy Lab Rotation, Count the Stars Random Sampling Lab	Standards 5.1.8 A-D 5.1.8 A3,A4 **COMMON CORE READING** RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 **Common Core Writing** WHST.6-8.2.A-F WHST.6-8.4 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9	Time Frame 2 weeks

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Unit Title: Rocks		
Content: ***Classifying Rocks*:** List the characteristics used to identify rocks. Identify and describe the three major groups of rocks. ***Igneous Rocks:*** Identify the characteristics used to classify Igneous Rocks. Describe ways in which Igneous Rocks are used. ***Sedimentary Rocks:*** Describe how Sedimentary Rocks form. List and describe the three major types of sedimentary Rocks. Explain how Sedimentary Rocks are used. ***Metamorphic Rocks:*** Describe how Metamorphic Rocks form. Identify the ways in which Geologists classify Metamorphic Rocks. Explain how Metamorphic Rocks are used. ***The Rock Cycle:*** Describe the Rock Cycle. ***Labs:*** Rock Cycle Processes Lab, Identify Rock Type Lab, Geology Dig Lab	Standards 5.1.8 A-D 5.4.8 C1,C2 **COMMON CORE READING** RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 **Common Core Writing** WHST.6-8.2.A-F WHST.6-8.4 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9	Time Frame 1 week

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Unit Title: Plate Tectonics, Earthquakes, and Volcanoes		
Content: ***Earth's Interiors*:** Explain how Geologists learn about Earth's Inner Structures. Identify the characteristic of Earth's Crust, Mantle, and Core. ***Convection In The Mantle:*** Explain how heat is transferred. Identify what causes Convection Currents. Describe Convection Currents in Earth's Mantle. ***Drifting Continents:*** Explain Alfred Wegener's hypothesis about the Continents. List the evidence used by Wegener to support his hypothesis. Explain why scientists of Wegener's time rejected his hypothesis. ***Sea-Floor Spreading:*** List the Evidence for Sea-Floor Spreading. Explain the process of Sea-Floor Spreading. Describe the process of subduction. ***The Theory of Plate Tectonics:*** Explain the Theory of Plate Tectonics. Describe the three types of Plate Bound. ***Forces in Earth's Crust:*** Explain how stress in the Earth's Crust changes Earth's surface. Describe where faults are usually found and why they form. Identify the land features that result from Plate Movement. ***Earthquakes and Seismic Waves:*** Describe how energy of an Earthquake travels through Earth. Identify the scales used to measure the strength of an Earthquake. Explain how scientists locate the epicenter of an Earthquake. ***Volcanoes and Plate Tectonics:*** Identify where Earth's Volcanic regions are located and explain why they are found there. Explain how Hot Spot Volcanoes form. ***Properties of Magma:*** Identify some Physical and Chemical Properties of Matter. Define viscosity. Explain what factors determine the viscosity of Magma. ***Labs:*** Scale Model Earth Layers Lab, Rock Cycle Processes Lab, Plate Tectonics Map Lab, Earth's Magnetic Field Lab, Rock Type/Identification Lab, Pangaea Lab, Earthquake Internet Lab, Mapping Earthquake & Volcano Zones Lab, Geode Lab.	Standards 5.1.8 A-D 5.3.8 E1-E2	Time Frame 4 Weeks

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Physical Science	Life Science	Earth & Space Science	Engineering, Technology, & The Application of Science
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CROSSCUTTING CONCEPTS

⊗ **Patterns** Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them. ⊗ **Cause and Effect: Mechanism and Explanation** Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.	⊗ **Scale, Proportion, and Quantity** In considering phenomena, it is critical to recognize what is relevant at different measures of size, time and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance. ⊗ **Systems and System Models** Defining the system under study – specifying its boundaries and making explicit a model of that system – provides tools for understanding and testing ideas that are applicable throughout science and engineering.	⊗ **Energy and Matter: Flows, Cycles, and Conservation** Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations. ⊗ **Structure and Function** The way in which an object or living thing is shaped and its substructure determine many of its properties and functions. ⊗ **Stability and Change** For natural and build systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

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SCIENTIFIC AND ENGINEERING PRACTICES

Asking Questions and Defining Problems

A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.

Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world.

Both scientists and engineers also ask questions to clarify the ideas of others.

Planning and Carrying Out Investigations

Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

Engineering investigations identify the effectiveness, efficiency, and durability of deigns under different conditions.

Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools-including tabulation, graphical interpretation, visualization, and statistical analysis-to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.

Engineering investigations include analysis of data collected in the tests of designs. This allows comparison of different solutions and determines how well each meets specific design criteria-that is, which design best solves the problem within given constraints. Like scientists, engineers require a range of tools to identify patterns within data and interpret the results. Advances in science make analysis of proposed solutions more efficient and effective.

Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Modeling tools are used to develop questions, predictions and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineered systems. Measurements and observations are used to revise models and designs.

Constructing Explanations and Designing Solutions

The products of science are explanations and the products of engineering are solutions.

The goal of science is the construction of the theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories. The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints.

Engaging in Argument from Evidence

Argumentation is the process by which explanations and solutions are reached.

In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to identify strengths and weaknesses of claims.

Using Mathematics and Computational Thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Statistical methods are frequently used to identify significant patterns and establish correlational relationships.

Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to acquire information that is used to evaluate the merit and validity of claims, methods, and designs.

Unit Title: Ocean Motions and Ocean Zones		
Content: ***Wave Action*:** Explain how waves form and describe the characteristics of waves. Describe how waves change as they near the shore. Explain how waves affect shorelines and beaches. ***Tides:*** Explain what causes Tides. Explain what affects the height of tides. Explain how tides are a source of energy. ***Ocean Water Chemistry:*** Describe the Salinity of Ocean Water. Explain how temperature and gas content of Ocean water vary. Describe how conditions in the ocean change with depth. ***Currents and Climate:*** Identify what causes surface currents and explain how surface currents affect climate. Identify the causes of deep currents and describe the effects that the currents have. Describe how Upwelling affects the distribution of nutrients in the ocean. ***Exploring the Ocean:*** Discuss the reasons that people have studied the Ocean. Identify the features and main sections of the ocean floor. Identify the Zones into which scientists divide the ocean. ***Ocean Habitats:*** Describe how marine organisms are classified. Identify the conditions that organisms in the Intertidal Zone must tolerate. Describe the conditions in the Neritic Zone. Describe the conditions in the Open Ocean Zone. ***Labs:*** Ocean Floor Feature Lab, 4 Ocean Map Lab, Classification of Ocean Life/Zones Lab, Horseshoe Crab Model Lab, Density Currents Lab, Shell Classification/Identification Lab, Composition of Sand lab, World Ocean Currents Map Lab, Wave Tank Lab, Water Cycle Lab, Where Does Water Come From? – Textbook Lab.	Standards 5.1.8 A-D 5.3.8 A1-A2 5.3.8 B1-B2	Time Frame 4 Weeks

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IX. MODIFICATIONS: INCLUSION TECHNIQUES/ENRICHMENTS

Possible instructional techniques may include but may not be limited to the following:

- Graphic Organizers/Structure/Routines
- Word Banks supplied for classwork, homework, quizzes and tests
- Hands on, Kinesthetic Opportunities
- Modify Assignments to Ability Level
- Provide Individual Assistance/Direct Instruction
- Frequent encouragement/positive feedback
- Frequent opportunities to respond
- Provide signals/cues to communicate
- Highlight Important Information
- Allow Oral Responses to written essay questions
- Allow students to verbalize before writing
- Use computers, calculators, audio materials where necessary
- Provide Strong Peer Lab Partners
- Extended time for assessments, assignments, and experiences
- Read Tests, Directions, and information aloud
- Restate, reword, clarify and have young scientists do the same
- Provide manipulative materials to assist in understanding
- Provide study guides, copies of notes, and content information
- Redirect scientists to keep focus
- Provide breaks when frustration levels rise
- Check Science Notebooks frequently
- Reteach lesson using small group instruction
- Monitor progress during lessons and labs
- Shorten and chunk assignments to focus on mastery
- Supply mnemonic devices

X. INTERDISCIPLINARY CONNECTIONS/MULTICULTURAL MATERIALS

Videos:

Bill Nye "Measuring In Science"
Bill Nye "Chemistry"
Bill Nye "Seasons"
Eyewitness Video "The Planets"
Discovery Channel: Understanding the Universe
Eyewitness Video "Shells"
PBS "Secret Life of the Ocean Realm"

Art:

"All About Me" Pennant Get to Know You-First Day Activities
Physical Challenge Project: Physically Changes Index Card
Super Heroes of the Periodic Table
I LOVE SCIENCE Valentine card
3D Planet Earth

Music:

Classical Music while working independently
Periodic Table Rap
Water Cycle Song

Other:

Element Poetry/Limerick

XI. MATERIALS/TECHNOLOGY

Prentice Hall Earth Science 2009

Mimio/Smart Board

Mimio Voters

Laptops

Document Camera

Compound Microscopes

Dissecting Microscopes

Triple Beam Balances

Graduated Cylinders

Test Tubes

Metric Rulers

Yearly Orders from the following vendors:

Science Kit and Boreal Lab

Educational Innovations

Teacher Discovery

School Specialty

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