Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe educational environment for all students to attain the skills and knowledge specified in the New Jersey Core Curriculum Content Standards at all grade levels so as to ensure their full participation in our global society as responsible, self-directed, and civic-minded citizens.*

Course Title:	Advanced Science
Grade Level(s):	7th

Duration:	*Full Year:*	X	*Semester:*		*Marking Period:*	
Course Description:	The Washington Township School District seventh grade science curriculum uses an integrated approach to general science that focuses with units on physical, life, and earth science. By using this approach, teachers are able to meets the needs of all students while aligning with the New Jersey Model Curriculum and the Next Generation Science Standards. Hands on activities are stressed and include student discovery, laboratory experiments, problem solving, model building, cooperative learning, computer usage, classroom discussion, teacher demonstrations, and writing opportunities for research and self-expression. Interdisciplinary subject areas are incorporated whenever possible. Students are introduced to the use of scientific tools and methods used for investigations.					
Grading Procedures:	Tests – 35% Quizzes – 20% Labs/Projects - 30% Homework/Class work – 15%					
Primary Resources:	Pearson Realize – Interactive Science 21st Century Learner Framework					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

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Under the Direction of:	Dr. Patricia Hughes

Written: _____

Revised: _____

BOE Approval: _____

Unit Title: Physical Science - Introduction to Chemistry

Unit Description: Students will be introduced to chemistry through three chapters of science instruction. Students will be learn about the three states of matter, how matter changes states, and how gas behaves, including Charles's and Boyle's Laws. In the second chapter, students will learn about atoms and bonding, including the periodic table, ionic and covalent bonds, and bonding in metals. The introduction to chemistry will end with chemical reactions. Students will observe chemical changes and finish the unit by describing and controlling chemical reactions.

Unit Duration: about 4 weeks

Desired Results

Standard(s):

Chapter 1 – Solids, Liquids, and Gases – MS–PS1–2; MS–PS1–4
Chapter 2 – Atoms and Bonding – MS–PS1–1
Chapter 3 – Chemical Reactions – MS–PS1–5; MS–PS1–6

Indicator(s):

Chapter 1 – PS1.A Structures and Properties of Matter, PS1.B Chemical Reactions, PS3.A Definitions of Energy
Chapter 2 – PS1.A Structures and Properties of Matter
Chapter 3 – PS1.B Chemical Reactions, ETS1.B Developing Possible Solutions, ETS1.C Optimizing the Design Solution

Understandings:

Students will ……

Chapter 1

Lesson 1

- Apply scientific principles to describe the motion of particles in a solid.
- Construct a scientific explanation based on evidence to describe the motion of particles in a liquid.
- Use mathematical representations to describe the motion of particles in a gas.

Lesson 2

- Construct a scientific explanation based on evidence to describe what happens to a substance during changes between solid and liquid.
- Apply scientific principles to explain what happens to a substance during changes between liquid and gas.
- Gather and synthesize information to explain what happens during changes between a solid and gas.

Lesson 3

- Apply scientific principles to explain how pressure and temperature of a gas are related.
- Use mathematical representations to explain how volume and temperature of a gas are related.
- Develop and use models to explain how pressure and volume of a gas are related.

Chapter 2

Lesson 1

- Gather and synthesize information to describe a model of the atom.
- Construct a scientific explanation based on evidence to describe what determines an element's chemistry.

Essential Questions:

Chapter 1 - Solids, Liquids, and Gases

- Why does a substance change states?

Chapter 2 - Atoms and Bonding

- How can bonding determine the properties of a substance?

Chapter 3 - Chemical Reactions

- How is matter conserved in a chemical reaction?

Lesson 2 • Gather and synthesize information to describe how ions form. • Use mathematical representations to explain how the formulas and names of ionic compounds are written. • Gather and synthesize information to identify properties of ionic compounds. *Lesson 3* • Develop and use models to describe how atoms are held together in a covalent bond. • Apply scientific principles to identify the properties of molecular compounds. • Apply scientific principles to explain how bonded atoms become partially charged. *Lesson 4* • Develop and use models to describe the structure of a metal crystal. • Gather and synthesize information to identify the properties of metals. *Chapter 3* *Lesson 1* • Construct a scientific explanation based on evidence to describe changes in matter. • Apply scientific principles to identify ways to tell that a chemical reaction occurred. *Lesson 2* • Develop and use models to identify the information included in a chemical reaction. • Apply scientific principles to explain how mass is conserved during a chemical reaction. • Use mathematical representations to identify three categories of chemical reactions. *Lesson 3* • Apply scientific principles to explain how activation energy is related to chemical reactions. • Gather and synthesize information to identify factors that affect the rate of a chemical reaction.	

Assessment Evidence

Performance Tasks: (Expectation Activities)

- Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- Develop models to describe the atomic composition of simple molecules and extended structures.
- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

Other Evidence:

- Lesson quizzes
- Chapter Tests
- Labs
- Performance Assessments
  - Chapter 1 – Balloon Graph
  - Chapter 2 – Bonds and Compounds
  - Chapter 3 – Chemical Reactions

Chapter 1
Lab – Melting Ice (Vernier Temperature Probe Lab) or My Glass is Leaking (Scenario Investigation)

Chapter 2
Lab – Shedding Light on Ions (Vernier Conductivity Probe Lab) or Bonding Super Heroes (Scenario Investigation)

	Chapter 3 **Lab –** Where's the Evidence or The Pipeline is Burning (Scenario Investigation) • Performance Expectation Activities (Pearson Realize) • Unit PBL – StemQuest – Hot and Cold Chemistry
Benchmarks: to be determined	

Learning Plan

Learning Activities:

Chapter 1 - Solids, Liquids and Gases

Lesson 1 – States of Matter (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will investigate solids, liquids, and gases. Discuss their observations. Have students do the After the Inquiry Warm-Up worksheet. Talk about how they classified the three different states of matter in the activity. Have volunteers share their answers to question 4 about whether or not more gas will be produced.
- Focus on the Inquiry Skill for the lesson. Point out that when you infer, you use information and prior knowledge to draw a conclusion. What could be inferred about the state of matter inside the balloon in the Inquiry Warm-Up activity? *(The balloon is full of gas.)*
- Build Inquiry by giving students the opportunity to examine a crystalline solid.
- Support the Big Q by differentiating between crystalline solids and amorphous solids.
- Do the Teacher Demo to show students the shapes of the fragments of sugar and chocolate in order to help them classify solids.
- Assign the Quick Lab for students to explore the arrangements of particles in solids.
- Have students do the second Quick Lab to compare the viscosity of two different liquids and then share their results.
- Do the Teacher Demo to demonstrate gas pressure.
- Do the Quick Lab to reinforce understanding of how gas particles move.
- Have students take the Lesson Quiz.

Lesson 2 – Changes of State (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will make fog form on a mirror. Discuss what happened to the mirror during the investigation. Have students do the After the Inquiry Warm-Up worksheet. Talk about why fog formed on the mirror. Have volunteers share their answers to question 4 about what will cause the mirror to fog more.
- Focus on the Inquiry Skill for the lesson. Point out that when you predict, you apply your prior knowledge to a new situation. What was predicted in the Inquiry Warm-Up activity? *(I predicted that cooling the mirror would make it fog more.)*
- Do the Teacher Demo to measure the melting point of water. Review the differences between a solid and liquid before beginning the Apply It activity. Ask volunteers to share their comparisons.
- Do the Lab Investigation to explore how the temperature of surroundings affects the rate at which ice melts.
- Build Inquiry by experimenting with evaporation. Have students do the Quick Lab to explore how temperature is affected by evaporation and then share their results.
- Explore the Big Q by examining what happens to water as it changes states.
- Do the Quick Lab to explore what happens when dry ice is placed in water. Have students explain why a substances changes states to Answer the Big Q.
- Have students take the Lesson Quiz.

Lesson 3 – Gas Behavior (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will learn how air can keep chalk from breaking. Discuss the effects of dropping the chalk in each situation. Have students do the After the Inquiry Warm-Up worksheet. Talk about what would happen to the chalk if the air bubbles in the bubble wrap were popped before dropping it. Have volunteers share their answers to question 4 about how the air particles cushion the chalk's fall.

- Focus on the Inquiry Skill for the lesson. Point out that when you graph, you depict the relationship between at least two quantities. What information can be graphed from the activities in the Inquiry Warm-Up activity? *(How many pieces the chalk broke into depending on what material protected it)*
- To Support the Big Q, discuss how thermal energy affects solids, liquids, and gases.
- Have students do the Quick Lab to explore gas pressure at different temperatures.
- Do the second Quick Lab to explore what happens to a balloon as it is heated and cooled.
- During the Lab Investigation students will explore how the volume of the air in a syringe is affected by pressure.
- Have students take the Lesson Quiz.

Chapter 2 - Atoms and Bonding

Lesson 1 – Atoms, Bonding, and the Periodic Table (2-3 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will investigate the periodic tables. Discuss what an element's atomic number represents. Have students do the After the Inquiry Warm-Up worksheet. Talk about the trends students noticed in the periodic table. Have volunteers share their answers to question 4 about how many electrons are in a phosphorous atom.
- Focus on the Inquiry Skill for the lesson. Point out that when you predict, you use your experiences or evidence to make inferences. How did students predict the number of electrons in a phosphorous atom in the Inquiry Warm-Up activity? *(Based on question 4, I know that phosphorous' atomic number is 15. Also, I remember that the atomic number is equivalent to the number of electrons. So the number of electrons in phosphorous is equivalent to the atomic number 15.)*
- To Support the Big Q, discuss how noble gases differ from all other groups.
- Review which electrons are represented in an electron dot diagram before beginning the Apply It activity. Ask volunteers to share their predictions.
- Do the Teacher Demo to show students the reactivity of alkaline earth metals.
- Have students do the Quick Lab to determine an element's chemistry and then share their results.
- Have students take the Lesson Quiz.

Lesson 2 – Ionic Bonds (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will investigate how ions are formed. Discuss what the checkers model. Have students do the After the Inquiry Warm-Up worksheet. Talk about what happens to the charge when electrons are exchanged to form ions. Have volunteers share their answers to question 4 about why electrons moved but the protons did not.
- Focus on the Inquiry Skill for the lesson. Point out that when you interpret data, you look for patterns or trends in the given information. What trend could be noticed in the Inquiry Warm-Up activity? *(The electrons moved but the protons did not.)*
- Have students do the Quick Lab to see how ions form and then share their results.
- Review groups and valence electrons before beginning the Apply It Activity. Ask volunteers to interpret data.
- Do the Quick Lab to reinforce understanding of how to form balanced compounds.
- Review the meaning of superscripts and subscripts in ionic formulas before assigning the Apply It Activity.
- To Support the Big Q, use Figure 6 to illustrate the electrical conductivity of ionic compounds.
- Use the Teacher Demo to model the high melting point of an ionic compound.
- Have students do the Lab Investigation to explore and classify the electrical conductivity of solutions.
- Have students take the Lesson Quiz.

Lesson 3 – Covalent Bonds (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will investigate covalent bonds. Discuss what happened when the rod was placed near the liquid with covalent bonds. Have students do the After the Inquiry Warm-Up worksheet. Talk about what happens when a negatively charged object is put near a stream of liquid with covalent bonds. Have volunteers share their answers to question 4 about how a stream of liquid with covalent bonds reacts to positively charged objects.
- Focus on the Inquiry Skill for the lesson. Point out that when you graph, you compare or present data for analysis. What data from the Inquiry Warm-Up activity could be graphed? *(The movement of the water depending on the distance of the charged rod from the water)*
- Review how to locate the number of valence electrons using the periodic table before beginning the Apply It Activity. Ask volunteers to share their diagrams.
- Have students do the Quick Lab to model how atoms share electrons and then share their results.
- Do the Quick Lab to reinforce understanding of how knowing the properties of a compound will help you classify it.
- To Explore the Big Q, help students identify the properties of the compounds in the Dead Sea.
- Have students do the Quick Lab to explore surface tension.
- Have students Answer the Big Q and share their responses.

