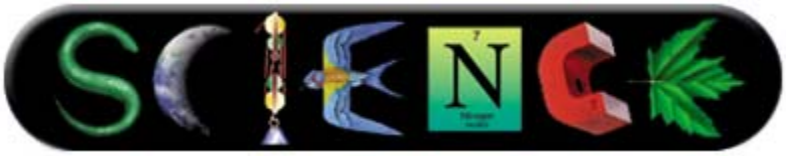
2018-2019 6th Grade



ɪills described in standard 6.1 are intended to define the "investigate" component of all of the other sixth-grade standards (6
lard 6.1 is that students will continue to develop a range of inquiry skills and achieve proficiency with those skills in the co
eloped at the sixth grade. Standard 6.1 does not require a discrete unit on scientific investigation because the inquiry skills t
hould be incorporated in all the other sixth-grade standards. It is also intended that by developing these skills, students will
ɜtanding of scientific inquiry and the nature of science, as well as more fully grasp the content-related concepts in the stand
that models, simulations and current applications are used throughout the course in order to learn and reinforce science cor

ɜtudent will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducti
tigations in which

- ʏations are made involving fine discrimination between similar objects and organisms;
- e and approximate measurements are recorded;
- nodels are used to estimate distance, volume, and quantity;
- ıeses are stated in ways that identify the independent and dependent variables;
- ıod is devised to test the validity of predictions and inferences;
- ıriable is manipulated over time, using many repeated trials;
- re collected, recorded, analyzed, and reported using metric measurements and tools;
- re analyzed and communicated through graphical representation;
- s and simulations are designed and used to illustrate and explain phenomena and systems; and
- t applications are used to reinforce science concepts.

lards 6.8 Unit 1 Outer Space Weeks 2-6 8/13/20 18

ent will investigate and understand the organization of the solar system and the interactions among the various bodie
Key concepts include
ne sun, moon, Earth, other planets and their moons, dwarf planets, meteors, asteroids, and comets;
elative size of and distance between planets;
e role of gravity;
volution and rotation;
e mechanics of day and night and the phases of the moon;
e unique properties of Earth as a planet;
e relationship of Earth's tilt and the seasons;
ne cause of tides; and
e history and technology of space exploration.

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successf this standard, students are expected to:**
ts developed in this standard include the following: olar system consists of the sun, moon, Earth, other ts and their moons, meteors, asteroids, and comets. body has its own characteristics and features. istance between planets and sizes of the planets vary y. The outer, "gas" planets are very large, and the four planets are comparatively small and rocky. ty is a force that keeps the planets in motion around the ravity acts everywhere in the universe. ts revolve around the sun, and moons revolve around ts. A planet rotates upon an axis. arf planet revolves around the sun, and can maintain a round shape as planets do, but it cannot move other ts away from its orbital neighborhood. rth rotates, different sides of Earth face toward or away the sun, thus causing day and night, respectively. hases of the moon are caused by its position relative to and the sun.	In order to meet this standard, it is expected that students ● describe the planets and their relative positions fron ● compare the characteristics of Pluto to the planets a its designation as a dwarf planet. ● design and interpret a scale model of the solar syste model may be a physical representation of an object It can also be a mathematical representation that us such as ratios, proportions, and percentages.) ● explain the role of gravity in the solar system. ● compare and contrast revolution and rotation and a terms to the relative movements of planets and thei ● model and describe how day and night and the phas moon occur. ● model and describe how Earth's axial tilt and its ann around the sun cause the seasons. ● describe the unique characteristics of planet Earth. ● discuss the relationship between the gravitational p moon and the cycle of tides.

