Westmoreland County Public Schools
Integrated Instructional Pacing Guide
6th Grade Science
2011-2012
Text: Prentice Hall Science Explorer

Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
SOL	6.1 Planning and conducting investigations	6.8 Investigating and understanding the organization of the solar system and the relationships among the various bodies that comprise it.		6.4 Investigating and understanding that all matter is made up of atoms.		6.2 Investigating and understanding basic sources of energy, their origins, transformations, and uses.		6.9 Investigating and understanding public policy decisions relating to the environment.	Review SOL 6.1, 6.8, 6.4, 6.2, 6.9
Standards of the Heart	Responsibility (class rules; lab expectations)	Cooperation (encouragement and teamwork)		Perseverance (creating a plan to accomplish a task)				Responsibility (brainstorm ways to demonstrate responsibility)	
Internet Safety	AUP rules; techniques for evaluating information; potential dangers; precautions/problem resolution							Research (fact vs. opinion; techniques for persuasion; point of view)	
Textbook Correlation	Introduction Chapter 1 Chapter 2 Skills Handbook Appendix	Chapter 18 Chapter 19		Chapter 1 Chapter 3		Chapter 15 Chapter 16		Chapter 14 Chapter 17	

Related Experiments	Obscertainers	Football Field Solar System	Building an atom	Energy Source Presentations		
Additional Resources	Enhanced Scope and Sequence	Enhanced Scope and Sequence	Enhanced Scope and Sequence	Enhanced Scope and Sequence	Enhanced Scope and Sequence	
Date Completed						

Week 1 (SOL 6.1)

The concepts developed in this standard include the following:

• To communicate an observation accurately, one must provide critical details of exactly what is being observed.

Using that information, students will be able to differentiate definitively between or among similar objects and/or organisms.

• In an effective classification system, accurate comparisons and contrasts are made.

• Systematic investigations require accurate measurements; however, in the absence of precision tools, observers must record careful estimations.

• Scale models must maintain relative values of size and/or quantity in order to maintain the integrity of the object or topic being modeled.

• An *experiment* is a structured test of a hypothesis. A *hypothesis* is stated in terms of a testable relationship.

• A scientific *prediction* is a forecast about what may happen in some future situation. It is based on the application of scientific principle and factual information. An *inference* is a conclusion based on evidence about events that have already occurred.

• Accurate observations and evidence are necessary to draw realistic and plausible conclusions.

• In order to conduct an experiment, one must recognize all of the potential variables that can affect an outcome.

• In a scientific investigation, data should be collected, recorded, analyzed, and reported using appropriate metric measurement.

• In a scientific investigation, data should be organized and communicated through appropriate graphical representation (graph, chart, table, and diagram).

• Models provide a way of visually representing abstract concepts. The use of models permits students to order events or processes.

• Patterns discerned from direct observations can be the basis for predictions or hypotheses that attempt to explain the mechanism responsible for the pattern.

Weeks 2 and 3 (SOL 6.8)

The concepts developed in this standard include the following:

• The solar system consists of the sun, moon, Earth, other planets and their moons, meteors, asteroids, and comets.

Each body has its own characteristics and features.

• The distance between planets and sizes of the planets varies greatly. The outer, gas planets are very large, and the four inner planets are comparatively small and rocky.
• Gravity is a force that keeps the planets in motion around the sun. Gravity acts everywhere in the universe.
• Planets revolve around the sun, and moons revolve around planets. A planet rotates upon an axis.
• As the Earth rotates, different sides of the Earth face toward or away from the sun, thus causing day and night, respectively.
• The phases of the moon are caused by its position relative to the Earth and sun.
• The Earth is a rocky planet, extensively covered with large oceans of liquid water and having frozen ice caps in its polar regions. The Earth has a protective atmosphere consisting predominantly of nitrogen and oxygen and has a magnetic field. The atmosphere and the magnetic field help shield the Earth's surface from harmful solar radiation. Scientific evidence indicates that the Earth is about 4.5 billion years old.
• Seasons are caused by the tilt of the Earth on its axis and, thus, the angle at which sunlight strikes the surface of the Earth during its annual revolution around the sun.
• Tides are the result of the gravitational pull of the moon and sun on the surface waters of the Earth.
• The ideas of Ptolemy, Aristotle, Copernicus, and Galileo contributed to the development of our understanding of the solar system.
• With the development of new technology over the last half century, our knowledge of the solar system has increased substantially.