- Have students take the Lesson Quiz.

Lesson 4 – Bonding in Metals (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will investigate what happens to the nails and bolt when they are exposed to salt water. Discuss how the nails and bolt changed. Have students do the After the Inquiry Warm-Up worksheet. Talk about how rust forms. Have volunteers share their answers to question 4 about which object contains the most iron.
- Focus on the Inquiry Skill for the lesson. Point out that when you classify, you group items that are similar together. How could objects be classified in the Inquiry Warm-Up activity? *(By the properties of the objects)*
- Have students do the Quick Lab to describe the characteristics of metal crystals.
- Support the Big Q by discussing the properties of metal demonstrated by the forming of a wire.
- Do the Teacher Demo to reinforce the properties of metals.
- Review the properties of metals and their definitions before beginning the Apply It activity. Ask volunteers how they classified the items.
- Do the Quick Lab to allow students to determine the properties of metals by manipulating samples.
- Have students take the Lesson Quiz.

Chapter 3 - Chemical Reactions

Lesson 1 – Observing Chemical Change (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will observe a chemical reaction. Discuss their observations of the substances before the chemical reaction. Have students do the After the Inquiry Warm-Up worksheet. Talk about how the substances changed after the chemical reaction. Have volunteers share their answers to question 4 about the temperature of the cup holding the mixture.
- Focus on the Inquiry Skill for the lesson. Point out that when you graph, you chart comparisons between two variables. What two variables could be graphed in the Inquiry Warm-Up activity? *(The temperature of the elements at different points during the chemical reaction)*
- Review the definitions for physical change and chemical change before assigning the Apply It activity.
- To Support the Big Q, discuss how atoms are rearranged in a chemical reaction.
- Have students do the Quick Lab to observe a chemical change and identify evidence that a chemical change has taken place, and then share their results.
- Do the first Teacher Demo to show students how to recognize that a chemical reaction has taken place.
- Do the second Teacher Demo to show students that toasting is an endothermic reaction.
- Have students do the Lab Investigation to observe different types of evidence of chemical reactions.
- Have students take the Lesson Quiz.

Lesson 2 – Describing Chemical Reactions (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will model what happens during a chemical reaction by using coins. Discuss what the coins represent. Have students do the After the Inquiry Warm-Up worksheet. Talk about the law of conservation of mass. Have volunteers share their answers to question 4 about what they know about the atoms in the chemical equation.
- Focus on the Inquiry Skill for the lesson. Point out that when you make models, you represent a situation in order to more closely examine it. What was modeled in the Inquiry Warm-Up activity? *(A chemical reaction.)*
- Review the concept of a chemical equation in regards to the reactants and products before beginning the Apply It Activity. Ask volunteers to share their models.
- Have students do the Quick Lab to explore chemical questions by making models of the parts of the equations.
- Have students do the Build Inquiry activity to model the law of conservation of mass using nuts, bolts, and a balance. The second Build Inquiry activity models how equations can be balanced by adding complete molecules of reactants and products.
- Explore the Big Q by discussing how matter is conserved during a chemical reaction.
- Do the Quick Lab to reinforce understanding of the law of conservation of mass. Answer the Big Q by discussing the ways in which matter is conserved during a chemical reaction.
- Have students do the Build Inquiry activity to model a single replacement reaction.
- Review the definitions and examples of the three types of chemical reactions before beginning the Apply It Activity.
- Do the Quick Lab to model the three types of chemical reactions.
- Have students take the Lesson Quiz.

Lesson 3 – Controlling Chemical Reactions (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will explore the effect of temperature on the rate of a chemical reaction. Discuss students' initial observations of iodine and

vitamin C. Have students do the After the Inquiry Warm-Up worksheet. Talk about what this activity tested. Have volunteers share their answers to question 4 about what they concluded about the reaction rate.

- Focus on the Inquiry Skill for the lesson. Point out that when you predict, you use what you already know to draw a conclusion. What was predicted based on the Inquiry Warm-Up activity? *(Heating a solution increases the reaction rate.)*
- Have students do the Quick Lab to model activation energy and then share their results.
- To Support the Big Q, discuss how glow sticks obey the law of conservation of mass and then ask students what type of a chemical reaction takes place in a glow stick.
- Review how temperature affects the rate of reaction before beginning the Apply It activity. Ask volunteers to share their responses.
- Build Inquiry with students to reinforce how surface area affects reaction rates.
- Do the Quick Lab to explore how increasing temperature speeds up a reaction.
- Have students take the Lesson Quiz.

*All activities, labs, assessments, performance expectations, etc. can be found within the Pearson Interactive Online Program.

Unit Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

Standard(s): MS-PS1-1 – Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.]

4.0	Students will be able to: • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	Students will be able to: • Develop models to describe the atomic composition of simple molecules and extended structures.
2.0	Students will be able to: • Recognize or recall specific vocabulary(for example, actual mass, atomic composition, atomic weight, extended structure, molecular arrangement, molecular level, molecule, simple molecules (Such as ammonia and methanol) and extended structures (such as chloride or diamonds) • Describe the individual components of the atomic composition of molecules.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): MSPS1-4 - Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

4.0	Students will be able to: • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.

3.0	Students will be able to: • Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]
2.0	Students will be able to: • Recognize or recall specific vocabulary(for example , boiling point, chemical compound, chemical element, chemical energy, chemical reaction, concentration of reactants, density, flammability, food oxidation, property, reaction rate, rusting, solubility, substance, surface area of reactants.) • Describe signs or signals that indicate a chemical reaction. • Describe how a substance changes before and after a chemical reaction.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): MSPS1-5-Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]	
4.0	Students will be able to: • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	Students will be able to: • Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved (for example, apply the law of conservation of matter to create physical models or drawings that represent atoms before and after a chemical reaction).
2.0	Students will be able to: • Recognize or recall specific vocabulary (for example, atom, chemical reaction, conserve, law of conservation of matter, mass, molecule, property). * Describe the basic nature of a chemical reaction. * Describe the atomic structure of a molecule.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): MSPS1-6 - Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.[Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.	
4.0	Students will be able to: • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	Students will be able to: • Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. (for example, create a device whose substances chemically react, and modify the type and concentration of those substances to control the transfer of energy into the environment).

2.0	Students will be able to: • Recognize and recall specific vocabulary (for example, absorb, chemical compound, chemical element, chemical energy, chemical process, chemical reaction, concentration, concentration of reactants, device, energy, environment, release, substance, thermal energy, transfer of energy). • Describe chemical processes that release or absorb thermal energy.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Unit Modifications for Special Population Students	
Advanced Learners	Enrichment Worksheets
Struggling Learners	Use L1 Differentiated Instruction Activities
English Language Learners	Use ELL Support Activities from lesson as needed.
Special Needs Learners	Use L1 Differentiated Instruction Activities.

Unit Title: Life Science

Unit Description: The Advanced Students will be introduced to life science through five chapters of instruction using an inquiry style of instruction. They will be exploring cells and microscopy in the first chapter (Chapter 4). Chapter 5 discusses cell processes like photosynthesis, cellular respiration, fermentation and cell division. In Chapter 6, students will learn about topics in genetics by looking at Mendel's experiments and describing how traits are inherited. Punnett squares will be used to explain the probability of organisms inheriting traits. Delving further into heredity in Chapter 7, students will explore the discovery of DNA, genotypes, the production of proteins, mutations, human inheritance, selective breeding and genetic engineering. Chapter 8 introduces the student to the processes of the human body. They will look at the organization of the body, the various systems and homeostasis. Our last life science chapter is chapter 9 where the students will explore systems like the nervous system and the endocrine system and how the body reacts to the information produced by these systems. In the last sections of Chapter 9, students will be learning about human reproduction and the systems and processes involved, finishing with pregnancy and birth.

Unit Duration: About 17 weeks

Desired Results

Standard(s):

Chapter 4: Introduction to Cells - MSLS1-1, MSLS1-2

Chapter 5: Cell Processes and Energy - MSLS1-6

Chapter 6: The Science of Heredity - MSLS3-2

Chapter 7: DNA: The Code of Life – MSLS3-1, MSLS4-5

Chapter 8: Introduction to the Human Body – MSLS1-3

Chapter 9: Controlling Body Processes – MSLS1-8

Indicators:

Chapter 4: LS1.A Structure and Function

Chapter 5: LS1.C Organization for Matter and Energy Flow in Organisms, PS3.D Energy in Chemical Processes and Everyday Life

Chapter 6: LS1.B Growth and Development of Organisms, LS3.A Inheritance of Traits, LS3.B Variation of Traits

Chapter 7: LS3.A Inheritance of Traits, LS3.B Variation of Traits

Chapter 8: LS1.A Structure and Function

Chapter 9: LS1.D Information Processing

Understandings:

Students will ……

- Gather and synthesize information to explain what cells are. (C4L1)
- Apply scientific principles to describe how scientists first observed cells and developed the cell theory. (C4L1)
- Construct an explanation for how microscopes produce magnified images. (C4L1)
- Develop and use a model to describe the functions of cell structures and organelles. (C4L2)
- Apply scientific principles to describe how cells are organized in many-celled organisms. (C4L2)
- Gather and synthesize information to define elements and compounds. (C4L3)
- Apply scientific principles to identify the main compounds that are important in cells. (C4L3)
- Apply scientific principles to describe how materials move into and out of cells. (C4L4)
- Gather and synthesize information to explain how living things get energy from the sun. (C5L1)
- Develop and use models to describe what happens during photosynthesis. (C5L1)
- Develop and use models to explain the events that occur during respiration. (C5L2)
- Gather and synthesize information to explain what happens during fermentation. (C5L2)
- Apply scientific principles to explain the functions of cell division. (C5L3)
- Develop and use models to explain the events that take place during the stages of mitosis. (C5L3)
- Evaluate Mendel's experimental design and describe the results of his experiments. (C6L1)
- Construct a scientific explanation based on evidence to describe the role of alleles in the inheritance of traits. (C6L1)
- Use mathematical representations to define probability and describe how it helps explain the results of genetic crosses. (C6L2)
- Apply scientific principles to explain what is meant by phenotypes and genotype.
- Construct a scientific explanation based on evidence to describe at least three complex patterns of inheritance. (C6L3)
- Apply scientific principles to discuss how characteristics result from inheritance and environmental factors. (C6L3)

Essential Questions:

Chapter 4 – Introduction to Cells

- What are cells made of?

Chapter 5 – Cell processes and Energy

- How do living things get energy?

Chapter 6 – The Science of Heredity

- Why don't offspring always look like their parents?

Chapter 7 – DNA: The Code of Life

- What does DNA do?

Chapter 8 – Introduction to the Human Body

- How does your body work?

Chapter 9 – Controlling Body Processes

- What systems regulate and control body processes?