is a rocky planet, extensively covered with large oceans uid water and having frozen ice caps in its polar regions. has a protective atmosphere consisting predominantly ·ogen and oxygen and has a magnetic field. The sphere and the magnetic field help shield Earth's :e from harmful solar radiation. Scientific evidence ıtes that Earth is about 4.5 billion years old. ns are caused by a combination of the tilt of Earth on its he curvature of Earth's surface and, thus, the angle at ı sunlight strikes the surface of Earth during its annual ıtion around the sun. are the result of the gravitational pull of the moon and ı the surface waters of Earth. leas of Ptolemy, Aristotle, Copernicus, and Galileo buted to the development of our understanding of the system. the development of new technology over the last half- ry, our knowledge of the solar system has increased antially.	• compare and contrast the ideas of Ptolemy, Aristotle Copernicus, and Galileo related to the solar system. • create and interpret a timeline highlighting the adva solar system exploration over the past half century. include information on the first modern rockets, arti satellites, orbital missions, missions to the moon, Ma explorers, and exploration of the outer planets.

PRIMARY Resources and Activities	SUPPLEMENTAL Resources and Activities	TEACHER NOTES

tudent will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. K

a mixture of gaseous elements and compounds;
ure, temperature, and humidity;
spheric changes with altitude;
l and human-caused changes to the atmosphere and the importance of protecting and maintaining air quality;
ationship of atmospheric measures and weather conditions; and
nformation from weather maps, including fronts, systems, and basic measurements.

ESSENTIAL UNDERSTANDINGS All students should:	ESSENTIAL KNOWLEDGE AND SKILLS To be successful with this standard, students are expecte
developed in this standard include the following: . mixture of gaseous elements and compounds. These ;en, oxygen, water, argon and carbon dioxide. es up the largest proportion of air. rts pressure. Air pressure decreases as altitude re in the air is called humidity. nosphere is made up of layers (troposphere, mesosphere, and thermosphere) that have distinct s. rature decreases as altitude increases in the lowest mosphere. f the air that makes up the atmosphere is found in the he lowest layer). Virtually all weather takes place fires and volcanic eruptions are two natural processes rth's atmosphere. Many gaseous compounds and eleased into the atmosphere by human activity. All of these materials are not yet fully understood. a form of oxygen, can form near the surface when tants react with sunlight. This pollutant can cause ns. Naturally occurring ozone is also found in the	In order to meet this standard, it is expected that students will · comprehend and apply basic terminology related to air a atmosphere. · identify the composition and physical characteristics of atmosphere. · analyze and interpret charts and graphs of the atmosphe terms of temperature and pressure. · measure and record air temperature, air pressure, and hu using appropriate units of measurement and tools. · analyze and explain some of the effects that natural eve human activities may have on weather, atmosphere, and clima · evaluate their own roles in protecting air quality. In order to meet this standard, it is expected that students will · describe the planets and their relative positions from the · compare the characteristics of Pluto to the planets and e designation as a dwarf planet. · design and interpret a scale model of the solar system. (model may be a physical representation of an object or concep also be a mathematical representation that uses factors such as proportions, and percentages.) ·

here and helps to shield Earth from ultraviolet developed in this standard include the following:	

PRIMARY Resources and Activities	SUPPLEMENTAL Resources and Activities	TEACHER NOTES

lards 6.3 Unit 3 Solar Energy Weeks 11-14 10/15/201
018

ent will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, , and on Earth's surface. Key concepts include

s energy budget;
le of radiation and convection in the distribution of energy;
tion of the atmosphere and the oceans;
formation; and
le of thermal energy in weather-related phenomena including
torms and hurricanes.

