DINWIDDIE COUNTY Public Schools

4th Grade

Science Curriculum

Dinwiddie County Public Schools provides each student the opportunity to become a productive citizen, engaging the entire community in the educational needs of our children.

Revised: 8/7/16

Dinwiddie County Public Schools

4th Grade
Science Curriculum

- The DCPS scope and sequence/pacing guide contains key topics that must be cross referenced with the VDOE enhanced scope and sequence and VDOE curriculum framework.

- All scientific investigations suggested in the Curriculum Framework under *Essential Knowledge, Skills, and Processes* should be included in science instruction. More information and resources can be found in the Enhanced Scope and Sequence found at the DOE link below.

DOE LINKS

Science Standards and SOL Based Resources

Performance Assessments

Performance assessments measure subject-matter proficiency and the ability of students to apply the content and skills they have learned. Performance assessments may also assess acquisition of the "Five C's" – critical thinking, creativity, communication, collaboration and citizenship – described in the Board of Education's Profile of a Virginia Graduate. Performance assessments are designed to encourage deeper learning and are an essential component of a balanced testing program.

The Virginia Department of Education – supported by a $1.1 million grant from the Hewlett Foundation – is developing resources and regional and statewide professional learning opportunities to help school divisions develop the capacity to design performance assessments and provide instruction that supports deeper learning.

Information about new resources and opportunities will be posted on the VDOE website as it becomes available.

- Performance Test Bank
- Local Alternate Assessments

Nine Weeks	Weeks Taught	Topic	Target SOL	Curriculum Framework	Textbook Correlation
1	2	Scientific Investigation, Reasoning, and Logic	4.1	1-8	S 1- S 8
1	5	Interrelationships in Earth/Space Systems (Weather)	4.6 4.1	23-27	Unit D
1/2	4	Earth Patterns, Cycles, and Change (Earth-Moon-Sun)	4.8 4.1	28-33	C 62- C 76
2	3	Earth Patterns, Cycles, and Change (Planets in our Solar System)	4.7 4.1	27-30	C 78 - C 90
2	2	Force, Motion, and Energy (Moving Objects)	4.2 4.1	9-11	F 4- F 17
2/3	5	Force, Motion, and Energy (Electrical Energy)	4.3 4.1	9,12-14	F 66 –F 104
3	4	Life Processes (Plants)	4.4 4.1	15-18	A 66 – A 96
3/4	3	Living Systems (Ecosystems	4.5 4.1	19-22	(Gr 3) Unit B A 38 – A 62 B 62 – B 80
4	2	Earth Resources (Virginia Resources)	4.9 4.1	34-36	Virginia, Hello USA
4		Review	Review All 4th Grade SOLs		

Dinwiddie County Public Schools Science Curriculum			
SOL 4.1 – 1st Nine Weeks/Ongoing throughout the year	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which a) observations are made and are repeated to ensure accuracy; b) predictions are formulated using a variety of sources of information; c) objects with similar characteristics or properties are classified into at least two sets and two subsets; d) natural events are sequenced chronologically; e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques; f) time is measured to the nearest minute using proper tools and techniques; g) questions are developed to formulate hypotheses; h) data are gathered, charted, graphed, and analyzed; i) unexpected or unusual quantitative data are recognized; j) inferences are made and conclusions are drawn; k) data are communicated; l) models are designed and built; and m) current applications are used to reinforce science concept	Scientific Investigation	4.1 a-l	10
	Prior Knowledge		
	3.9 - Estimate and measure length, volume, weight/mass 3.11 - Tell time/determine elapsed time 3.12 - Relationship among days, months, and years as well as minutes and hours 3.13 - Read temperature with a thermometer 3.17 - Making Graphs · collect & organize data · construct graph · read & interpret data 3.18 - Probability 3.19 - Recognize & describe patterns		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• The nature of science refers to the foundational concepts that govern the way scientists formulate explanations about the natural world. The nature of science includes the following concepts: a) the natural world is understandable; b) science is based on evidence, both observational and experimental; c) science is a blend of logic and innovation; d) scientific ideas are durable yet subject to change as new data are collected; e) science is a complex social endeavor; and f) scientists try to remain objective and engage in peer review to help avoid bias. In grade four, an emphasis should be placed on concepts a, b, c, d, and e. • Science assumes that the natural world is understandable. Scientific inquiry can provide explanations about nature. This expands students' thinking from just a knowledge of facts to understanding how facts are relevant to everyday life. • Science demands evidence. Scientists develop their ideas based on evidence and they change their ideas when new evidence becomes available or the old evidence is viewed in a different way. • Science uses both logic and innovation. Innovation has always been an important part of science. Scientists draw upon their creativity to visualize how nature works, using analogies, metaphors, and mathematics. • Scientific ideas are durable yet subject to change as new data are collected. The main body of scientific knowledge is very stable and grows by being corrected slowly and having its boundaries extended gradually. Scientists themselves accept the notion that scientific knowledge is always open to improvement and can never be declared absolutely certain. New questions arise, new theories are proposed, new instruments are invented, and new techniques are developed. • Science is a complex social endeavor. It is a complex social process for producing knowledge about the natural world. Scientific knowledge represents the current consensus among scientists as to what is the best explanation for phenomena in the natural world. This consensus does not arise automatically, since scientists	• analyze the variables in a simple experiment. Identify the independent variable and the dependent variable. Decide which other variable(s) must be held constant (not allowed to change) in order for the investigation to represent a fair test. • create a plausible hypothesis, stated in terms of cause (if) and effect (then), from a set of basic observations that can be tested. Hypotheses can be stated in terms such as: "If the water temperature is increased, then the amount of sugar that can be dissolved in it will increase." • organize and analyze data from a simple experiment. Construct bar graphs and line graphs depicting the data. • judge which, if any, data in a simple set of results (generally 10 or fewer in number) appear to be contradictory or unusual. • present results of a simple experiment using graphs, pictures, statements, and numbers. • construct a physical model to clarify an explanation, demonstrate a relationship, or solve a need.