• Apply scientific principles to describe the role chromosomes and genes play in inheritance. (C6L4) • Develop and use a model to identify the events that occur during meiosis and fertilization. (C6L4) • Develop and use a model to describe the structure of DNA. (C7L1) • Construct a scientific explanation to describe how DNA copies itself. (C7L1) • Develop and use a model to describe how a cell produces proteins. (C7L2) • Apply scientific principles to identify how mutations can affect an organism. (C7L3) • Develop and use models to explain how cancer is related to mutations and the cell cycle. (C7L3) • Apply scientific principles to identify some patterns of inheritance in humans. (C7L4) • Gather and synthesize information to describe the functions of the sex chromosomes. (C7L) • Gather and synthesize information to identify the levels of organization in the body. (C8L1) • Construct a scientific explanation based on evidence for how skeletal and muscular systems work together. (C8L2) • Analyze data to describe which body systems work together to gain and transport materials. (C8L2) • Gather and synthesize information about the body systems that control communication and regulations. (C8L2) • Gather and synthesize information to define homeostasis and explain how systems interact to maintain homeostasis. (C8L3) • Gather and synthesize information to identify the functions of the skeleton. (C8L4) • Develop and use models to explain the role that joints play on the body. ((C8L4) • Analyze data to describe the characteristics of bones and to explain how to keep bones healthy and strong. (C8L4) • Interpret and analyze data to identify the types of muscles found in the body. (C8L5) • Construct a scientific explanation based on evidence to describe how skeletal muscles work in pairs. (C8L5) • Develop and use models to describe the functions and structures of the skin. (C8L6) • Gather and synthesize information to identify the functions of the nervous system. (C9L1) • Construct a scientific explanation based on evidence to describe the parts of the nervous system and how each part functions. (C9L1) • Analyze data to describe how the senses work. (C9L1) • Gather and synthesize information to describe how the glands of the endocrine system control body processes. (C9L2) • Analyze data to explain how negative feedback controls hormone levels. (C9L2)	

- Gather and synthesize information to describe the structures and functions of the male and female reproductive system. (C9L3)
- Develop and use models to sequence the events that occur during the menstrual cycle. (C9L3)
- Gather and synthesize information to list the stages of human development that occur before birth. (C9L4)
- Interpret and analyze data to explain how developing embryo is protected and nourished. (C9L4)
- Construct a scientific explanation based on evidence to describe what happens during childbirth. (C9L4)

Assessment Evidence

Performance Tasks: (Expectation Activities)

- Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- Develop and use a model to describe the function of a cell as a whole and the ways parts of a cell contribute to its function.
- Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- Develop and use a model to describe why structural changes to genes(mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
- Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Other Evidence:

- Lesson Quizzes
- Chapter Tests
- Labs
- Performance Assessments*
  - Chapter 4 - The Cell Game (Scenario Investigation) or Design and Build a Microscope Lab investigation
  - Chapter 5 - Energy Boosters (STEM Activity) or Exhaling Carbon Dioxide Lab Investigation
  - Chapter 6 - We All Have It, So It Must Be Dominant (Scenario Investigation) or Make the Right Call Lab Investigation
  - Chapter 7 - The WWGP (Scenario Investigation) or How Are Genes on Sex Chromosomes Inherited? Lab Investigation
  - Chapter 8 - Working Together Is the Key (Scenario Investigation) or A Look Beneath the Skin Lab Investigation
  - Chapter 9 - Stay Calm if You Can (Scenario Investigation) or Ready or Not! Lab Investigation
- Performance Expectation Activities (Pearson Realize)
- Unit PBL – StemQuest – Funky Fruit

*Additional or alternate performance assessments may be used.

Benchmarks: To be determined.

Learning Plan

Learning Activities:

Chapter 4 - Introduction to Cells

Introduce Big Q and Show Untamed Science Video – Touring Hooke's Crib

Lesson 1 – Discovering Cells (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will observe newspaper photographs and determine that each image is made up of tiny dots they cannot normally see.
- The After the Inquiry Warm-Up worksheet sets up a discussion about how a magnifying lens can help you see very small objects.
- Have volunteers share their answers to question 4, predicting what they could see with a more powerful magnifying lens.
- Focus on the Inquiry Skill for the lesson. Remind students how to use the millimeter markings of a metric ruler. Make sure students remember that a unit should always be included as part of a measurement.
- How could measurement have been used in the Inquiry Warm-Up Activity? *(Sample: A metric ruler could have been used to measure the size of the dots.)*
- Have students do the Quick Lab and share what they observed about the characteristics of plant and animal cells.
- Support the Big Q by discussing Hooke's observations of the walls of cells that are no longer living. Have students do the Quick Lab exploring living cells under the microscope.
- Build Inquiry to allow students to use magnifying glasses with varying strengths. Before beginning the Apply It activity, show students a plastic millimeter ruler. Allow them to feel the ridges that indicate millimeters.
- Do the Teacher Demo to allow students to compare images taken with both light and electron microscopes. Have students do the Lab Investigation exploring how microscopes work by designing and building a basic compound microscope.
- Have students take the Lesson Quiz.

Lesson 2 – Looking inside Cells (4 class periods)

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will estimate how tall they are in cells.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the size of a single-celled organism.
- Have volunteers share their answers to question 4, describing the differences between an amoeba cell and a human body cell.
- Focus on the Inquiry Skill for the lesson. Remind students that models can help them understand things that are too small to observe directly. Mental models can be made by applying what they know about a familiar set of relationships to a new situation. What mental model could students use in the Inquiry Warm-Up Activity? *(Accept reasonable answers.)*
- Explore the Big Q by using Figure 3 to discuss the specialized structures of plant and animal cells.
- Do the Teacher Demo allowing students to compare slides of plant and animal cells to drawings of other types of cells.
- Before beginning the Apply It Activity, review the parts of a cell and their functions.
- Do the Teacher Demo to show the function of plant vacuoles.
- Have students do the Quick Lab exploring cell structures by making a model with gelatin and other materials.
- Answer the Big Q by leading a class discussion about what comprises cells.
- Have students do the Quick Lab and then share their models of the organization of a multicellular organism.
- Have students take the Lesson Quiz.

Lesson 3 – Chemical Compounds in Cells (2 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will perform an experiment to find out which foods contain starch.
- The After the Inquiry Warm-Up worksheet sets up a discussion about foods that contain starch. Have volunteers share their answers to question 4, sharing their ideas for experiments that determine which foods contain fat.
- Focus on the Inquiry Skill for the lesson. Remind students that they draw conclusions by summing up what they have learned from a set of data. What conclusion did students draw about the starch content of granulated sugar in the Inquiry Warm-Up Activity? *(Since the sugar didn't darken when the iodine was placed on it, I drew the conclusion that sugar does not contain starch.)*
- Have students do the Quick Lab examining different compounds and learning what elements are components of the compound.
- Support the Big Q by reviewing the importance of proteins and lipids to the health of cells.
- Do the Teacher Demo to demonstrate what water does for cells.
- Have students do the Quick Lab to explore the effect of saliva enzymes on starch.
- Have students take the Lesson Quiz.

Lesson 4 – The Cell in Its Environment (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will determine how long it takes for a drop of dye to spread through a container of water.
- The After the Inquiry Warm-Up worksheet sets up a discussion about how molecules spread from one point.
- Have volunteers share their answers to question 4 about whether food coloring would spread faster or slower in ice water than in room temperature water.
- Focus on the Inquiry Skill for the lesson. Remind students that when they predict, they use their knowledge of cause and effect to make an inference about a future event. What prediction did students make in question 4 in the Inquiry Warm-Up Activity? *(The food coloring would spread more slowly in colder water.)*
- Do the Teacher Demo to model the function of cell membranes. Build Inquiry to model Brownian Motion.
- Before beginning the Apply It activity, make sure that students understand the relationship between cell radius and cell area.
- Have students do the Quick Lab investigating how the concentration of a substance affects its rate of diffusion.

- Have students take the Lesson Quiz.

Chapter 5 - Cell Processes and Energy

Introduce Big Q and Show Untamed Science Video – Ymm... Eating Solar Energy

Lesson 1 – Photosynthesis (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will determine the source of energy that powers a solar-powered calculator.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the types of energy used to power a solar-powered calculator.
- Have volunteers share their answers to question 4, explaining why they think some solar-powered calculators also have batteries.
- Focus on the Inquiry Skill for the lesson. Remind students that when they classify, they group together items that are alike in some way. By organizing items according to similarities, the relationships among the items become easier to understand.
- How can students classify the type of energy that powered the calculator in the Inquiry Warm-Up Activity? *(Types of light—light from the sun and light from an electrical light)*
- Support the Big Q by discussing some of the ways animals use energy and the source of their energy.
- Review Figure 1 before beginning the Apply It activity. Check that students show an energy path that goes from the sun to the plant to the caterpillar to the spider.
- Have students do the Quick Lab looking for photosynthetic activity in *Elodea.*
- Do the Teacher Demo to show a leaf's response to light.
- Have students do the Quick Lab to explore the pigments in a leaf using coffee-filter chromatography.
- Have students take the Lesson Quiz.

Lesson 2 – Cellular Respiration (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will observe the activities of yeast and determine one of the products of respiration.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the products of respiration.
- Have volunteers share their answers to question 4 about how the presence of sugar affected the results of the experiment.
- Focus on the Inquiry Skill for the lesson. Remind students that an experiment should have only one independent variable so that the results can be interpreted in terms of the effect of that variable. What variable was discussed in question 2 in the Inquiry Warm-Up Activity? *(The effect of boiling on yeast)*
- Have students do the Lab Investigation to explore the relationship between exercise and the amount of carbon dioxide exhaled.
- Before beginning the Apply It activity, review the characteristics of alcoholic fermentation.
- Explore the Big Q by helping students understand that while only producers carry out photosynthesis, both producers and consumers carry out cellular respiration.
- Have students do the Quick Lab exploring the production of carbon dioxide as a result of fermentation when yeast is exposed to sugar.
- Answer the Big Q by leading a class discussion about the ways that living things get energy.
- Have students take the Lesson Quiz.

Lesson 3 – Cell Division (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will observe the activity of yeast cells under a microscope.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the process of cell division that occurs in all living organisms.
- Have volunteers share their answers to question 4, giving their ideas for another hypothesis and explaining what the "double cells" may be undergoing.
- Focus on the Inquiry Skill for the lesson. Remind students of the importance of interpreting data in order to use that data to identify trends or patterns in measurements or observations. How did students interpret data to answer the questions in the Inquiry Warm-Up Activity? *(Answers will vary. If students hypothesized that the "double cells" were single cells in the process of splitting, they should say that some of the single cells will divide into double cells and then split into two cells.)*
- Have students do the Quick Lab to observe mitosis.
- Before beginning the Apply It Activity, make sure students understand the mathematical operation they are using to solve the problem—doubling the number.
- Build Inquiry to model the stages of the cell cycle.
- Build Inquiry again by comparing the number of chromosomes in the cells of a variety of organisms.
- Support the Big Q by explaining that energy is required for cell division and that energy is produced during cellular respiration.
- Do the Teacher Demo to demonstrate that different organisms may have different patterns of cytokinesis.
- Have students do the Quick Lab to explore the process of mitosis by constructing a model.

- Have students take the Lesson Quiz.

Chapter 6 - Genetics: The Science of Heredity

Introduce Big Q and Show Untamed Science Video – Where'd You Get Those Genes?

Lesson 1 – What is Heredity? (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will investigate what the unknown father of a kitten looks like. Discuss the physical characteristics of the kitten and the mother.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about what predictions they could somewhat accurately make based on the descriptions of the mother and the kittens.
- Have volunteers share their answers to question 4 about whom the orange and black kittens might look like.
- Focus on the Inquiry Skill for the lesson. Point out that when you predict, you use evidence to make inferences about a future event.
- What were students trying to predict in the Inquiry Warm-Up activity? *(How the father of the kittens looks)*
- Have students do the Quick Lab to examine the parts of a flower.
- Do the Teacher Demo to give students the opportunity to observe the cross-pollination of fruit flies in order to determine dominant and recessive traits.
- Use the Support the Big Q to illustrate the idea that traits are determined by individual, separate alleles inherited from each parent.
- Remind students that the principles which apply to the genetics of pea plants also apply to fruit flies before beginning the Apply It activity.
- Ask volunteers to share their predictions.
- Do the Quick Lab to determine which alleles come from the parent generation.
- Have students take the Lesson Quiz.

Lesson 2 – Probability and Heredity (4 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will investigate probability by tossing coins. Discuss how to calculate what percent of your own coin tosses landed heads up.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about how probability does not change even when you complete a number of trials.
- Have volunteers share their answers to question 4 about the probability of a coin landing on heads or tails when you toss it a second time.
- Focus on the Inquiry Skill for the lesson. Point out that when you draw conclusions, you sum up what you have learned from your studies or experiences.
- Based on the Inquiry Warm-Up activity, what conclusion can students draw about the probability of a coin landing tails up when you flip it? *(It is equally likely to land on tails as it is on heads.)*
- Do the Teacher Demo to reinforce the idea that a Punnett square just predicts probability while the actual outcome may not be exactly the same.
- Have students do the Quick Lab to explore how alleles combine, and then ask them to share their results.
- To Support the Big Q, identify and explain the terms used to describe the make up of an organism's genotype.
- Before beginning the Apply It Activity, review the importance of considering both the color and percent of offspring prior to drawing conclusions.
- Ask volunteers to share the conclusions that they drew. Have students do the Lab Investigation to predict the results of genetic crosses.
- Have students take the Lesson Quiz.