Week 4 (SOL 6.4)

The concepts developed in this standard include the following:
• The basic structural components of the typical atom are *electrons*, *protons*, and *neutrons*. Protons and neutrons comprise the *nucleus* of an atom.
• An *element* is a form of matter made up of one type of atom.
The atoms of an element are basically alike, though the number of neutrons may vary.
• The atoms of one element differ from those of another element in the number of protons.
• Elements can be represented by chemical symbols.
• Two or more atoms of different elements may combine to form a *compound*.
• Compounds can be represented by chemical formulas. Each different element in the compound is represented by its unique symbol. The number of each type of element in the compound (other than 1) is represented by a small number (the subscript) to the right of the element symbol.
• Chemical equations can be used to model chemical changes, illustrating how elements become rearranged in a chemical reaction.
• A limited number of elements, including silicon, aluminum, iron, sodium, calcium, potassium, magnesium, hydrogen, oxygen, nitrogen, and carbon, form the largest portion of the Earth's crust, living matter, the oceans, and the atmosphere.

Weeks 5 and 6 (SOL 6.2)

The concepts developed in this standard include the following:
• *Potential energy* is energy that is not "in use" and available to do work. *Kinetic energy* is energy that is "in use"; the energy a moving object has due to its motion. For example, moving water and wind have kinetic energy. The chemical energy in fossil fuels is potential energy until it is released.
• Some important sources of energy include fossil fuels, wood, wind, water (hydropower), the sun (solar energy), and the
Earth's interior.
• Heat and light can be converted into mechanical energy, chemical energy, and electrical energy and back again.
• Solar energy from the ancient past is stored in fossil fuels, such as coal and petroleum. Fossil fuels are rich in the elements carbon and hydrogen. These sources of energy take very long periods of time to form and once depleted, are essentially nonrenewable.

• Many of the Earth's energy resources are available on a perpetual basis. These include solar, wind, water, and geothermal energy. Some energy sources can be replenished over relatively short periods of time. These include wood and other biomass. All are considered renewable.
• Modern industrial society is dependent upon energy. Fossil fuels are the major sources of energy in developed and industrialized nations.

Weeks 7 and 8 (SOL 6.9)

The concepts developed in this standard include the following:
• People, as well as other living organisms, are dependent upon the availability of clean water and air and a healthy environment.
• Local, state, and federal governments have significant roles in managing and protecting air, water, plant, and wildlife resources.
• Modern society is dependent upon many finite resources, including coal, oil, natural gas, and nuclear power.
• Many renewable and nonrenewable resources are managed by the private sector (private individuals and corporations).
• Regulations, incentives, and voluntary efforts help conserve resources and protect environmental quality.
• Conservation of resources and environmental protection begin with the individual.
• Use of renewable and nonrenewable resources must be considered in terms of their cost/benefit tradeoffs.
• Preventive measures, such as pollution prevention or thoughtfully planned and enforced land-use restrictions can reduce the impact of potential problems in the future.
• Pollution prevention and waste management are less costly than cleanup.
• Renewable resources should be managed so that they produce continuously. Sustainable development makes decisions about long-term use of the land and natural resources for maximum community benefit for the longest time and with the least environmental damage.

Week	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18
SOL	6.5 Investigating and understanding the unique properties and characteristics of water and its roles in the natural and human-made environment.		6.3 Investigating and understanding the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on the Earth's surface.		6.6 Investigating and understanding the properties of air and the structure and dynamics of the Earth's atmosphere.		6.7 Investigating and understanding the natural processes and human interactions that affect watershed systems.		Review all Science 6 SOL
Standards of the Heart	Responsibility and Cooperation								
Internet Safety	Cybersafety Reminders		Cybersafety Reminders		Cybersafety Reminders				
Textbook Correlation	Chapter 2 Chapter 7 Chapter 8				Chapter 11 Chapter 12 Chapter 13		Chapter 7, section 2		
Related Experiments	Mystery of the Note								
Additional Resources	Enhanced Scope and Sequence		Enhanced Scope and Sequence		Enhanced Scope and Sequence		Enhanced Scope and Sequence		

Date Completed					

Weeks 10 and 11 (SOL 6.5)

The concepts developed in this standard include the following:

• Water is the only compound that commonly exists in all three states (solid, liquid, gas) on Earth. The unique properties of water are a major factor in the ability of our planet to sustain life.