with different backgrounds from all over the world may interpret the same data differently. To build a consensus, scientists communicate their findings to other scientists and attempt to replicate one another's findings. In order to model the work of professional scientists, it is essential for fourth-grade students to engage in frequent discussions with peers about their understanding of their investigations. • An observation is what you see, feel, taste, hear, or smell. Scientists construct knowledge from observations and inferences, not observations alone. To communicate an observation accurately, one must provide a clear description of exactly what is observed and nothing more. Those conducting investigations need to understand the difference between what is seen and what inferences, conclusions, or interpretations can be drawn from the observation. • An inference is a tentative explanation based on background knowledge and available data. • A scientific prediction tells what may happen in some future situation. It is based on the application of scientific principles and factual information. • Accurate observations and evidence are necessary to draw realistic and plausible conclusions. A conclusion is a summary statement based on the results of an investigation. • Conclusions are drawn by making judgments after considering all the information you have gathered. Conclusions are based on details and facts. • Systematic investigations require standard measures (metric), consistent and reliable tools, and organized reporting of data. The way the data are displayed can make it easier to uncover important information. This can assist in making reliable scientific forecasts of future events. • Elapsed time is the amount of time that has passed between two given times. (*See Grade Four Mathematics Curriculum Framework, Standard 4.9, page 24.*) • An experiment is a fair test driven by a hypothesis. A fair test is one in which only one variable is compared. • A hypothesis is a prediction about the relationship between variables. A hypothesis is an educated guess/prediction about what will happen based on what you already know and what you have already learned from your research. It must be worded so that it is "testable."	

- In order to conduct an experiment, one must recognize all of the potential variables or changes that can affect its outcome.
- An independent variable is the factor in an experiment that is altered by the experimenter. The independent variable is purposely changed or manipulated.
- A dependent variable is the factor in an experiment that changes as a result of the manipulation of the independent variable.
- The constants in an experiment are those things that are purposefully not changed and remain the same throughout the experiment.

In science, it is important that experiments and the observations recorded are repeatable. There are two different types of data – qualitative and quantitative. Qualitative data deal with descriptions and data that can be observed, but not measured. Quantitative data are data that can be counted or measured and the results can be recorded using numbers. Quantitative data can be represented visually in graphs and charts. Quantitative data define whereas qualitative data describe. Quantitative data are more valuable in science because they allow direct comparisons between observations made by different people or at different times.

Example of Qualitative vs. Quantitative Data

Main Street Elementary School Science Club

Qualitative	Quantitative
• Friendly • Like science • Positive about school	• 10 fourth-grade students and 12 fifth-grade students • 14 girls, 8 boys • 92 percent participated in the divisionwide science fair last year

- It is important for students to apply the science content they have learned to current events and applications.