Lesson 3 – Patterns of Inheritance (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will make observations about natural characteristics. Discuss why it is important to only study natural characteristics.
- Have students do the After the Inquiry Warm-Up worksheet.
- Talk about the dominant and recessive alleles found in the observed patterns of inheritance.
- Have volunteers share their answers to question 4 about how many attached earlobe alleles the woman has.
- Focus on the Inquiry Skill for the lesson. Point out that when you interpret data, you look for trends or patterns in observations and measurements.
- What data did students interpret in the Inquiry Warm-Up activity? *(Natural characteristics of people's hair)*
- Before beginning the Apply It Activity, remind students that any one individual only has two alleles for a trait even if multiple alleles are possible.
- Ask volunteers to share how they interpreted the data.
- Have students do the Quick Lab to explore patterns of inheritance and then ask them to share their results.
- Explore the Big Q by identifying patterns of characteristics in the images shown in Figure 3.
- Do the Quick Lab to reinforce understanding of acquired versus inherited characteristics. Have students Answer the Big Q and then share their responses.
- Have students take the Lesson Quiz.

Lesson 4 – Chromosomes and Inheritance (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will investigate which chromosome is which.
- Discuss the color pods that the female parent has.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about what color pods the offspring plants have based on the assumptions in questions 1 and 2.
- Have volunteers share their answers to question 4 about what color pods these three offspring have.
- Focus on the Inquiry Skill for the lesson. Point out that when you design experiments, you need to keep all variables but one the same. For question 4 in the Inquiry Warm-Up activity, what variables remained the same? *(The* G *and* g *alleles of the parent plants remained the same.)*
- Review the organisms shown on page 93 before beginning the Apply It activity.
- Ask volunteers to explain which organism they chose and why.
- To Support the Big Q, use the information in Figure 2 to identify the pairs as either homozygous or heterozygous.
- Have students do the Quick Lab to investigate genetic crosses and then share their results.
- Do the Teacher Demo to model meiosis.
- Do the Quick Lab to reinforce understanding of how chromosomes move during meiosis.
- Have students take the Lesson Quiz.

Chapter 7 - DNA: The Code of Life

Introduce Big Q and Show Untamed Science Video – Why Is This Lobster Blue?

Lesson 1 – The Genetic Code (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will investigate Morse code. Discuss the characters in Morse code.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about how easy or difficult it would have been to decode the sentence if the slashes or a few letters were missing from the Morse code table.
- Have volunteers share their answers to question 4 about whether they could have decoded the message if they were missing 10 or more characters from the Morse code table.
- Focus on the Inquiry Skill for the lesson. Point out that when you infer, you answer a question using facts that you already know. If a few letters were missing from the Morse code table in the Inquiry Warm-Up activity, what would students have to infer to decode the sentence? *(The missing letters based on what they know about how words are spelled)*
- Do the Teacher Demo to show students how the probability of finding two identical DNA sequences decreases as the sequence grows.
- Review the idea that segments of DNA from the crime scene are longer than the segments from the suspects, before beginning the Apply It activity. Ask volunteers to share their inferences.
- Use the Support the Big Q to illustrate how it is determined what type of protein will be produced.
- Have students do the Lab Investigation to model how DNA is used to identify people.
- Model how DNA replicates by completing the Teacher Demo.
- Have students do the Quick Lab to model DNA and then share their results.
- Have students take the Lesson Quiz.

Lesson 2 – How Cells Make Proteins (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will investigate DNA and RNA using models. Discuss the parts of the DNA model.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about how the DNA and RNA models are alike and different.
- Have volunteers share their answers to question 4 about what the lines on the blocks represent.
- Focus on the Inquiry Skill for the lesson. Point out that when you design experiments, you first must state a hypothesis to be examined. If students designed an experiment to identify the RNA from the Inquiry Warm-Up activity, what might a hypothesis be? *(Sample: What are the differences between DNA and RNA?)*
- Review the differences between RNA and DNA before beginning the Apply It activity. Ask volunteers to share the experiments they designed.
- Use the Explore the Big Q to model the process of protein synthesis.
- Do the Quick Lab to reinforce understanding of protein synthesis.
- Have a discussion about what DNA does to Answer the Big Q.
- Have students take the Lesson Quiz.

Lesson 3 – Mutations (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will examine how deleting a base from a strand of DNA affects the message the DNA is carrying.
- Discuss how many different nitrogen bases make up DNA.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about how the position of a deletion can affect how serious a problem it causes.
- Have volunteers share their answers to question 4 about whether a deletion or a substitution is likely to cause more damage.

- Focus on the Inquiry Skill for the lesson. Point out that when you calculate, you use mathematical reasoning to solve a problem. Based on the Inquiry Warm-Up activity, if students calculated the number of segments affected by substituting one DNA base for another versus the number of segments affected when one DNA base was deleted, which number would be greater? *(The deletion of one DNA base would affect the whole strand after the deletion, so the number of segments affected would be greater.)*
- Use the Support the Big Q to illustrate which type of mutation would cause the smallest change in the protein that is produced.
- Have students do the Quick Lab to explore the effects of mutations of organisms and then share their results.
- Do the Build Inquiry activity to help students see how quickly the division of cells can lead to the growth of a tumor.
- Review how chemotherapy is used before beginning the Apply It Activity. Ask volunteers to share their responses.
- Do the Quick Lab to explore the effects of unchecked cell growth on the human body.
- Have students take the Lesson Quiz.

Lesson 4 – Human Inheritance (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will measure the height of classmates and make a graph of the data.
- The After the Inquiry Warm-Up worksheet sets up a discussion about human height and inherited traits.
- Have volunteers share their answers to question 4.
- Focus on the Inquiry Skill for the lesson. Remind students that when they interpret an observation, they are making an inference. What observations did students interpret to make an inference to answer question 3 in the Inquiry Warm-Up Activity? *(Heights of classmates recorded on a bar graph)*
- Before beginning the Apply It Activity, make sure that students understand that the superscripts in Figure 1 are not exponents. Tell students that they are labels that distinguish the two dominant alleles.
- Have students do the Quick Lab exploring the test for eye dominance.
- Support the Big Q by presenting a hypothetical example exploring sex-linked genes.
- Build Inquiry to model sex-linked inheritance. Have students do the Lab Investigation to determine how colorblindness and hemophilia are inherited.
- Have students take the Lesson Quiz.

Lesson 5 – Advances in Genetics (2 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will examine the fingerprints of their classmates.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the uniqueness of fingerprints.
- Have volunteers share their answers to question 4 about how to identify the owner of the unlabeled fingerprint.
- Focus on the Inquiry Skill for the lesson. Remind students that drawing conclusions involves making a statement that sums up what they have learned. What information could students use to draw a conclusion in question 4 in the Inquiry Warm-Up Activity? *(They know that each person's fingerprints are unique, so they should know they would be able to identify the unlabeled fingerprint by comparing it to the labeled fingerprints.)*
- Review the meaning of hybridization before beginning the Apply It activity.
- Build Inquiry to give students the opportunity to apply the concepts of hybridization. Use the next Build Inquiry to model gene splicing.
- Support the Big Q by discussing the uses of genetic engineering in cows and in some crop plants.
- Have students do the Quick Lab to breed an imaginary organism for specific characteristics.
- Have students take the Lesson Quiz.

Chapter 8 - Introduction to the Human Body

Introduce Big Q and Show Untamed Science Video – Keeping Cool and Staying Warm

Lesson 1 – Body Organization (2 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will examine the levels of organization in the human body using a model. Discuss what the smallest piece in the model represents.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about what the other blocks in the model represent and what they show about organs and tissues.
- Have volunteers share their answers to question 4, sequencing structures of the body according to their complexity.
- Focus on the Inquiry Skill for the lesson. Point out that when you make models, you create a representation of a process or system in order to better understand it. What did students make a model of in the Inquiry Warm-Up activity? *(An organ)*
- To Support the Big Q, discuss how various types of tissues are formed and what their functions are.
- To Build Inquiry, help students understand how muscle tissue reacts to temperature and repeated usage.
- Review the concept of levels of organization in the human body before beginning the Apply It Activity. Ask volunteers to share their responses.
- Use the Support the Big Q to illustrate how groups of organs work together to perform major functions in the body.
- Do the Teacher Demo to show students how all the systems of the body work together to enable the body to perform various feats.
- Have students do the Quick Lab to see how the tissue structure is related to its function and then share their results.

- Have students take the Lesson Quiz.

Lesson 2 – System Interactions (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will examine how body parts work together and respond. Discuss how the arms felt after holding up the books.
- Have students do the After the Inquiry Warm-Up worksheet.
- Talk about how the position in which the books were held impacted how the muscles responded. Have volunteers share their answers to question 4 about how the body was doing work when the books were balanced on the head.
- Focus on the Inquiry Skill for the lesson. Point out that when you develop hypotheses, you state testable explanations for a set of observations. What hypothesis could students develop about muscles based on the Inquiry Warm-Up activity? *(Answers will vary.)*
- Review locations in the body where bones come together and movement takes place before beginning the Apply It activity. Ask volunteers to share how shoulders and elbows move in different ways.
- Do the Lab Investigation for students to observe the characteristics of skeletal muscles and identify how they work.
- Support the Big Q by describing how the digestive and circulatory systems work together to break down food into nutrient molecules that your body can use.
- To Build Inquiry, show students the importance of chewing in the process of digestion. Have students do the Quick Lab to model how body systems move nutrients and wastes through the body.
- Review the functions of all the body systems and how they work together to allow the body to function before beginning the Apply It activity. Ask volunteers to share their responses.
- Do the Quick Lab to reinforce understanding of how the changing needs of cells affect the interactions of body systems.
- Have students take the Lesson Quiz.

Lesson 3 – Homeostasis (2 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will figure out how to maintain balance using a model. Discuss why the half-meter stick fell toward the ground.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about what they should do to balance the half-meter stick.
- Have volunteers share their answers to question 4 about why it is important to keep the body in balance.
- Focus on the Inquiry Skill for the lesson. Point out that when you communicate, you share information and ideas. How did students communicate during the Inquiry Warm-Up activity? *(By drawing diagrams)*
- Build Inquiry by modeling homeostasis.
- Do the Teacher Demo to show students how their bodies involuntarily respond to stress.
- Support the Big Q by explaining how the immune system responds to bacteria and viruses when homeostasis is disrupted.
- Review that stress is the body's reaction to possible threatening or uncomfortable situations before beginning the Apply It activity.
- Ask volunteers to share descriptions of how their bodies responded to stressful events.
- Explore the Big Q by analyzing how the body systems of this runner work together as she pushes herself to excel.
- Have students do the Real-World Inquiry to determine what is wrong with someone based on problems with the interactions of body systems.
- Have students do the Quick Lab to see how the body works to maintain balance through relaxed breathing and then share their results.
- Help students Answer the Big Q by discussing how organ systems perform specific functions while working together to ensure the proper functioning and survival of an organism.
- Have students take the Lesson Quiz.

Lesson 4 – The Skeletal System (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will compare rock and bone. Discuss the difference in weights between rock and bone.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about the strength and durability of both rock and bone.
- Have volunteers share their answers to question 4 about whether the same elements are found in both rocks and bones.
- Focus on the Inquiry Skill for the lesson. Point out that when you classify, you group items that are similar. What word could be used to classify both rocks and bones based on the Inquiry Warm-Up activity? *(Hard)*
- Use the Support the Big Q to identify the primary functions of various bone structures.
- Have students do the Quick Lab to determine whether hollow or solid bones are stronger, and then have them share their results.
- Review the explanations and illustrations of moveable joints in Figure 3 before beginning the Apply It activity. Ask volunteers to share how they classified the joints.
- Do the Quick Lab to reinforce understanding of how joints move.
- Do the Build Inquiry activity to identify the types of tissues found in different bones.
- Do the Teacher Demo to show students the differences between bone and cartilage.
- Have students do the Quick Lab to explore the importance of calcium in bones.
- Have students take the Lesson Quiz.