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successf this standard, students are expected to:**
s developed in this standard include the following:	In order to meet this standard, it is expected that students will
receives only a very small portion of the sun's energy, yet ıergy is responsible for powering the motion of the phere, the oceans, and many processes at Earth's surface. radiation is made up of different types of radiation ding infrared, visible light, and ultraviolet). ing solar radiation is in close balance with the energy that the atmosphere; otherwise Earth would heat up or cool Excess carbon dioxide and other gases may disrupt this :e, creating a greenhouse effect. one-third of the sun's incoming energy is reflected back space. About one-half of the energy striking Earth is)ed by Earth's surface. s surface is heated unequally. air or water is heated, the molecules move faster and r apart, reducing their density and causing them to rise. r air or water molecules move more slowly and are denser	• comprehend and apply basic terminology related to sola including wavelength; ultraviolet, visible, and infrared and reflection and absorption. • analyze and interpret a chart or diagram showing Earth budget. • analyze, model, and explain the greenhouse effect in ter energy entering and leaving the atmosphere. • design an investigation to determine the effect of sunlig heating of a surface. • analyze and explain how convection currents occur and distribute thermal energy in the atmosphere and oceans • analyze the role of heating and cooling in the formation • order the sequence of events that takes place in the form cloud. • describe the relationship between thermal energy and th of hurricanes and thunderstorms.

/arm air or water. Warm air or water rising coupled with air or water descending forms a cyclic rising/falling ı called convection. tion and convection from Earth's surface transfer thermal /. This energy powers the global circulation of the phere and the oceans on our planet. dies of water (oceans, lakes, rivers, etc.) absorb thermal /, the water evaporates causing the air to be warm and Warm, moist air is less dense than cold, dry air, so it rises e to colder, drier air. As warm, moist air rises, it gives off thermal energy as the moisture condenses, forming clouds. s are not gaseous water vapor; rather they are minute, nsed water particles. thunderstorms are formed where the land is strongly l. Hurricanes form over warm, tropical water and are fed by ergy of that water.	

PRIMARY Resources and Activities	SUPPLEMENTAL Resources and Activities	TEACHER NOTES

lards 6.2, 6.6, 6.9 Unit 4 Energy/Heat/Sun/Weather Weeks 15-2
018-12/19/2018

ent will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts inc

ial and kinetic energy;
le of the sun in the formation of most energy sources on Earth;
newable energy sources;
able energy sources; and
transformations.
ent will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. Key c

a mixture of gaseous elements and compounds;
ure, temperature, and humidity;
spheric changes with altitude;
l and human-caused changes to the atmosphere and the importance of protecting and maintaining air quality;
ationship of atmospheric measures and weather conditions; and
nformation from weather maps, including fronts, systems, and basic measurements.

ent will investigate and understand public policy decisions relating to the environment. Key concepts include
anagement of renewable resources;

nagement of nonrenewable resources;

tigation of land-use and environmental hazards through preventive measures; and
enefit tradeoffs in conservation policies.

.6 is intended to provide students with a basic understanding of the properties of air, the structure of the atmosphere, l air quality. Students need to understand there are both natural and human-caused changes to the atmosphere and that s of these changes are not yet fully known. A basic understanding of weather and weather prediction builds on the key standard 4.6. Standard 6.6 also focuses on student understanding of air quality as an important parameter of human and tal health. It is important to make the obvious connections between this standard and the other sixth-grade standards. It hat students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science (6.1) in the context of the key concepts presented in this standard.

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successful with this students are expected to:**
of thermal energy and water vapor in the air and the e air largely determine what the weather conditions are important indicators of atmospheric conditions. und at various levels within the troposphere. Three f clouds are cumulus, stratus, and cirrus. ining good air quality is a crucial goal for modern t is everyone's responsibility to work toward it. s show much useful information about descriptive air s, observations, and boundaries between air masses curved lines showing areas of equal air pressure and re key features of weather maps. Weather maps are understanding and predicting the weather.	design an investigation to relate temperature, barometric press humidity to changing weather conditions. · compare and contrast cloud types and relate cloud types weather conditions. · compare and contrast types of precipitation. · compare and contrast weather-related phenomena, includ thunderstorms, tornadoes, hurricanes, and drought. · interpret basic weather maps and make forecasts based o information presented. · map the movement of cold and warm fronts and interpre effects on observable weather conditions.