Vocabulary	Lessons and TEI Items	Trade Books
Hypothesis- an educated guess- must be an "if/then" statement **Properties**- a quality or trait belonging and especially peculiar to an individual or thing **Observation**s- an act of recognizing and noting a fact or occurrence often involving measurement with instruments **Predictions**- to make an educated guess **Outcomes**- something that follows as a result or consequence **Results**- something obtained by calculation or investigation **Investigation**- to observe or study by close examination and systematic inquiry **Data**- factual information **Classify**- to assign to a category **Characteristics**- a distinguishing trait, quality, or property **Analyze**- to study or determine the nature and relationship of the parts **Model**- a mini representation of something **Sequence**- a continuous or connected series	Activities in Google Drive Science Experiments for Kids	*The Science Fair from the Black Lagoonby* (by Mike Thaler, illustrated by Jared Lee) *Hands-on Projects about Earth and Space* (by Krista West) *Bill Nye the Science Guy's Big Blast of Science* (by Bill Nye, drawings by Terry Marks, photographs by Tom Owen) *Scientists Ask Questions* (by Ginger Garrett, consultant Linda Bullock.) *Janice VanCleave's Great Science Project Ideas From Real Kids* (by Janice VanCleave, illustrations by Laurie Hamilton) *Janice VanCleave's Rocks and Minerals: mind-boggling experiments you can turn into science fair projects* (By Janice VanCleave, illustrated by Doris Ettlinge) *Smash it! Crash it! Launch it! : 50 mind-blowing, eye-popping science experiments* (by Rain Newcomb & Bobby Mercer, illustrated by Tom LaBaff) *Science Tools* (by J.A. Randolph) *Tiger Math*: Learning to Graph from a Baby Tiger *(by Anne Whitehead Nagda and Cindy Bickel)*

Chronological order- according to the order time **Length**- the longest dimension of an object **Mass**- amount of matter in an object **Volume**- amount of space an object takes up **Temperature**- degree of hotness or coldness measured on a definite scale		

Additional Resources	
Interactive Notes	National Science Digital Library
Book Room Resources	Virginia Department of Inland Fisheries
Library Resources	Science Net Links
Discovery Works	The Franklin Institute for Science Learning
Wonderville	Story Books Online
Teacher Tube	Online Science Books
Fossweb	National Geographic: Young Explorers Online
BBC.co	Scholastic Study Jams
SOL Pass	Solar Connections
Scholastic Resources: BookFLIX, TrueFLIX, ScienceFLIX	

Dinwiddie County Public Schools Science Curriculum			
SOL 4.6– 1st Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include a) weather phenomena; b) weather measurements and meteorological tools; and c) use of weather measurements and weather phenomena to make weather predictions.	Earth Space Systems and Cycles	4.6a-c 4.7a-c 4.8a-e 4.9a, c-d	10
	Prior Knowledge		
	3.9 - investigate and understand the water cycle and its relationship to life on Earth b) the energy from the sun drives the water cycle; c) the water cycle involves several processes;		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• Temperature is the measure of the amount of thermal energy in the atmosphere. • Air pressure is due to the weight of the air and is determined by several factors including the temperature of the air. • A front is the boundary between air masses of different temperature and humidity. • Cirrus, stratus, cumulus, and cumulo-nimbus clouds are associated with certain weather conditions. • Cumulus clouds are fluffy and white with flat bottoms. They usually	**In order to meet this standard, it is expected that students will** • design an investigation in which a thermometer is used to compare air temperatures over a period of time. • analyze the changes in air pressure occurring over time, using a barometer, and predict what the changes mean in terms of changing weather patterns. • illustrate and label high and low pressures on a map. • differentiate between the types of weather associated with high and low pressure air masses. Illustrate and label high and low pressure air masses

indicate fair weather. However, when they get larger and darker on the bottom, they become cumulo-nimbus clouds. Cumulo-nimbus clouds may produce thunderstorms. • Stratus clouds are smooth, gray clouds that cover the whole sky (block out direct sunlight). Light rain and drizzle are usually associated with stratus clouds. • Cirrus clouds are feathery clouds. They are associated with fair weather. Cirrus clouds often indicate that rain or snow will fall within several hours. • Extreme atmospheric conditions create various kinds of storms such as thunderstorms, hurricanes, and tornadoes. • Different atmospheric conditions create different types of precipitation. • Meteorologists gather data by using a variety of instruments. • Meteorologists use data to predict weather patterns. • A barometer measures air pressure. • An anemometer measures wind speed. • A rain gauge measures the amount of precipitation. • A thermometer measures the temperature of the air.	and warm and cold fronts. • differentiate between cloud types (i.e., cirrus, stratus, cumulus, and cumulo-nimbus clouds) and the associated weather. • compare and contrast the formation of different types of precipitation (e.g., rain, snow, sleet, and hail). • recognize a variety of storm types, describe the weather conditions associated with each, and explain when they occur (e.g., thunderstorms, hurricanes, and tornadoes). • analyze and report information about temperature and precipitation on weather maps. • measure wind speed, using an anemometer. • measure precipitation with a rain gauge. • design an investigation in which weather data are gathered using meteorological tools and charted to make weather predictions.