Lesson 5 – The Muscular System (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will investigate how muscles work. Discuss why students think the muscles in one hand are stronger than the muscles in the other hand.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about what happens to muscles as they are more regularly exercised.
- Have volunteers share their answers to question 4 about testing the strength of the muscles in each leg.
- Focus on the Inquiry Skill for the lesson. Point out that when you infer, you use your experiences and evidence to reach a logical conclusion. What evidence was used in the inquiry Warm-Up activity to infer which muscles were used to pick up the clothespin? *(The strength of the grip for each hand)*
- To Support the Big Q, discuss how bones and skeletal muscles are held together.
- Have students do the Quick Lab to observe skeletal, smooth, and cardiac muscles.
- Review explanations and illustrations of the contraction and relaxation of a pair of muscles in Figure 3 before beginning the Apply It activity. Ask volunteers to share their inferences.
- Do the Quick Lab to reinforce understanding of how muscles pairs work together.
- Have students take the Lesson Quiz.

Lesson 6 – The Skin (2 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will observe skin.
- Discuss the purpose of the hair on their hands.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about how the skin responds to certain circumstances.
- Have volunteers share their answers to question 4 about what happens when you apply lotion to the skin.
- Focus on the Inquiry Skill for the lesson. Point out that when you observe, you use your senses to gather information. What was observed during the Inquiry Warm-Up activity? *(There is hair on the backs of the hands but not on the palms.)*
- Explore the Big Q by identifying how the girl's bones, muscles, and skin are functioning.
- Have students do the Quick Lab to model the cooling effects of the evaporation of sweat and then ask them to share their results.
- To Answer the Big Q, discuss the functions of bones, muscles, and skin.
- Do the Lab Investigation to help students better understand how various sunscreens and fabrics protect against sun exposure.
- Have students take the Lesson Quiz.

Chapter 9 - Controlling Body Processes

Introduce Big Q and Show Untamed Science Video – Think Fast!

Lesson 1 – The Nervous System (4 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will identify the many organs, movements, and processes involved in a simple task. Discuss the organs, movements, and processes involved in simply picking up a penny.
- Have students do the After the Inquiry Warm-Up worksheet. Talk about what the other parts of the body are doing while a penny is being picked up.
- Have volunteers share their answers to question 4 about the differences between all the steps involved in picking up a penny and all the other things the body does at the same moment.
- Focus on the Inquiry Skill for the lesson. Point out that when you infer, you draw conclusions based on information, knowledge, and evidence. Based on the Inquiry Warm-Up activity, what can be inferred about the two different types of activities described in questions 2 and 3? *(The body has to think about some of the movements and processes but others are automatic.)*
- Support the Big Q by identifying the stimulus and response in each of the described situations.
- Before beginning the Apply It activity review the Key Concept statement about the functions of the nervous system. Have students share their descriptions.
- Do the Lab Investigation to develop and test hypotheses about how the time of day affects reaction time.
- Have students do the Quick Lab to model the three types of neurons.
- Do the Quick Lab to reinforce understanding of how a message can change form and still remain the same.
- Have students take the Lesson Quiz.

Lesson 2 – The Endocrine System (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will play a game to model how the body uses nerve impulses as signals.
- The After the Inquiry Warm-Up worksheet sets up a discussion about how signals transmit information. Have volunteers share their answers to question 4 telling how the activity modeled what goes on in the human body when signals travel from one part to another.
- Focus on the Inquiry Skill for the lesson. Remind students that making models helps people understand things they cannot observe directly. Point out that physical models take the form of drawings, diagrams, and three-dimensional structures, whereas mental models include mathematical equations and words that describe how something works. What model was used in the Inquiry Warm-Up Activity? *(A game was used to model how the body uses nerve impulses as signals.)*
- Before beginning the Apply It Activity, review the paragraph about the special relationship between a hormone and specific target cells.

- Support the Big Q by using Figure 1 to identify the glands that cause the body to change over a person's lifetime.
- Do the Build Inquiry to help students learn more about the functions of hormones.
- Have students do the Quick Lab making models showing how the structures of a hormone and a target cell enable the two to fit together.
- Have students do the Lab Investigation to model the concept of negative feedback.
- Have students take the Lesson Quiz.

Lesson 3 – The Male and Female Reproductive Systems (3 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will analyze, sketch, and label slides of egg cells and sperm cells. The After the Inquiry Warm-Up worksheet sets up a discussion about the differences between male and female reproductive cells. Have volunteers share their answers to question 4 telling which the human body produces more of, sperm cells or egg cells.
- Focus on the Inquiry Skill for the lesson. Remind students that a hypothesis is one possible explanation or answer to a scientific question. Point out that a hypothesis can be worded as an if/then statement. Have students write a hypothesis about why the human body produces more sperm cells than egg cells as learned in the Inquiry Warm-Up activity. *(Answers will vary.)*
- Support the Big Q by explaining that life begins from a single-cell egg and that trillions of cells result from a single fertilized egg.
- Have students do the Quick Lab using models of egg and sperm cells to calculate the size of human sex cells.
- Have students do the Quick Lab to model the sequence of changes in LH levels during a woman's menstrual cycle.
- Have students take the Lesson Quiz

Lesson 4– Pregnancy and Birth (2 class periods**)**

- Begin with the Inquiry Warm-Up activity. (Lab Zone – Pearson Realize) Students will model the rate of growth of a human fetus.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the growth rate of the human fetus. Have volunteers share their answers to question 4 giving their interpretations of the data on the graphs showing a fetus's growth in length and mass.
- Focus on the Inquiry Skill for the lesson. Remind students that it is vital to calculate accurately in order to find the correct answer to a problem. What calculation could be used in the Inquiry Warm-Up activity? *(Sample: A calculation that measures how the fetus grows twice as much during the second half of pregnancy as it did during the first half of pregnancy)*
- Support the Big Q by helping students distinguish a zygote, an embryo, and a fetus.
- Have students do the Quick Lab to model the function of the amniotic sac in protecting a developing baby.
- Do the Build Inquiry having students research facts about twins.
- Have students do the Quick Lab to model how a mother's cervix must dilate to allow the fetus to pass through during delivery.
- Have students take the Lesson Quiz.

*All activities, labs, assessments, performance expectations, etc. can be found within the Pearson Interactive Online Program.

Unit Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

Standard(s):
MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different number and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different number and types of cells.

2.0	**Students will be able to:** • Describe specific vocabulary including: cell, prokaryotic and eukaryotic cells, stimulus, homeostasis, reproduction, organism, lens, magnification, multicellular and unicellular • Identify all the 6 characteristics of all living things • State the Cell Theory
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
2.0	**Students will be able to:** • Describe specific vocabulary including: cell, cell wall, cell membrane, nucleus, nucleolus, ribosomes, rough and smooth endoplasmic reticulum, mitochondria, golgi body, cytoplasm, chloroplasts, vacuole, organelle, lysosome, • Describe the cell parts' structure and function • Identify each cell structure • Compare and contrast plant and animal cells • Describe osmosis
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
2.0	**Students will be able to:** • Describe specific vocabulary including: neuron, nerve impulse, nerve, synapse, central nervous system, peripheral nervous system and reflex. • Describe how each part of the nervous system works • Explain that the nervous system includes sense organs.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
2.0	**Students will be able to:** • Describe specific vocabulary including: cell, tissue, organ, organ system, homeostasis, stress, hormone. • Identify the levels of organization in the body. • Explain how systems work together. Ex. Skeletal system and muscular system. • Describe the systems responsible for moving materials throughout the body. • Synthesize information about the body systems that communicate and regulate body systems.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [**Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
2.0	**Students will be able to:** • Describe specific vocabulary including: food chain, food web, photosynthesis, autotroph, heterotroph, chlorophyll, cellular respiration, fermentation cell cycle, interphase, replication, chromosome, mitosis, cytokinesis • Explain how living things get energy from the sun. • Explain the events that occur during respiration. • Explain what happens during fermentation.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
2.0	**Students will be able to:** • Describe specific vocabulary including: neuron, nerve impulse, nerve, synapse, central nervous system, peripheral nervous system and reflex. • Describe how each part of the nervous system works • Explain that the nervous system includes sense organs.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
2.0	**Students will be able to:** • Describe specific vocabulary including: glucose, carbon dioxide, oxygen, energy, fermentation, cell cycle, interphase, replication, chromosome, mitosis, cytokinesis • Describe the raw materials and products of photosynthesis. • Describe the raw materials and products of cellular respiration.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.** **[**Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

2.0	**Students will be able to:** • Describe specific vocabulary including: protein, messenger RNA, transfer RNA, mutation, cancer, tumor • Explain how mutations can affect an organism. • Describe how a cell makes proteins.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [**Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
2.0	**Students will be able to:** • Describe specific vocabulary including: heredity, trait, genetics, fertilization, purebred, gene, allele, dominant allele, recessive allele, hybrid, probability, Punnett square, phenotype, genotype, homozygous, heterozygous, incomplete dominance, codominance, multiple alleles, polygenetic inheritance, genotype, phenotype, mitosis and meiosis. • Describe Mendel's experiments. • Describe the role of alleles in the inheritance of traits. • Explain the difference between asexual reproduction and sexual reproduction.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.** [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
2.0	**Students will be able to:** • Describe specific vocabulary including: selective breeding, inbreeding, hybridization, clone, genetic engineering and gene therapy. • Describe ways of producing organisms with desired traits. • Explain the difference between selective breeding, cloning and genetic engineering.

1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Enrichment Worksheets and Scenario Investigations
Struggling Learners	Use L1 Differentiated Instruction Activities
English Language Learners	Use ELL Support Activities from lesson as needed.
Special Needs Learners	Use L1 Differentiated Instruction Activities.

Unit Title: Earth Science

Unit Description: In this unit students will be learning about Earth science by learning about rock formation to why we study the past. Students will begin learning about minerals and rocks. This will include the three main types of rocks and how they form. From there, students will learn about how are Earth is in constant motion because of the tectonic plates that it is composed of and how they move. Students will also be able to relate that movement to earthquakes in the their next chapter of study. Learning the processes that shape the surface of the Earth through erosion and deposition will also help make students aware of the changes that are constantly happening on their Earth. The Earth science unit will conclude with looking at Earth's past. This will include fossils and the dating of rocks, as well as radioactive dating. Students will then take a trip to the past and learn about the Earth's history through learning about the different eras that have occurred to get to where we are today.

Unit Duration: about 13 weeks

Desired Results

Standard(s):

Chapter 10 – Minerals and Rocks – MS-ESS2-1

Chapter 11 – Plate Tectonics – MS-ESS2-3

Chapter 12 – Earthquakes – MS-ESS3-2

Chapter 13 – Erosion and Deposition – MS-ESS2-2

Chapter 14 – A Trip Through Geologic Time – MS-ESS1-4

Indicators:

Chapter 10 – ESS2.A Earth's Materials and Systems

Chapter 11 – ESS1.C History of the Planet Earth, ESS2.B Plate Tectonics and Large Scale System Interactions

Chapter 12 – ESS3.B Natural Hazards

Chapter 13 – ESS2.A Earth's Materials and Systems, ESS2.C The Role of Water in Earth's Surface Processes

Chapter 14 – ESS1.C History of the Planet Earth

Understandings:	**Essential Questions:**
Students will …… Chapter 10 Lesson 1	Chapter 10 – Minerals and Rocks • How do rocks form? Chapter 11 – Plate Tectonics

- Define a mineral.
- Explain how minerals are identified.
- Explain how minerals form and where mineral resource are located.

Lesson 2
- List the characteristics used to identify rocks, and identify the three major groups of rocks.

Lesson 3
- Identify the characteristics used to identify igneous rocks.
- Describe ways in which igneous rocks are used.