PRIMARY **Resources and Activities**	**SUPPLEMENTAL** **Resources and Activities**	**TEACHER NOTES**

lards 6.4, 6.5 Unit 5 Water and Atoms Weeks 21-25
)19-02/01/2019

student will investigate and understand that all matter is made up of atoms. Key concepts include
consist of particles, including electrons, protons, and neutrons;
of a particular element are alike but are different from atoms of other elements;
nts may be represented by chemical symbols;
r more atoms interact to form new substances, which are held together by electrical forces (bonds);
ounds may be represented by chemical formulas;
ical equations can be used to model chemical changes; and
ted number of elements comprise the largest portion of the solid Earth, living matter, the oceans, and the atmosphe

tudent will investigate and understand the unique properties and characteristics of water and its roles in the natural environment. Key concepts include
water as the universal solvent;
the properties of water in all three phases;

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successful with this students are expected to:**
epts developed in this standard include the following: g water's unique properties is that one side of each water ule is slightly negative and the other is slightly positive. dual water molecules, therefore, attract other water ules like little magnets as the slightly positive portion of a molecule is attracted to the slightly negative portion of an nt water molecule. In this way, water molecules "stick er." water's polar nature, a large number of substances will lve" in water. For this reason, water is often called the sal solvent.	6.4 In order to meet this standard, it is expected that students v ● comprehend and apply key terminology related to wate properties and uses. ● model and explain the shape and composition of a wate ● design an investigation to demonstrate the ability of wa dissolve materials. ● comprehend the adhesive and cohesive properties of wa ● compare the effects of adding thermal energy to the stat ● explain why ice is less dense than liquid water. ● relate the three states of water to the water cycle. ● design an investigation to model the action of freezing

is the only compound that commonly exists in all three (solid, liquid, gas) on Earth. The unique properties of are a major factor in the ability of our planet to sustain life. ional properties of water are its high surface tension and the range of temperature (0–100 degrees Celsius) in which it found in the liquid state, as well as the fact that, unlike substances, solid water is less dense than liquid water. is able to absorb thermal energy without showing ely large changes in temperature. Large bodies of water act derate the climate of surrounding areas by absorbing al energy in summer and slowly releasing that energy in the . For this reason, the climate near large bodies of water is y milder than areas without large bodies of water. (rain, ice, snow) has shaped our environment by cally and chemically weathering rock and soil and orting sediments. Freezing water can break rock without ange in the minerals that form the rock (physical ering). This usually produces small particles and sand. with dissolved gases and other chemicals causes the als in rocks to be changed, leading to the deterioration of ck (chemical weathering). of Earth's water is salt water in the oceans (97 percent). ozen, fresh water makes up less than 1 percent of the water rth. is essential for agriculture. Crops watered by reliable ion systems are more productive and harvests more dable. is an important resource used in power generation. electric power plants make use of the kinetic energy of as it flows through turbines. Water is also heated in power and turned to steam. The steam is used to turn turbines, generate electricity. past, streams and rivers were often used to dispose of	material. ● design an investigation to determine the presence of wa material (e.g., a fruit). ● infer how the unique properties of water are key to the of organisms. ● design an investigation to model the action of acidified building materials such as concrete, limestone, or marb ● chart, record, and describe evidence of chemical weathe local environment. ● analyze and explain the difference in average winter ter among areas in central and western Virginia and cities a along the Chesapeake Bay and Atlantic coast. ● explain the role of water in power generation. ● describe the importance of careful management of wate ● ●