Vocabulary	Lessons and TEI Items	Trade Books
Temperature –a measure of how hot or cold something is. **Air pressure-**the force put on a given area by the weight of the air above it. **Front-**a boundary between air masses with different temperatures **Air mass-**a large region of the atmosphere where the air has similar properties throughout. **Cirrus-** a high altitude cloud with a featherlike shape, made of ice crystals. **Cumulus -** a puffy cloud that appears to rise up from a flat bottom. **Cumulo-nimbus-** cumulus clouds that are dark on the bottom that produce thunderstorms **Humidity-** a measurement of how much water vapor is in the air. **Stratus-** a cloud that forms in blanket-like layer. **Condensation –** the process in which water particles change from a gas to a liquid. **Evaporation-**the process in which water particles changes from a liquid to a gas. Hail **Hurricane-** a tropical cyclone with winds of 74 miles	Activities in Google Drive Name the Cloud Storm Warning Measurements and Tools GeoSnow Exploring the World of Snowflakes Weather Experiments NOAA Weather Experiments for Kids	*Thunderstorm* (by Catherine Chambers) *Weather Words and What They Mean* (by Gail Gibbons) *Weather* (by Seymour Simon) *Weather Patterns* (by Monica Hughes) *Studying Weather* (by Ted O'Hare) *Tornado* (by Catherine Chambers) *Weather* (by Darlene Lauw) *Hurricanes* (by Gail Gibbons) *Tornadoes* (by Gail Gibbons) *National Geographic Kids Everything Weather: Facts, Photos, and Fun That Will Blow You Away* (by Kathy Furgang) Extreme Weather! Weather For Kids Book On Storms: Hurricanes, Tornadoes, Blizzards, Thunderstorms & Much More (Kid's Nature Books Series 2) (by Leanne Annett)

or higher. **Tornados-** a funnel shaped cloud with rotating winds. **Water vapor-** a gas in Earth's atmosphere **Sleet-** precipitation in the form of ice pellets created by the freezing of rain as it falls **Thermometer-** an instrument used to measure temperature **Rain gauge-** measures the amount of precipitation. **Anemometer-** measures the wind speed. **Barometer-**measures air pressure **Atmosphere-** the blanket of gases that surround Earth **Precipitation-** water in the atmosphere that falls to Earth as rain, snow, hail, or sleet.		

Additional Resources	
Interactive Notes	National Science Digital Library
Book Room Resources	Virginia Department of Inland Fisheries
Library Resources	Science Net Links
Discovery Works	The Franklin Institute for Science Learning
United Streaming	Story Books Online
Wonderville	Online Science Books
Teacher Tube	National Geographic: Young Explorers Online
Fossweb	Scholastic Study Jams
BBC.co	
SOL Pass	
Scholastic Resources: BookFLIX, TrueFLIX, ScienceFLIX	

Dinwiddie County Public Schools Science Curriculum			
SOL 4.8 – 1st/2nd Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand the relationships among Earth, the moon, and the sun. Key concepts include a) the motions of Earth, the moon, and the sun; b) the causes for Earth's seasons; c) the causes for the phases of the moon; d) the relative size, position, age, and makeup of Earth, the moon, and the sun; and e) historical contributions in understanding the Earth-moon-sun system	Earth Space Systems and Cycles	4.6a-c 4.7a-c 4.8a-e 4.9a,c-d	10
	Prior Knowledge		
	3.8 - The student will investigate and understand the water cycle and its relationship to life on Earth a) patterns of natural events such as day and night, seasonal changes, simple phases of the moon, and tides		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• Earth completes one revolution around the sun every 365 ¼ days. The moon revolves around Earth about once every month. • Due to its axial tilt, Earth experiences seasons during its revolution around the sun. • The phases of the moon are caused by its position relative to Earth and the sun. The phases of the moon include the new, waxing crescent, first quarter, waxing gibbous, full, waning gibbous, last (third) quarter, and	**In order to meet this standard, it is expected that students will** • differentiate between rotation and revolution. • describe how Earth's axial tilt causes the seasons. • model the formation of the eight moon phases, sequence the phases in order, and describe how the phases occur. • describe the major characteristics of the sun, including its approximate