Lesson 4
- Describe how sedimentary rocks form.
- List and describe the three major types of sedimentary rocks.
- Explain how sedimentary rocks are used.

Lesson 5
- Describe the conditions under which metamorphic rocks form, how geologists classify metamorphic rocks and how metamorphic rocks are used.

Lesson 6
- Describe the rock cycle.

Chapter 11

Lesson 1
- Analyze and interpret data in the distribution of fossils and rocks, continental shapes, and seafloor structures to explain Alfred Wegner's hypothesis about the movement of the continents.

Lesson 2
- Construct an explanation from evidence for the formation of mid-ocean ridges.
- Apply scientific principles to explain how sea-floor spreading affects the Earth's crust.
- Develop and use models to explain the existence of deep-ocean trenches and explain the process of subduction.

Lesson 3
- Construct an explanation based on evidence of geoscience processes to describe the theory of plate tectonics.

Chapter 12

Lesson 1
- Construct a scientific explanation based on evidence for how stress in the crust changes Earth's surface.
- Develop and use models to describe the three major types of faults.
- Uses graphical displays to compare and contrast the land features that result from plate movement.

Lesson 2
- Integrate qualitative and scientific technical information to describe how the energy of an earthquake travels through Earth.
- Apply scientific ideas to identify the scales used to measure the strength of an earthquake.
- Apply scientific principles to explain how scientists locate the epicenter of an earthquake.

Lesson 3
- Apply scientific principles to explain how seismographs work.
- How do moving plates change Earth's crust?

Chapter 12 – Earthquakes
- Why do earthquakes occur more often in some places than in others?

Chapter 13 – Erosion and Deposition
- What processes shape the surface of the land?

Chapter 14 – A Trip Through Geologic Time
- How do scientists study Earth's past?

- Analyze and interpret data to explain the patterns that seismographic data reveal.

Chapter 13

Lesson 1

- Construct an explanation based on evidence for the geoscience processes that wear down and build up Earth's surface.
- Apply scientific principles to identify the causes of different types of mass movements.

Lesson 2

- Use graphical displays to explain how moving water causes erosion.
- Construct an explanation based on evidence to describe some of the land features that are formed by water erosion and deposition.

Lesson 3

- Gather and synthesize to explain how glaciers form and move.
- Develop and use models to explain how glaciers cause erosion and deposition.

Lesson 4

- Develop and use models to describe how ocean waves cause erosion and deposition.

Lesson 5

- Interpret evidence to explain how wind causes erosion and deposition.

Chapter 14

Lesson 1

- Explain how fossils form.
- Identify the different kinds of fossils.
- Describe what fossils tell about organisms and environments of the past.

Lesson 2

- Describe how geologists determine the relative age of rocks.
- Explain how unconformities and folding can alter the order of rock layers.

Lesson 3

- Explain what happens during radioactive decay.
- Describe what can be learned from radioactive dating..

Lesson 4

- Construct a scientific explanation for how and why the geologic time scale is used to show Earth's history.

Lesson 5

- Construct a scientific explanation based on evidence to explain how Earth developed during the Precambrian time.

Lesson 6

- Construct a scientific explanation based on evidence for major events in the Paleozoic Era.
- Construct a scientific explanation based on evidence for major events in the Mesozoic Era.
- Construct a scientific explanation based on evidence for major events in the Cenozoic Era.

Assessment Evidence

Performance tasks. (Expectation Activities)

- Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motion.
- Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their efforts.
- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

Other Evidence:

- Lesson quizzes
- Chapter Tests
- Performance Assessments

Chapter 10

- Test Rock Flooring Lab
- The Rock Cycle Virtual Lab

Chapter 11

- Modeling Sea-Floor Spreading Lab
- Rate of Continental Drift Virtual Lab
- Flight 7084 to Barcelona (Scenario Investigation)

Chapter 12

- Finding the Epicenter Lab
- Locating an Earthquake Virtual Lab
- Shake Rattle and Roll (Stem Activity)

Chapter 13

- Quick Labs
- Sand Hills Lab
- Dunwich is Done (Scenario Investigation)

Chapter 14

- Exploring Geologic Time Through Core Samples Lab
- Radiometric Dating Virtual Lab
- Goodbye Columbus (Scenario Investigation)

Performance Expectation Activities (Pearson Realize)

Unit PBL – StemQuest – The Big Fossil Hunt

Benchmarks: to be determined

Learning Plan

Learning Activities
Chapter 10 - Minerals and Rocks

Introduce Big Q and Show Untamed Science Video – Climbing Through the Rock Cycle

Lesson 1 – Properties of Minerals (4-5 class periods)

- Begin with the Inquiry Warm-Up Activity. Students will grow and compare crystals.
- The After the Inquiry Warm-Up worksheet sets up a discussion about factors that affect the formation of crystals.
- Have volunteers share their answers to number 4 regarding their predictions about how the rate of cooling affects crystal formation.
- Focus on the Inquiry skill for the lesson. Point out the operational definition is a statement that describes how to measure a particular variable or how to define a particular term.
- Ask students to form an operational definition of crystallization based on the information gathered in the inquiry Warm Up Activity. *(The formation of crystals)*
- Review the term inorganic before beginning the Quick Lab on minerals.
- Build Inquiry to observe a mineral's streak. Have students share the results from their data tables.
- Build Inquiry to have students place minerals in a sequence from softest to hardest. Ask the groups to share their results.

- Build Inquiry to have students learn about mineral cleavage.
- Have students do the Quick lab to identify minerals based on streak and hardness.
- Use figure 12 to Support the Big Q by discussing characteristics of minerals in volcanic rock.
- Do the Build Inquiry to give students the opportunity to draw conclusions about granite and rhyolite.
- Have students do the Quick Lab. Discuss what the students saw as the water evaporated.
- Use online Vocab Flash Cards to review key terms.
- Have students take the lesson Quiz

Lesson 2 – Classifying Rocks (1-2 class periods)

- Begin with the Inquiry Warm-Up activity. Students will observe and compare rock characteristics.
- The After the Inquiry Warm-Up worksheet sets up a discussion about comparing rocks using color, texture, hardness and density. Have volunteers share their answers to number 4 about using the characteristics of rocks for a specific use.
- Focus on the Inquiry skill for the lesson. Point out that when you observe something you make a careful study of it. Remind students that they should accurately note and report on what their senses detect. What did you observe in the Inquiry Warm-Up activity? *(color, texture, hardness and density of rocks.)*
- Build inquiry to have students identify the minerals in granite.
- Use Support the Big Q activity to discuss how each of the three types of rock form.
- Review banded and non-banded rocks before beginning the Apply It activity.
- Have volunteers tell what might have caused the wavy pattern in the rock.
- Have students do the Quick Lab to observe the characteristics of unknown rocks and classify them.
- Use online vocabulary flash cards to review key terms
- Have students take the lesson quiz.

Lesson 3 – Igneous Rocks (1-2 class period)

- Begin with the Inquiry Warm-Up activity. Students will observe melted wax as it solidifies under different conditions.
- The After the Inquiry Warm-up worksheet asks students to draw conclusions about how the rate at which magma cools affects the grain size of the rock that is formed. Have volunteers share their answers to number 4, which makes a generalization about the grain size of a rock formed from lava and the grain size of rock from magma.
- Focus on the Inquiry Skill for the lesson. Point out that data are not just numbers and measurements but include facts and other information gathered through observations. What data did you gather through observations in order to answer the questions in the Inquiry Warm-Up activity? (length of time, appearance of the hardened wax)
- Use the Support to Big Q to help students understand that igneous rocks that cooled on Earth's surface have smaller grains than igneous rocks that cooled beneath the surface.
- Review how to interpret a circle graph before assigning the Apply It activity.
- Have students do the Quick Lab to examine characteristics of igneous rocks. Have students share their results.
- Assign the Quick Lab to have students examine igneous rocks and infer possible uses for them.
- Have students take the lesson quiz.

Lesson 4 – Sedimentary Rocks (2-3 class periods)

- Begin with the Inquiry Warm-Up activity. Students will test sedimentary rock samples and draw conclusions about each rock origin.
- The After the Inquiry Warm Up worksheet guides students to infer about the original processes that formed the rock samples. Have volunteers share answer to number 4, in which they infer the classification of a rock sample by processes that formed it.
- Focus on the Inquiry Skill for the lesson. Tell students that an inference is an interpretation of an observation. Remind students to draw upon their experiences when they make an inference. What inferences did the students make in the Inquiry Warm Up activity? (The origin of rock samples).
- Then have students do the Quick Lab using books and slices of bread to model how pressure might pack sediments into rock. Have students share their results.
- Support the Big Q by reviewing the steps in the formation of sedimentary rocks. Remind students that texture and composition are important rock characteristics.
- Have students do the Build Inquiry Activity to classify sedimentary rocks. Have each group explain it's rationale for classifying the samples.
- Review the three major groups of sedimentary rocks before beginning the Apply It Activity.

- Have students do the quick lab to investigate how differently-sized sediments settles out of water to form layers.
- Use the Lab Investigation activity to examine pieces of flooring made of various types of sedimentary rock. Have students discuss the durability of each type of flooring.
- Use online vocab flashcards to review key terms.
- Have students take the lesson quiz.

Lesson 5 – Metamorphic Rocks (1-2 class periods)

- Begin with the Inquiry Warm-Up activity. Students will use sequins and clay to model how rocks become foliated.
- The After the Inquiry Warm-Up worksheet sets up a discussion about how pressure can change rocks. Have volunteers share their answers to number 4 about real-world examples of metamorphic rocks.
- Focus on the Inquiry Skill for the lesson. Point out that observing involves using the five senses of sight, hearing, touch, taste, and smell to gather information. What senses did you use to make observations in the Inquiry Warm-Up activity? (sight and touch)
- Support the Big Q by discussing the sources of heat for changing rock. Review the term foliated and then do the Teacher Demo to model the formation of a foliated metamorphic rock.
- Review the uses of metamorphic rocks before beginning the Apply It activity.
- Have students share their examples of real-world uses of metamorphic rocks.
- Do the Quick Lab to examine various types of metamorphic rocks. Have students share their results.
- Have students take the lesson quiz.

Lesson 6 – The Rock Cycle (1-2 class periods)

- Begin with the Inquiry Warm-Up activity. Students will use interconnecting plastic blocks to model the rock cycle, showing that rock that has been broken into sediment later may be cemented together to form new rock.
- The After the Inquiry Warm-Up worksheet sets up a discussion about the characteristics of new rock. Have volunteers share their observations to number 4 about a pattern to the placement of the grains in the rock.
- Focus on the Inquiry Skill for the lesson. Point out to students that when they classify, they group together similar objects or events, such as rocks or minerals. Discuss what characteristics were used to classify the rocks in the Inquiry Warm-Up activity. (texture, color, and grain)
- Explore the Big Q by helping students identify the products and the processes of the rock cycle.
- Review Figure 2 about igneous and sedimentary rocks before beginning the Apply It activity. Have them submit their work to you.
- Do the Quick Lab to have students observe and sketch related rock samples and develop a hypothesis about rock formation.
- Have students take the lesson quiz.

Chapter 11 - Plate Tectonics

Lesson 1 – Drifting Continents (1-2 class periods)

- Begin with the Inquiry Warm-Up activity. Students will locate oceans and continents on a globe. The After the Inquiry Warm-Up worksheet sets up a discussion about how Earth's continents are connected. Have volunteers share their answer to number 4 about how islands might have formed.
- Focus on the Inquiry Skill for the lesson. Tell students that when they infer, they interpret an observation or other information. Remind them that an inference is not a fact but one of many possible interpretations. What inferences did students make in the Inquiry Warm-Up activity about land formations that appear in the ocean? (Islands may have separated and drifted away from continents or that they might have been formed by volcanoes.)
- Support the Big Q by explaining that while Wegener had a hypothesis, he had no way to explain how the continents had separated and moved away from each other.
- Review the term Pangaea before doing the Build Inquiry. Have students share their ideas about the evidence that was used to reconstruct Pangaea.
- Do the Teacher Demo to show how North America was positioned as a part of Pangaea.
- Review Figure 2 before assigning the Apply It activity. Have students share the inferences they drew about South Africa's former location.
- Have students do the Quick Lab and then share their findings about the shapes of the continents and how they fit together.
- Have students take the lesson quiz.