• Among water's unique properties is that one side of each water molecule is slightly negative and the other is slightly positive. Individual water molecules, therefore, attract other water molecules like little magnets as the slightly positive portion of a water molecule is attracted to the slightly negative portion of an adjacent water molecule. In this way, water molecules "stick together."

• A large number of substances will dissolve in water. For this reason, water is often called the universal solvent.

• Water is able to absorb heat energy without showing relatively large changes in temperature. Large bodies of water act to moderate the climate of surrounding areas by absorbing heat in summer and slowly releasing that heat in the winter. For this reason, the climate near large bodies of water is slightly milder than areas without large bodies of water.

• Additional properties of water are its high surface tension and the large range of temperature (0.100 degrees Celsius) in which it can be found in the liquid state, as well as the fact that, unlike other substances, it expands when it freezes. Ice is less dense than liquid water.

• Water (rain, ice, snow) has shaped our environment by physically and chemically weathering rock and soil and transporting sediments. Freezing water can break rock without any change in the minerals that form the rock (physical weathering). This usually produces small particles and sand. Water with dissolved gases and other chemicals causes the minerals in rocks to be changed, leading to the deterioration of the rock (chemical weathering).

• Scientific evidence indicates that the Earth formed about four-and-a-half billion years ago from the dust and debris orbiting the sun. Due to gravity, this debris became compacted and grew quite hot, creating hot gases, including water vapor and carbon dioxide. Over millions of years, the Earth and its gases cooled, and seas are believed to have formed when the Earth cooled enough for water vapor in the atmosphere to condense.

• Most of Earth's water is salt water in the oceans (97 percent). Available non-frozen, fresh water makes up less than 1 percent of the water on Earth.

• Water occurs on Earth in oceans, lakes, rivers, streams, and in rock layers underground called aquifers. A large amount of water is also found in the bodies of living things.

• The first human settlements were established near springs, rivers, and lakes. Reliable fresh water sources and irrigation systems allowed civilizations to grow and flourish. As cities grew, different strategies (tunnels, aqueducts, wells, cisterns, pumps, reservoirs) were employed to collect water.

• Water is essential for agriculture. Crops watered by reliable irrigation systems are more productive, and harvests more dependable.

• Water is an important resource used in power generation. Hydroelectric power plants make use of the kinetic energy of water as it flows through turbines. Water is also heated in power plants and turned to steam. The steam is used to turn turbines, which generate electricity.

• In the past, streams and rivers were often used to dispose of human waste, and open sewers were common. During the mid-1800s, public health officials recognized the connection between disease outbreaks and contamination of public wells and drinking water. Advances in water treatment and sanitary sewers have helped eliminate diseases associated with human waste.

Weeks 12 and 13 (SOL 6.3)

The concepts developed in this standard include the following:

• The Earth receives only a very small portion of the sun's energy, yet this energy is responsible for powering the motion of the atmosphere, the oceans, and many processes at the Earth's surface.

• Solar radiation is made up of different types of radiation (including infrared, visible light, and ultraviolet).

• Incoming solar radiation is in close balance with the energy that leaves the atmosphere; otherwise the Earth would heat up or cool down. Excess carbon dioxide and other gases may disrupt this balance, creating a Greenhouse Effect.

• About one third of the sun's incoming energy is reflected back out to space. About one half of the energy striking the Earth is absorbed by the Earth's surface.
• The Earth's surface is heated unequally.
• When air or water is heated, the molecules move faster and farther apart, reducing their density and causing them to rise. Cooler air or water molecules move more slowly and are denser than warm air or water. Warm air or water rising coupled with cooler air or water descending forms a cyclic rising/falling pattern called *convection*.
• Radiation and convection from the Earth's surface transfer heat energy. This energy powers the global circulation of the atmosphere and the oceans on our planet.
• As bodies of water (oceans, lakes, rivers, etc.) absorb heat energy, the water evaporates forming clouds.
• Warm, moist air is less dense than cold, dry air, so it rises relative to colder, drier air. As warm, moist air rises, it actually gives off some heat as the moisture condenses. Clouds are not gaseous water vapor; rather they are minute, condensed water particles.
• Some thunderstorms are formed where the land is strongly heated. Hurricanes form over warm, tropical water and are fed by the energy of that water.