waning crescent. • The sun is an average-sized yellow star, about 110 times the diameter of Earth. The sun is approximately 4.6 billion years old. • Our moon is a small rocky satellite, having about one-quarter the diameter of Earth and one-eightieth its mass. It has extremes of temperature, virtually no atmosphere or life, and very little water. • Earth is one of eight planets that revolve around the sun and comprise the solar system. Earth, the third planet from the sun, is one of the four terrestrial inner planets. It is about 150 million kilometers from the sun. • Earth is a geologically active planet with a surface that is constantly changing. Unlike the other three inner planets (Mercury, Venus, and Mars), it has large amounts of life-supporting water and an oxygen-rich atmosphere. Earth's protective atmosphere blocks out most of the sun's damaging rays. • Our understanding of the solar system has changed from an Earth-centered model of Aristotle and Ptolemy to the sun-centered model of Copernicus and Galileo. • The NASA Apollo missions added greatly to our understanding of the moon. • Our understanding of the sun, moon, and the solar system continues to change with new scientific discoveries.	size, color, age, and overall composition. • create and describe a model of the Earth-moon-sun system with approximate scale distances and sizes. • compare and contrast the surface conditions of Earth, the moon, and the sun. • compare and contrast an Earth-centered to the sun-centered model of the solar system. • analyze the differences in what Aristotle, Ptolemy, Copernicus, and Galileo observed and what influenced their conclusions. • describe a contribution of the NASA Apollo missions to our understanding of the moon.

Vocabulary	Lessons and TEI Items	Trade Books
Astronomy – branch of science that studies points beyond the Earth **Gravity-** a force of attraction, or pull, between any object and any other objects around it. Gravity is a property of all matter.	Activities in Google Drive What's the difference? Moon Phases	*Earth* (by Elaine Landau) *The Reasons for the Seasons* (by Gail Gibbons) *The Moon* (by Seymour Simon)

Sun-the star in the middle of our solar system **NASA-** National Aeronautics and Space Administration, responsible for aerospace and aeronautics research **Crater-** a hollow area shaped like the inside of a bowl, the moon has many craters. **Solar system-** the sun and the objects traveling around it **Axis –** a real or imaginary line that a spinning object turns around **Lunar-** having to do with the moon **Waxing-** to become brighter, the size of a moon's brightness grows from a waxing crescent to a full moon **Solar-** having to do with or coming from the Sun **Waning-** to become slowly less in size **Gibbous-** rounded outward at both edges; between half full and full in illumination. **Revolution-** one complete cycle of orbiting motion on its axis. On Earth it takes 365 days. **Crescent-** the shape of the moon when it looks like a curved line with a point at each end. This happens at the first and fourth quarter. **New moon-** the phase of the moon when it cannot be seen because it passes directly between the sun and the earth	Changing Theories Moon Phase Calendar	*Earth* (by Steven Kipp) *The Moon* (by Elaine Landau) *The Sun* (by Melanie Chrismer) *Moon Days* (author unknown) *The Sun* (by Allison Lassieur)

Rotate- to make a complete spin on an axis, causing one day on a planet. A day differs in length from planet to planet. **Full moon-**the moon when it is on the side of Earth that is opposite the sun and looks from Earth like a complete circle. **Equator-** imaginary line that separates the Northern and Southern hemispheres **Orbit-** the path of a planet traveling around a star. **Moon-** a natural satellite it revolves from west to east around Earth in 28 days.		

Additional Resources	
Interactive Notes	National Science Digital Library
Book Room Resources	Virginia Department of Inland Fisheries
Library Resources	Science Net Links
Discovery Works	The Franklin Institute for Science Learning
Wonderville	Story Books Online
Teacher Tube	Online Science Books
Fossweb	National Geographic: Young Explorers Online
BBC.co	Scholastic Study Jams
SOL Pass	Scholastic Resources: BookFLIX, TrueFLIX, ScienceFLIX

Dinwiddie County Public Schools Science Curriculum			
SOL 4.7– 2nd Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand the organization of the solar system. Key concepts include a) the planets in the solar system; b) the order of the planets in the solar system; and c) the relative sizes of the planets	Earth Space Systems and Cycles	4.6a-c, 4.7a-c, 4.8a-e, 4a, c-d	10
	Prior Knowledge		
	1.6 - investigate and understand the basic relationship between the sun and Earth a) the sun is the source of energy and light that warms the land, air, and water		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• Our solar system is ancient. Early astronomers believed that Earth was the center of the universe and all other heavenly bodies orbited around Earth. We now know that our sun is the center of our solar system and eight planets, a handful of dwarf planets, 170 named moons, dust, gas, and thousands of asteroids and comets orbit around the sun. • Our solar system is made up of eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. • Mercury, Venus, Earth, and Mars are considered terrestrial planets. Jupiter, Saturn, Uranus, and Neptune are called gas giants. • Mercury is closest to the sun and is a small, heavily cratered planet. Mercury looks like our moon. Since Pluto's reclassification from planet to dwarf planet, Mercury is now the smallest planet in our solar system.	**In order to meet this standard, it is expected that students will** • name the eight planets and describe whether they are a terrestrial planet or a gas giant. • sequence the eight planets in the solar system based on their position from the sun. (Mercury is the first from the sun, Venus is the second, etc.) • sequence the eight planets in the solar system based on size (Jupiter is the largest, Saturn is next, etc.) • construct a simple model of the sun and the planets in our solar system.