Lesson 2 – Sea-Floor Spreading (1-2 class periods)

- Begin with the Inquiry Warm-Up activity. students will investigate density changes by moistening a washcloth with water and watching its edges start to sink. The After the Inquiry Warm-Up worksheet sets up a discussion about the difference between mass and density. Have volunteers share their answers to number 4 about items that sink or float depending on whether they are more dense and less dense than water.

- Focus on the Inquiry Skill for the lesson. Remind students that a hypothesis is a possible explanation for a set of observations or an answer to a scientific question. What was the student's hypothesis about the density of a washcloth cannot change when it remains under water? (The washcloth stays wet under water so its density stays the same.)
- Have the students do the Quick Lab and then share their observations about mid-ocean ridges based on the seams of a baseball.
- Use the Support the Big Q to help students understand that scientific theories must be testable and supported by evidence.
- The Build Inquiry activity challenges students to determine the relative age of the crust based on its distance from a mid-ocean ridge.
- Have the students do the Quick Lab and then share their findings about the changes in the Earth's magnetic field.
- Review the information under the read head Subduction and Earth's Oceans before beginning the Apply It activity. Have students share their hypotheses about why the Pacific Ocean is shrinking.
- Have students do the Lab Investigation activity to explore the sea-floor spreading and magnetic stroping using paper models of the ocean floor.
- Have students take the lesson quiz.

Lesson 3 – The Theory of Plate Tectonics (2-3 class periods)

- Begin with the Inquiry Warm-Up activity. Students will model tectonic plate boundaries. The After the Inquiry Warm-Up worksheet sets up a discussion of how Earth's plates interact. Have volunteers share their answers to number 4 about the land features produced when plates collide.
- Focus on the Inquiry Skill for the lesson. Remind students to add, subtract, multiply, or divide carefully when they calculate. What sort of calculations could be done by scientists to track the movement of the Earth's plates in the Inquiry Warm-Up activity? (Subtraction to determine how far the plates have moved in a given amount of time or multiplication to predict how far they will move in a given amount of time.)
- Do the Teacher Demo by cutting a grapefruit peel into segments to model how Earth's surface is broken into plates. Then, have students calculate the average rate of plate motion in the Do the Math activity.
- Build Inquiry to help students understand what happens to the continental crust when two continents collide.
- Explore the Big Q by discussing the ways in which Earth's crust is changed by plate motions.
- Have students do the Quick Lab exploring convection currents in the mantle.
- Have students take the Lesson Quiz.

Chapter 12 - Earthquakes

Lesson 1 – Forces in the Earth's Crust (3-4 class periods)

- Begin with the Inquiry Warm-Up activity. Students will explore the effect of a deforming force of an object. The After the Inquiry Warm-Up worksheet sets up a discussion about how force can affect matter. Have volunteers share their answers to number 4 about how the stored energy is released when force is applied.
- Focus on the Inquiry Skill for the lesson. Point out to students that some processes are too slow to observe directly. A model makes it possible for students to shoe changes happen more quickly. How did using a model in the Inquiry Warm-Up activity help students learn about how stress affect Earth's crust? (It showed the difference between what happens when a light force is applied and when a stronger force is applied.)
- Support the Big Q by discussing how stress in rock is released and what happens at places where rock under stress breaks.
- Assign the Quick Lab and have students share their models of the three kinds of stress.
- Do the Teacher Demo modeling synclines and anticlines.
- Assign the Quick Lab and have students create models to explore how different kinds of stress create mountains and other landforms.
- Have students take the Lesson Quiz.

Lesson 2 – Earthquakes and Seismic Waves (3-4 class periods)

- Begin with the Inquiry Warm-Up activity. Students will model two kinds of waves that travel through a spring toy. The After the Inquiry Warm-Up worksheet sets up a discussion about how waves move through matter. Have volunteers share their answers to number 4 comparing the waves created with the spring toy and water waves.
- Focus on the Inquiry Skill for the lesson. Point out to students that when they infer, they look at the information they have been given and relate it to knowledge they already have to draw a conclusion. What was inferred about the waves created in Step 4 of the Inquiry Skill activity? (The waves in the spring toy moved like water waves.)
- Support the Big Q by reviewing how plate movement leads to the formation of faults. Remind students that earthquake waves carry energy in many directions from the source.
- Review the cause of earthquakes before beginning the Apply It Activity.
- Do the Teacher Demo to help students understand the movement of seismic waves.

- Have students do the Quick Lab to model the behavior of seismic waves.
- Do the Build Inquiry activity. Have students classify earthquake damage according to the Modified Mercalli scale.
- Have students do the Quick Lab and share the scales they created to report the magnitude of an earthquake.
- Assign the Lab Investigation. Students will interpret data to locate the epicenter of an earthquake.
- Have students take the lesson quiz.

Lesson 3 – Monitoring Earthquakes (2-3 class periods)

- Begin with the Inquiry Warm-Up activity. Students will model a device to detect waves moving through matter.
- The After the Inquiry Warm-Up worksheets sets up a discussion about how waves move through matter. Have volunteers share their answers to number 4 about why scientists must rely on instruments to detect earthquake waves.
- Focus on the Inquiry Skill for the lesson. Point out to students that predicting is not just taking a guess. When they predict what will happen, students should consider what they already know and apply it to the new situation. What was already known to help predict what would happen in Step 2 in the Inquiry Warm-Up activity when the gelatin was tapped more firmly? (It is easier to see the movement of a fishing line by looking at a bobber resting on the surface of the water.)
- Have students do the Quick Lab and then have them share the results of testing the model seismographs they constructed.
- Review the Kay Concept for this section before assigning the Apply It activity. Have students share their predictions about where the plate boundaries lie in the United State.
- Explore the Big Q by using Figure 3 to identify countries with a history of earthquakes.
- Have students do the Quick Lab and then share their predictions of locations of future earthquakes.
- Answer the Big Q by leading a discussion about earthquakes.
- Have students take the lesson quiz.

Chapter 13 - Erosion and Deposition

Lesson 1 – Mass Movement (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will observe and compare the effect of gravity on a marble's movements on a surface with and without sandpaper covering. The After the Inquiry Warm-Up worksheet sets up a discussion about the factors that influence the effect gravity has on material on a slope. Have volunteers share their answers to question 4 identifying the factor that clearly influences the effect of gravity on materials on a slope.
- Focus on the Inquiry Skill for the lesson. Tell students that when they infer, they interpret an observation or other information. Remind them that an inference is not a fact but one of many possible interpretations. What inferences could be made in the Inquiry Warm-Up Activity about the factors that influence the effect of gravity on materials on a slope? (The degree of smoothness or roughness of a surface of the slope affects the movement of the material.)
- Have students do the Quick Lab and share their findings about the effects of water and slope angle on the rate of erosion.
- Support the Big Q by discussing the effects erosion and deposition have on Earth's surface in the instance of a mass movement.
- Do the Teacher Demo modeling the affects of an earthquake and mudflow.
- Review the name and affect of each type of mass movement before beginning the Apply It activity. Have students share their ideas about what caused the fence to move.
- Assign the Lab Investigation and have students share their results.
- Have students take the Lesson Quiz.

Lesson 2 – Water Erosion (3-4 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will use soap and dripping water to model erosion. The After the Inquiry Warm-Up worksheet sets up a discussion about how moving water wears away rocks. Have volunteers share their responses to question 4.
- Focus on the Inquiry Skill for the lesson. Remind students that a hypothesis is a possible explanation for a set of observations or an answer to a scientific question. What hypothesis could be made in the Inquiry Warm-Up Activity about how water wears away rocks? (Sample: The temperature of the water affects the rate at which it wears away rock.)
- Build Inquiry by challenging students to identify and trace all the tributaries of a major U.S. river.
- Have students do the Quick Lab and share what they learned about the effect of raindrops on soil.
- Build Inquiry by having students compare and contrast the deltas of the major world rivers.
- Explore the Big Q by using Figure 7 to discuss how a river changes from its head to its mouth.
- Build Inquiry by challenging students to illustrate river environments.
- Do the Teacher Demo to show students how tributaries merge to form larger streams along most of a river's course and then how distributary channels form near its mouth.

- Do the next Teacher Demo to model how carbonic acid forms.
- Display a United States map showing the state names before having students do the Apply It activity.
- Have students do the Quick Lab and share what they learned about groundwater erosion.
- To Answer the Big Q lead a class discussion about the processes that shape the surface of the land.
- Have students take the Lesson Quiz.

Lesson 3 – Glacial Erosion (2-3 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will model glacial erosion by abrasion. The After the Inquiry Warm-Up worksheet sets up a discussion about how glaciers wear land away. Have volunteers share their answers to question 4 about what land under a glacier would look like after the glacier has melted.
- Focus on the Inquiry Skill for the lesson. Remind students that when they draw a conclusion, they make a statement that summarizes what they have learned from observations or an experiment. How could the scrape marks the sand-crusted ice made in the soap be described in the Inquiry Warm-Up Activity? (The sand made long scrape marks in the soap.)
- Review how rivers erode the land and shape a valley before beginning the Apply It activity. Call on students to share their conclusions.
- Assign the Quick Lab and call on students to share their observations about glacier movement.
- Support the Big Q by discussing how glaciers are agents of both erosion and deposition and how these two processes shape the surface of the land.
- Build Inquiry by helping students visualize the area of North America that was covered by ice in the last ice age.
- Have students do the Quick Lab and then share their observations of erosion caused by valley glaciers.
- Have students take the Lesson Quiz.

Lesson 4 – Wave Erosion (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will use a hand lens to observe beach sand and see what it is made up of. The After the Inquiry Warm-Up worksheet sets up a discussion about the origins of beach sand. Have volunteers share their answers to question 4 as to whether sand is a cause or an effect of erosion.
- Focus on the Inquiry Skill for the lesson. Remind students that when they communicate with a partner, they should take turns expressing their ideas and listening to their partner's ideas. How well could partners communicate in the Inquiry Warm-Up Activity? (Sample: I listened to my partner's ideas about sand being a cause of erosion and then explained why I thought sand was both a cause and an effect of erosion.)
- Do the Teacher Demo to model wave refraction.
- Help students identify the sea cave and sea arch in Figure 2 before assigning the Apply It activity. Have students share their conclusions.
- Have students do the Quick Lab exploring the relationship between wave impact and erosion along a shoreline.
- Have students take the Lesson Quiz.

Lesson 5 – Wind Erosion (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will simulate wind erosion. The After the Inquiry Warm-Up worksheet sets up a discussion about how moving air effects sediment. Have volunteers share their answers to question 4 about the factors that determine how moving air affects sediments.
- Focus on the Inquiry Skill for the lesson. Remind students that when they predict, they use what they already know to make an inference about what might happen. How could prior knowledge about kernels of corn be used to make a prediction in the Inquiry Warm-Up Activity? (Sample: I knew that kernels of corn were heavier than cornmeal, so I didn't think they could be moved very far by the air from the straw.)
- Support the Big Q by leading a discussion about how wind erosion affects Earth's surface, explaining that deflation is the main process by which wind erosion occurs.
- Review the effect plant roots can have on dune erosion before assigning the Apply It activity. Have students share their ideas about how to hold sand dunes in place.
- Have students do the Quick Lab and share their models of the formation of desert pavement.
- Have students take the Lesson Quiz.

Chapter 14 - A Trip Through Geologic Time

Lesson 1 – Fossils (2-3 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will examine, draw, and describe a rock sample. The After the Inquiry Warm-Up worksheet sets up a discussion about the

students' investigation of a rock sample and their ideas about how its parts got into the rock. Have volunteers share their labeled drawings of rocks.