Weeks 14 and 15 (SOL 6.6)
The concepts developed in this standard include the following:
• Air is a mixture of gaseous elements and compounds. These include nitrogen, oxygen, water, argon and carbon dioxide. Nitrogen makes up the largest proportion of air.
• Air exerts pressure. Air pressure decreases as altitude increases.
• Moisture in the air is called *humidity*.
• The atmosphere is made up of layers (troposphere, stratosphere, mesosphere, and thermosphere) that have distinct characteristics.
• Temperature decreases as altitude increases in the lowest layer of the atmosphere.
• Most of the air that makes up the atmosphere is found in the troposphere (the lowest layer). Virtually all weather takes place there.
• Forest fires and volcanic eruptions are two natural processes that affect the Earth's atmosphere. Many gaseous compounds and particles are released into the atmosphere by human activity. All of the effects of these materials are not yet fully understood.
• The amounts of heat energy and water vapor in the air and the pressure of the air largely determine what the weather conditions are.
• Weather maps show much useful information about descriptive air measurements, observations, and boundaries between air masses (fronts). The curved lines showing areas of equal air pressure and temperature are key features of weather maps. Weather maps are important for understanding and predicting the weather.
• Clouds are important indicators of atmospheric conditions. Clouds are found at various levels within the troposphere. Three major types of clouds are cumulus, stratus, and cirrus.
• *Ozone*, a form of oxygen, can form near the surface when exhaust pollutants react with sunlight. This pollutant can cause health problems. Naturally occurring ozone is also found in the upper atmosphere and helps to shield the Earth from ultraviolet radiation.
• Maintaining good air quality is a crucial goal for modern society, and it is everyone's responsibility to work toward it.

Weeks 16 and 17 (SOL 6.7)
The concepts developed in this standard include the following:
• An ecosystem is made up of the living community and the nonliving factors that affect it. The health of an ecosystem is directly related to water quality.
• Abiotic factors determine ecosystem type and its distribution of plants and animals as well as the usage of land by people. Abiotic factors include water supply, topography, landforms, geology, soils, sunlight, and air quality/O2 availability.

• Human activities can alter abiotic components and thus accelerate or decelerate natural processes. For example, people can affect the rate of natural erosion. Plowing cropland can cause greater erosion, while planting trees can prevent it. Flood protection/wetland loss is another example.
• A *watershed* is the land that water flows across or through on its way to a stream, lake, wetland, or other body of water. Areas of higher elevations, such as ridgelines and divides, separate watersheds.
• The three major regional watersheds systems in Virginia lead to the Chesapeake Bay, the North Carolina sounds, or the Gulf of Mexico.
• River systems are made up of tributaries of smaller streams that join along their courses. Rivers and streams generally have wide, flat, border areas, called flood plains, onto which water spills out at times of high flow.
• Rivers and streams carry and deposit sediment. As water flow decreases in speed, the size of the sediment it carries decreases.
• Wetlands form the transition zone between dry land and bodies of water such as rivers, lakes, or bays. Both tidal and non-tidal wetlands perform important water quality functions, including regulating runoff by storing flood waters; reducing erosion by slowing down runoff; maintaining water quality by filtering sediments, trapping nutrients, and breaking down pollutants; and recharging groundwater. They also provide food and shelter for wildlife and fish and nesting and resting areas for migratory birds.
• Estuaries perform important functions, such as providing habitat for many organisms and serving as nurseries for their young.
• The Chesapeake Bay is an estuary where fresh and salt water meet and are mixed by tides. It is the largest estuary in the contiguous United States and one of the most productive.
• Water quality monitoring is the collection of water samples to analyze chemical and/or biological parameters. Simple parameters include pH, temperature, salinity, dissolved oxygen, turbidity, and the presence of macro invertebrate organisms.