- Venus is second from the sun. It is similar to Earth in size and mass, and has a permanent blanket of clouds that trap so much heat that the temperatures on the surface of Venus are hot enough to melt lead.
- Earth is third from the sun. Earth's atmosphere, the liquid water found on Earth, and its distance from the sun, among many other factors, make Earth a haven for life.
- Mars is fourth from the sun. The atmosphere on Mars is thin and there is a vast network of canyons and riverbeds on the red planet. Scientists hypothesize that Mars once supported a wet, warm Earth-like climate.
- Jupiter is fifth from the sun. Jupiter is the largest planet in the solar system and is considered a gas giant. Jupiter has no solid surface.
- Saturn is sixth from the sun. Early scientists thought Saturn was the only planet with rings, but we now know that all four gas giants (Jupiter, Saturn, Uranus, and Neptune) have rings.
- Uranus is seventh from the sun. Uranus is a gas giant.
- Neptune is eighth from the sun. Neptune appears blue through telescopes and is a gas giant.
- The eight planets sorted by size from largest to smallest are: Jupiter, Saturn, Uranus, Neptune, Earth, Venus, Mars, and Mercury.
- Pluto is no longer included in the list of planets in our solar system due to its small size and irregular orbit. Many astronomers questioned whether Pluto should be grouped with worlds like Earth and Jupiter. In 2006, this debate led the International Astronomical Union (IAU), the recognized authority in naming heavenly objects, to formally reclassify Pluto. On August 24, 2006, Pluto's status was officially changed from planet to dwarf planet.
- A new distinct class of objects called "dwarf planets" was identified in 2006. It was agreed that "planets" and "dwarf planets" are two distinct classes of objects. The first members of the dwarf planet category are Ceres, Pluto and 2003 UB313, given the name Eris. More dwarf planets are expected to be announced by the IAU in the future.
- What differentiates a dwarf planet from a planet? For the most part, they are identical, but there is one key difference: A dwarf planet has not

"cleared the neighborhood" around its orbit, which means it has not become gravitationally dominant and it shares its orbital space with other bodies of a similar size. Pluto is smaller than seven of the moons in our solar system and cannot be seen without a telescope.	

Vocabulary	Lessons and TEI Items	Trade Books
Solar system- the Sun and the objects traveling around it. **Craters-** a hollow area shaped like the inside of a bowl , many can be found on the moon **Planet-** any of the eight objects that travel around the Sun and shine by reflecting its light **Moon-** the earth's natural satellite. It revolves around the earth from west to east in about 28 days. **Stars-** any of a vast number of heavenly bodies visible from earth as points of light in the night sky. **Sun-** the star in the middle of our solar system **Dwarf planets-** planets such as Pluto that have not become gravitationally dominant **Gas giant-** Neptune	Activities in Google Drive The Planets Sequencing the Planets	*Earth* (by Elaine Landau) *Beyond Pluto: The Final Frontier in Space* (by Elaine Landau) *Mercury* (by Christine Taylor-Butler) *Neptune* (by Melanie Chrismer) *Neptune* (by Elaine Landau) *Mars* (by Melanie Chrismer) *Saturn* (by Christine Taylor-Butler) *The Sun* (by Melanie Chrismer) *Uranus* (by Christine Taylor-Butler) *Venus (*by Elaine Landau) *Why Isn't Pluto a planet?: A Book About Planets* (by Steve Kortenkamp)

Telescope- an instrument that uses lenses and sometimes mirrors to make distant objects appear larger **Orbit-** the path an object follows as it revolves. **Revolution-** to move in a circular or nearly circular path around something else.		*Venus* (by Melanie Chrismer) *The Planets in Our Solar System* (by Franklyn Mansfield Branley) *Magic School Bus Presents Our Solar System* (by Joanna Cole) *Our Solar System* (by Seymour Simon)