ı waste, and open sewers were common. During the mid- , public health officials recognized the connection between e outbreaks and contamination of public wells and drinking Advances in water treatment and sanitary sewers have l eliminate diseases associated with human waste. › water's importance in power generation, agriculture, and ı health, it is important to conserve water resources.	
epts developed in this standard include the following: g water's unique properties is that one side of each water ule is slightly negative and the other is slightly positive. dual water molecules, therefore, attract other water ules like little magnets as the slightly positive portion of a molecule is attracted to the slightly negative portion of an nt water molecule. In this way, water molecules "stick er." › water's polar nature, a large number of substances will lve" in water. For this reason, water is often called the sal solvent. is the only compound that commonly exists in all three (solid, liquid, gas) on Earth. The unique properties of are a major factor in the ability of our planet to sustain life. onal properties of water are its high surface tension and the ange of temperature (0–100 degrees Celsius) in which it found in the liquid state, as well as the fact that, unlike substances, solid water is less dense than liquid water. is able to absorb thermal energy without showing ely large changes in temperature. Large bodies of water act derate the climate of surrounding areas by absorbing al energy in summer and slowly releasing that energy in the . For this reason, the climate near large bodies of water is y milder than areas without large bodies of water.	6.5 In order to meet this standard, it is expected that students v ● comprehend and apply key terminology related to wate properties and uses. ● model and explain the shape and composition of a wate ● design an investigation to demonstrate the ability of wa dissolve materials. ● comprehend the adhesive and cohesive properties of wa ● compare the effects of adding thermal energy to the stat ● explain why ice is less dense than liquid water. ● relate the three states of water to the water cycle. ● design an investigation to model the action of freezing material. ● design an investigation to determine the presence of wa material (e.g., a fruit).

PRIMARY Resources and Activities	SUPPLEMENTAL Resources and Activities	TEACHER NOTES
y formed? childrensuniversity.manchester. /services/thechildrensuniversit er/flash/electricity.swf		

lards 6.5 Unit 6 Unique Properties of Water Weeks 26-29
)19-03/01/2019

5

the action of water in physical and chemical weathering;
the ability of large bodies of water to store thermal energy and moderate climate;
the importance of water for agriculture, power generation, and public health; and
the importance of protecting and maintaining water resources.

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successful with this students are expected to:**
(rain, ice, snow) has shaped our environment by :ally and chemically weathering rock and soil and orting sediments. Freezing water can break rock without ıange in the minerals that form the rock (physical ering). This usually produces small particles and sand. with dissolved gases and other chemicals causes the ıls in rocks to be changed, leading to the deterioration of :k (chemical weathering). of Earth's water is salt water in the oceans (97 percent). ozen, fresh water makes up less than 1 percent of the water rth. is essential for agriculture. Crops watered by reliable ion systems are more productive and harvests more dable. is an important resource used in power generation. electric power plants make use of the kinetic energy of as it flows through turbines. Water is also heated in power and turned to steam. The steam is used to turn turbines, generate electricity. past, streams and rivers were often used to dispose of	● infer how the unique properties of water are key to the of organisms. ● design an investigation to model the action of acidified building materials such as concrete, limestone, or marb ● chart, record, and describe evidence of chemical weath local environment. ● analyze and explain the difference in average winter ter among areas in central and western Virginia and cities a along the Chesapeake Bay and Atlantic coast. ● explain the role of water in power generation. ● describe the importance of careful management of wate

ı waste, and open sewers were comm	

PRIMARY Resources and Activities	SUPPLEMENTAL Resources and Activities	TEACHER NOTES

lards 6.7, 6.9 Unit 7 Watersheds and Earth's Resources We
03/04/2019-04/12/2019

student will investigate and understand the natural processes and human interactions that affect watershed systems
epts include
alth of ecosystems and the abiotic factors of a watershed;
cation and structure of Virginia's regional watershed systems;
s, tributaries, river systems, and river and stream processes;
nds;
ries;
conservation, health, and safety issues associated with watersheds; and
monitoring and analysis using field equipment including hand-held technology.

ent will investigate and understand public policy decisions relating to the environment. Key concepts include

ent of renewable resources;

ent of nonrenewable resources;

tion of land-use and environmental hazards through preventive measures; and

fit tradeoffs in conservation policies.