- Focus on the Inquiry Skill for the lesson. Point out to students that posing questions as they read or do an activity can help them focus on important details. What questions could be asked as someone labeled their detailed drawing of a rock sample in the Inquiry Warm-Up Activity? (Sample: Questions about shape, size, texture, color, and other details.)
- Have students do the Quick Lab to explore how fossils of soft parts form.
- Support the Big Q by discussing that fossils are the remains of plants or animals and also physical evidence of the presence of organisms, such as tracks or burrows.
- Do the Teacher Demo to model how petrified fossils are formed.
- Build Inquiry to allow students to model mold and cast fossils.
- Review the characteristics of molds and casts and look again at the images of the raised fern and the hollow fern in Figure 2 before assigning the Apply It Activity. Have students share their questions about the organism in the cast fossil.
- Have students do the Quick Lab to explore modeling trace fossils.
- Have students do the Quick Lab to model fossil records and infer what they can tell about Earth's past.
- Have students take the Lesson Quiz.

Lesson 2 – The Relative Age of Rocks (2-3 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will use clay to create a model of rock layers. The After the Inquiry Warm-Up worksheet sets up a discussion about the positions of sediment layers. Have volunteers share their answers to question 4.
- Focus on the Inquiry Skill for the lesson. Remind students that when they make an inference they combine the evidence with their experience or knowledge. What inference could be made in the Inquiry Warm-Up Activity about the affect the shape of an object has upon the stacked layers? (The results remain the same regardless of the shape of the object.)
- Support the Big Q by using Figures 2 and 3 by discussing how intrusions and faults convey information about relative age.
- Review the information relating to intrusions and the law of superposition before beginning the Apply It activity. Have students share their inferences about the relative ages of areas B and E.
- Build Inquiry by inviting students to compare and label rock samples.
- Do the Lab Investigation having students explore what rocks and fossils tell about Earth's past.
- Review the descriptions of unconformities and folding and study the diagrams in Figure 5 before beginning the Apply It activity. Have students share their inferences about the history of the area in the photograph.
- Have students do the Quick Lab to explore modeling and deforming rock samples.
- Have students take the Lesson Quiz.

Lesson 3 – Radioactive Dating (2-3 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will measure and cut pieces of clay to explore the concept of half-life. The After the Inquiry Warm-Up worksheet sets up a discussion about radioactive dating. Have volunteers share their answers to question 4 saying if it is possible to perform the action on a cube of any size.
- Focus on the Inquiry Skill for the lesson. Remind students that when they calculate, they use addition, subtraction, multiplication, or division to find an answer. What calculations were performed in the Inquiry Warm-Up Activity? (Reducing the size of the initial cube by one fourth, one eighth, and one sixteenth)
- Have students do the Quick Lab to model the half-lives of radioactive elements.
- Support the Big Q by explaining that while carbon-14 is a radioactive isotope of carbon, not all isotopes of carbon are radioactive, reviewing the concept of isotopes, if necessary.
- Build Inquiry to model radioactive dating.
- Have students do the Quick Lab using half-lives to determine approximate ages.
- Have students take the Lesson Quiz.

Lesson 4 – The Geologic Time Scale (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will create a timeline of their own lives. The After the Inquiry Warm-Up worksheet sets up a discussion of how to make a model of a geologic time scale. Have volunteers share the timelines they created in response to question 4.
- Focus on the Inquiry Skill for the lesson. Point out that making models is necessary when dealing with things or processes that cannot be observed because they are too small, too large, or take place too slowly. What type of model could be created in the Inquiry Warm-Up Activity? (A timeline)

- Support the Big Q by identifying the major changes in the fossil record that mark the beginning and end of each time unit on the geologic time scale.
- Do the Build Inquiry having students create a bar graph to show the actual proportions of the divisions in the geologic time scale.
- Review the geologic time scale in Figure 2 before beginning the Apply It activity. Have students share the ideas about the advantages and disadvantages of using a 1 m = 1 million years scale.
- Have students do the Quick Lab comparing the major units of geologic time to distances in a long hallway.
- Have students take the Lesson Quiz.

Lesson 5 – Early Earth (1-2 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will make a model that demonstrates the formation of Earth. The After the Inquiry Warm-Up worksheet sets up a discussion about early Earth. Have volunteers share their answers to question 4 about how other planets may have formed.
- Focus on the Inquiry Skill for the lesson. Remind students that human begins communicate in many ways, including words, images, and gestures. What details could be communicated about the force of the magnet in the Inquiry Warm-Up Activity? (The force of the magnet was strong enough to attract the filings.)
- Support the Big Q by using Figure 3 to discuss early Precambrian organisms, helping students understand that scientists use these fossils to learn more about Earth's early life forms.
- Review the paragraphs under the red head Earth Takes Shape before beginning the Apply It activity.
- Have students share their ideas about how Earth's atmosphere would be different without organisms capable of photosynthesis.
- Build Inquiry by allowing students to compare and contrast atmospheric gases.
- Have students do the Quick Lab explore how stromatolites formed.
- Have students take the Lesson Quiz.

Lesson 6 – Eras of Earth's History (4-5 class periods)

- To teach this lesson with an emphasis on inquiry, begin with the Inquiry Warm-Up activity. Students will determine criteria for constructing and dividing a time scale. The After the Inquiry Warm-Up worksheet sets up a discussion about timelines. Have volunteers share their answers to question 4 about which is the better tool for presenting a person's history: a timeline or a list of key events.
- Focus on the Inquiry Skill for the lesson. Remind students that classifying is grouping together items that are alike in some way. How could classification be used in the Inquiry Warm-Up Activity? (Sample: Grouping events that occurred during a particular segment of time)
- Build Inquiry by allowing students to compare and contrast amphibians and reptiles.
- Have students do the Quick Lab to graph the ranges of various life forms.
- Review the information about reptiles in the Triassic Period and about reptiles and birds in the Jurassic Period before beginning the Apply It activity. Have students share their results.
- Do the Build Inquiry to allow students to develop hypotheses about why flowering plants became the dominant plants after the end of the Mesozoic Era.
- Have students do the Quick Lab to model how an asteroid impact might have affected life in the oceans.
- Explore the Big Q using Figure 6 to discuss the landmark events and life forms in each era.
- Build Inquiry by having students research prehistoric life forms and present their findings to the class.
- Do the Quick Lab to have students make a timeline of major events in the Cenozoic Era.
- Have students take the Lesson Quiz.

*All activities, labs, assessments, performance expectations, etc. can be found within the Pearson Interactive Online Program.

Unit Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s):

MS-ESS2-1 Earth's Place in the Universe Students who demonstrate understanding can:

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process (for example, create an use a model to explain the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials).
2.0	**Students will be able to:** • Recognize to recall specific vocabulary (for example, crystal, crystallization, cycle, deformation, Earth material, energy, flow, formation, melt, mineral, recrystallization, sedimentation, weathering). • Describe the role of melting, crystallization, weathering, deformation, and sedimentation in the formation of rocks and minerals.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): * MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, continent, continental shape, continental shelf, distribution, Earth's crust, fossil, fracture zone, geologic force, geologic shift, lithosphere, motion, plate, ridge, rock layer movement, seafloor structure, trench). • Describe ways in which the Earth's surface has changed over time. • Describe how distribution of fossils, rocks, continental shapes, and seafloor structures give evidence of past plate motion.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS – ESS 3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.

3.0	**Students will be able to:** • Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: Catastrophic, Drought, Earthquake, Flood, Forecast Frequency, Hurricane, Location, Mitigate, Natural Hazard, Predict, Reservoir, Satellite, Severe Weather, Technology, Tornado, Tsunami, Volcanic Eruption • Describe natural hazards. • Describe indicators that a natural hazard may occur. • Describe technologies that can mitigate the effects of natural hazards.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales (for example, use evidence to explain how geoscience processes such as surface weathering and deposition by the movements of water, ice, and wind – especially geoscience processes that shape local geographic features – change Earth's surface at time and spatial scales that can be large, such as slow plate motions or the uplift of large mountain ranges, or small, such as rapid landslides or microscopic geochemical reactions, and how many geoscience processes usually behave gradually but are punctuated by catastrophic events, such as earthquakes, volcanoes, and meteor impacts).
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, catastrophic, depositions, Earth's layers, Earth's surface, earthquake, geochemical reaction, geographic feature, feoscience, igneous rock, landslide, metamorphic rock, meteor impact, microscopic, mountain range, plate motion, sediment deposition, sedimentary rock, sedimentation, spatial scale, surface, surface runoff, time scale, uplift, volcano, water cycle, weathering).

	• Describe how long it takes for various geoscience processes to change the Earth's surface (for example, weathering, deposition, plate motion, uplift, landslides, earthquakes, volcanoes, and meteors).
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, Earth's age, evidence, evolution, extinction, formation, fossil, geologic, geologic evidence, history, Homo sapiens, Ice Age, living organism, mountain chain, ocean basin, relative, rock formation, rock layer movement, rock strata, sedimentary rock, time scale, volcanic eruption).
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Enrichment Worksheets
Struggling Learners	Use L1 Differentiated Instruction Activities
English Language Learners	Use ELL Support Activities from lesson as needed. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Use L1 Differentiated Instruction Activities. http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:

ELA

- **Conduct a research Project to answer a question and drawing on several sources.**
- **Cite textual evidence to support analysis of science and technical texts.**
- **Write arguments focused on discipline content.**
- **Trace and evaluate the argument and specific claims that are supported by reasons and claims that are not.**
- **Determine the central ideas or conclusions of a text; provide and accurate summary of the text from prior knowledge and opinions.**
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence and add interest.
- Write informative/explanatory texts to examine a topic and convey ideas, concepts and information through selection , organization and analysis of relevant content.
- Draw evidence from informational texts to support analysis, reflection and research.
- Gather relevant information from multiple and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

Math

- **Analyze the relationship between the dependent and independent variables using tables and graphs and relating this to an equation resulting from a real world problem that shows a change in a relationship between two variables.**
- **Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread and overall shape.**
- **Summarize numerical data sets in relation to their content.**
- Reason abstractly and quantitatively.
- Model with mathematics.
- Develop understanding of statistical variability.

Integration of 21st Century Skills

Indicators:

To function in the 21st Century work place a variety of skills need to be developed and strengthened some of those would be:

- **Developing and Using Models**
- **Planning and Carrying Out Investigations [**supported in the science lab setting but useful in many aspects of life**]**
- **Constructing Explanations and Designing Solutions** [supporting explanations with research and experimentation]
- **Engaging in Argument from Evidence**
- **Analyzing and Interpreting Data** [collected during labs or proposed scenarios]
- **Creativity and Innovation** [brainstorm, collaborate and incorporate group ideas]
- **Critical Thinking and Problem Solving** [Follow the steps of the scientific method.]
- **Communication and Collaboration** [All types of communication are needed - oral, written and nonverbal communication in a variety of forms and contexts. It is also importanat to be able to listen effectively to decipher meaning, including knowledge, values, attitudes and intentions.]
- **Information Literacy** [Use information accurately and creatively for the issue or problem at hand.]
- **Media Literacy** [Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media.]
- **ICT (Information, Communications and Technology) Literacy** [Use technology as a tool to research, organize, evaluate and communicate information.]
- **Flexibility and Adaptability** [Adapt to varied roles, jobs and responsibilities, schedules and contexts.]

- **Initiative and Self-Direction** [Set goals, balance short-term and long-term goals. Utilize time and manage workload efficiently. Monitor, define, prioritize, and complete tasks without direct oversight. Demonstrate commitment to learning as a lifelong process. Reflect critically on past experiences to continue to improve.]
- **Social and Cross-Cultural Skills** [Know when it is appropriate to listen and when to speak. Conduct themselves in a respectable manner. Learn and respect cultural differences and work effectively with people from a range of social and cultural backgrounds. Respond open-mindedly to different ideas and values.]
- **Productivity and Accountability** Set and meet goals, even in the face of obstacles.]
- **Leadership and Responsibility** [Use interpersonal and problem-solving skills to influence and guide others toward a goal. Inspire others to reach their very best via example and selflessness. Demonstrate integrity and ethical behavior in using influence and power. Act responsibly with the interests of the larger community in mind.]