Additional Resources	
Interactive Notes	National Science Digital Library
Book Room Resources	Science Net Links
Library Resources	The Franklin Institute for Science Learning
Discovery Works	Story Books Online
Wonderville	Online Science Books
Teacher Tube	National Geographic: Young Explorers Online
Fossweb	Scholastic Study Jams
BBC.co	Scholastic Resources: BookFLIX, TrueFLIX, ScienceFLIX
SOL Pass	

Dinwiddie County Public Schools Science Curriculum			
SOL 4.2– 2nd Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand characteristics and interactions of moving objects. Key concepts include a) motion is described by an object's direction and speed; b) changes in motion are related to force and mass; c) friction is a force that opposes motion; and d) moving objects have kinetic energy	Force, Motion, Energy, and Matter	4.2a-d 4.3a-e	10
	Prior Knowledge		
	3.11 - investigate and understand different sources of energy a) energy from the sun b) sources of renewable energy c) sources of nonrenewable energy		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• The position of an object can be described by locating it relative to another object or to the background. • Tracing and measuring an object's position over time can describe its motion. • Speed describes how fast an object is moving. • Energy may exist in two states: kinetic or potential. • Kinetic energy is the energy of motion. • A force is any push or pull that causes an object to move, stop, or change speed or direction. • The greater the force, the greater the change in motion will be. The more	**In order to meet this standard, it is expected that students will** • describe the position of an object. • collect and display in a table and line graph time and position data for a moving object. • explain that speed is a measure of motion. • interpret data to determine if the speed of an object is increasing, decreasing, or remaining the same. • identify the forces that cause an object's motion. • describe the direction of an object's motion: up, down, forward, backward.

massive an object, the less effect a given force will have on the object. • Friction is the resistance to motion created by two objects moving against each other. Friction creates heat. • Unless acted on by a force, objects in motion tend to stay in motion and objects at rest remain at rest.	• infer that objects have kinetic energy. • design an investigation to test the following hypothesis: "If the mass of an object increases, then the force needed to move it will increase." • design an investigation to determine the effect of friction on moving objects. • Write a testable hypothesis and identify the dependent variable, the independent variable, and the constants. Conduct a fair test, collect and record the data, analyze the data, and report the results of the data.

Vocabulary	Lessons and TEI Items	Trade Books
Kinetic Energy- energy of motion **Potential Energy-** energy that is stored or waiting to be used, giving an object the future ability to do work. **Friction-** is the resistance to motion created by two objects moving against each other. Friction creates heat. **Speed-** describes how fast an object is moving. **Force-** any push or pull that causes an object to move, stop, or change speed or direction. **Gravity-** a force of attraction or pull, between any object and any other objects around it. Gravity is a property of all matter. **Inertia-** the tendency of a moving object to keep moving in a straight line or of any object to resist a change in motion.	Activities in Google Drive Investigating Motion Force, Mass, and Demolition Derby Friction Lab Kinetic, Potential, or Both Solar Connections	*Looking at Forces and Motion: How do things move?* (by Angela Royston) *Forces and Motion: a question and answer book* (by Catherine Welch) *Newton and Me* (by Lynne Mayer) *What are Forces and Motion? exploring science with hands-on activities* (by Richard Spilsburyooks) *Forces and Motion* (by Lisa Trumbauer) *The Magic School Bus Plays Ball: A Book about Forces* (by Joanna Cole) *Forces (Science All Around Me)* (by Karen Bryant-Mole)

Additional Resources	
Interactive Notes Book Room Resources Library Resources Discovery Works Wonderville Teacher Tube Fossweb BBC.co	National Science Digital Library Virginia Department of Inland Fisheries Science Net Links The Franklin Institute for Science Learning Story Books Online Online Science Books National Geographic: Young Explorers Online Scholastic Study Jams Scholastic Resources: BookFLIX, TrueFLIX, ScienceFLIX

Dinwiddie County Public Schools Science Curriculum			
SOL 4.3– 2nd / 3rd Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand the characteristics of electricity. Key concepts include a) conductors and insulators; b) basic circuits; c) static electricity; d) the ability of electrical energy to be transformed into light and motion, and to produce heat; e) simple electromagnets and magnetism; and f) historical contributions in understanding electricity.	Force, Motion, Energy, and Matter	4.2a-d, 4.3 a-f	10
	Prior Knowledge		
	2.2 - investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel b) important applications of magnetism		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• A continuous flow of negative charges (electrons) creates an electric current. The pathway taken by an electric current is a circuit. Closed circuits allow the movement of electrical energy. Open circuits prevent the movement of electrical energy. • Electrical energy moves through materials that are conductors (metals). Insulators (rubber, plastic, wood) do not conduct electricity well. • Among conducting materials, the rate at which energy flows depends on the material's resistance. • In a series circuit, there is only one pathway for the current, but in a parallel circuit there are two or more pathways for it.	**In order to meet this standard, it is expected that students will** • apply the terms insulators, conductors, open and closed in describing electrical circuits. • differentiate between an open and closed electric circuit. • use the dry cell symbols (–) and (+). • create and diagram a functioning series circuit using dry cells, wires, switches, bulbs, and bulb holders. • create and diagram a functioning parallel circuit using dry cells, wires, switches, bulbs, and bulb holders.