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successf this standard, students are expected to:**
developed in this standard include the following: osystem is made up of the biotic (living) community and iotic (nonliving) factors that affect it. The health of an stem is directly related to water quality.	In order to meet this standard, it is expected that students will ● comprehend and apply basic terminology related to wat ● use topographic maps to determine the location and size Virginia's regional watershed systems.

c factors determine ecosystem type and its distribution of and animals as well as the usage of land by people.
c factors include water supply, topography, landforms, gy, soils, sunlight, and air quality/O_2 availability.
n activities can alter abiotic components and thus rate or decelerate natural processes. For example, people fect the rate of natural erosion. Plowing cropland can cause r erosion, while planting trees can prevent it. Flood tion/wetland loss is another example.
ershed is the land that water flows across or through on its a stream, lake, wetland, or other body of water. Areas of elevations, such as ridgelines and divides, separate sheds.
ree major regional watershed systems in Virginia lead to esapeake Bay, the North Carolina sounds, or the Gulf of o.
systems are made up of tributaries of smaller streams that ong their courses. Rivers and streams generally have wide, order areas, called flood plains, onto which water spills out es of high flow.
and streams carry and deposit sediment. As water flow ses in speed, the size of the sediment it carries decreases. nds form the transition zone between dry land and bodies er such as rivers, lakes, or bays. Both tidal and nontidal ds perform important water quality functions, including ting runoff by storing flood waters; reducing erosion by g down run-off; maintaining water quality by filtering ents, trapping nutrients, and breaking down pollutants; and ging groundwater. They also provide food and shelter for fe and fish and nesting and resting areas for migratory

ies perform important functions, such as providing habitat ny organisms and serving as nurseries for their young.

- locate their own local watershed and the rivers and strea associated with it.
- design an investigation to model the effects of stream fl various slopes.
- analyze and explain the functioning of wetlands and ap value of wetlands to humans.
- explain what an estuary is and why it is important to pe
- propose ways to maintain water quality within a waters
- explain the factors that affect water quality in a watersh those factors can affect an ecosystem.
- forecast potential water-related issues that may become the future.
- locate and critique a media article or editorial (print or concerning water use or water quality. Analyze and eva science concepts involved.
- argue for and against commercially developing a parcel containing a large wetland area. Design and defend a la model that minimizes negative impact.
- measure, record, and analyze a variety of water quality and describe what they mean to the health of an ecosyst

hesapeake Bay is an estuary where fresh and saltwater ınd are mixed by tides. It is the largest estuary in the uous United States and one of the most productive. quality monitoring is the collection of water samples to :e chemical and/or biological parameters. Simple eters include pH, temperature, salinity, dissolved oxygen, ity, and the presence of macroinvertebrate organisms.	
epts developed in this standard include the following: :, as well as other living organisms, are dependent upon the bility of clean water and air and a healthy environment. state, and federal governments have significant roles in ging and protecting air, water, plant, and wildlife resources. rn industrial society is dependent upon energy. Fossil fuels : major sources of energy in developed and industrialized s and should be managed to minimize adverse impacts. renewable and nonrenewable resources are managed by ivate sector (private individuals and corporations). vable resources should be managed so that they produce uously. Sustainable development makes decisions about erm use of the land and natural resources for maximum unity benefit for the longest time and with the least ınmental damage. ations, incentives, and voluntary efforts help conserve ces and protect environmental quality. rvation of resources and environmental protection begin ıdividual acts of stewardship. f renewable (water, air, soil, plant life, animal life) and ıewable resources (coal, oil, natural gas, nuclear power, ineral resources) must be considered in terms of their enefit tradeoffs. ıtive measures, such as pollution prevention or	In order to meet this standard, it is expected that students will ● differentiate between renewable and nonrenewable resc ● describe the role of local and state conservation profess managing natural resources. These include wildlife prot forestry and waste management; and air, water, and soi conservation. ● analyze resource-use options in everyday activities and how personal choices have costs and benefits related to generation of waste. ● analyze how renewable and nonrenewable resources are managed within the home, school, and community. ● analyze reports, media articles, and other narrative mate to waste management and resource use to determine va perspectives concerning the costs/benefits in real-life si ● evaluate the impact of resource use, waste management pollution prevention in the school and home environme

ıtfully planned and enforced land-use restrictions, can : the impact of potential problems in the future. ion prevention and waste management are less costly than ıp.	

PRIMARY Resources and Activities	SUPPLEMENTAL Resources and Activities	TEACHER NOTES

lards All Unit 8 Review & Post Testing Weeks 35-38 04/1 019

estigation, Reasoning, and Logic

tudent will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
ations are made involving fine discrimination between similar objects and organisms;
and approximate measurements are recorded;
odels are used to estimate distance, volume, and quantity;
eses are stated in ways that identify the independent and dependent variables;
od is devised to test the validity of predictions and inferences;
iable is manipulated over time, using many repeated trials;
collected, recorded, analyzed, and reported using metric measurements and tools;
analyzed and communicated through graphical representation;
and simulations are designed and used to illustrate and explain phenomena and systems; and
applications are used to reinforce science concepts.

, and Energy

tudent will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include
l and kinetic energy;
of the sun in the formation of most energy sources on Earth;
ewable energy sources;
ble energy sources; and
transformations.

tudent will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on Earth's surface. Key concept
energy budget;
of radiation and convection in the distribution of energy;
ion of the atmosphere and the oceans;
ormation; and
of thermal energy in weather-related phenomena including thunderstorms and hurricanes.

:udent will investigate and understand that all matter is made up of atoms. Key concepts include
:onsist of particles, including electrons, protons, and neutrons;
)f a particular element are alike but are different from atoms of other elements;
ts may be represented by chemical symbols;
more atoms interact to form new substances, which are held together by electrical forces (bonds);
ınds may be represented by chemical formulas;
al equations can be used to model chemical changes; and
:d number of elements comprise the largest portion of the solid Earth, living matter, the oceans, and the atmosphere.

:udent will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include
s the universal solvent;
perties of water in all three phases;
on of water in physical and chemical weathering;
ity of large bodies of water to store thermal energy and moderate climate;
ortance of water for agriculture, power generation, and public health; and
ortance of protecting and maintaining water resources.

:udent will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. Key concepts include
mixture of gaseous elements and compounds;
e, temperature, and humidity;
heric changes with altitude;
and human-caused changes to the atmosphere and the importance of protecting and maintaining air quality;
tionship of atmospheric measures and weather conditions; and
ıformation from weather maps, including fronts, systems, and basic measurements.

ıs

:udent will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include
lth of ecosystems and the abiotic factors of a watershed;
ıtion and structure of Virginia's regional watershed systems;
, tributaries, river systems, and river and stream processes;
ls;
:s;
onservation, health, and safety issues associated with watersheds; and
ıonitoring and analysis using field equipment including hand-held technology.

ships in Earth/Space Systems

:udent will investigate and understand the organization of the solar system and the interactions among the various bodies that comprise it. Key concepts include
, moon, Earth, other planets and their moons, dwarf planets, meteors, asteroids, and comets;
size of and distance between planets;
of gravity;
ion and rotation;
:hanics of day and night and the phases of the moon;

que properties of Earth as a planet;
tionship of Earth's tilt and the seasons;
se of tides; and
ory and technology of space exploration.

ces

udent will investigate and understand public policy decisions relating to the environment. Key concepts include
ement of renewable resources;
ement of nonrenewable resources;
igation of land-use and environmental hazards through preventive measures; and
nefit tradeoffs in conservation policies.

ESSENTIAL UNDERSTANDINGS **All students should:**	ESSENTIAL KNOWLEDGE AND SKILLS **To be successful with this students are expected to:**

PRIMARY **Resources and Activities**	**SUPPLEMENTAL** **Resources and Activities**	**TEACHER NOTES**