• Rubbing certain materials together creates static electricity. • Lightning is the discharge of static electricity in the atmosphere. • Electrical energy can be transformed into light or motion, and can produce thermal energy. • Certain iron-bearing metals attract other such metals (also nickel and cobalt). • Lines of force extend from the poles of a magnet in an arched pattern defining the area over which magnetic force is exerted. • An electric current creates a magnetic field, and a moving magnetic field creates an electric current. • A current flowing through a wire creates a magnetic field. Wrapping a wire around certain iron-bearing metals (iron nail) and creating a closed circuit is an example of a simple electromagnet. • Benjamin Franklin, Michael Faraday, and Thomas Edison made important discoveries about electricity.	• differentiate between a parallel and series circuit. • describe the types of energies (i.e., thermal, radiant, and mechanical) that are transformed by various household appliances (e.g., lamp, toaster, fan). • create a diagram of a magnetic field using a magnet. • compare and contrast a permanent magnet and an electromagnet. • explain how electricity is generated by a moving magnetic field. • design an investigation using static electricity to attract or repel a variety of materials. • explain how static electricity is created and occurs in nature. • construct a simple electromagnet using a wire, nail, or other iron-bearing object, and a dry cell. • design and perform an investigation to determine the strength of an electromagnet. (The independent variable could be the number of coils of wire and the dependent variable could be the number of paperclips the magnet can attract.) • describe the contributions of Ben Franklin, Michael Faraday, and Thomas Edison to the understanding and harnessing of electricity.

Vocabulary	Lessons and TEI Items	Trade Books
Conductors – materials that energy will move through **Insulators** – materials that energy will not move through **Open circuits** – prevent the movement of electrical energy **Closed circuits** – allow the movement of electrical energy **Parallel circuits** – two or more pathways for electrical energy **Series circuits** – one pathway for electrical energy repel – when 2 magnets push each other apart **Attract** – when 2 magnets pull each other together magnetism – the ability of iron to be attracted to a magnet **Magnetic fields** - the portion of space near a magnetic body or a current-carrying body in which the magnetic forces due to the body or current can be detected **Current** – the movement of electrons **Electro-magnet** – a current flowing through a wire that creates a magnetic field **Static electricity- the buildup of an electric charge on a material.** **Dry cell – a battery- a battery that changes**	Activities in Google Drive Get a move on...Electron! Electrical Engineering Challenge Static Electricity Energy Hunt Electromagnets Inventors Electric Circuits Version 2.0 Keeping It Cool!	*Charged Up: The Story of Electricity* (by Jacqui Bailey) *Switch On, Switch Off* (by Melvin Berger) *Electricity: A question and answer book (* by Adele Richardson) *Wind Power* (by Christine Peterson) *Magnets* (by Karen Bryant-Mole) *Electrical Circuits* (by Lewis Parker) *Electricity* (by Karen Bryant-Mole *What Makes a Magnet* (by Franklyn M. Branley) *Michael Faraday* (by Anne Fullick) *The Magic School Bus and the Electric Field Trip* (by Joanna Cole)

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Fossweb	National Geographic: Young Explorers Online
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SOL Pass	Scholastic Resources: BookFLIX, TrueFLIX, ScienceFLIX

Dinwiddie County Public Schools Science Curriculum			
SOL 4.4 – 3rd Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The students will investigate and understand basic plant anatomy and life process. Key concepts include a) the structures of typical plants and the function of each structure; b) processes and structures involved with plant reproduction; c) photosynthesis; and d) adaptations allow plants to satisfy life needs and respond to the environment.	Life Processes and Living Systems	4.4a-d 4.5a-f 4.9b	10
	Prior Knowledge		
	2.4 - investigate and understand that plants and animals undergo a series of orderly changes as they mature and grow b) plants life cycles		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• A cycle is a repeated pattern. A sequence is a series of events that occur For many typical green plants, there are anatomical structures that perform certain basic functions. For example, roots anchor the plants and take water and nutrients from the soil. Plant stems provide support and allow movement of water and nutrients. • Plants can be divided into two general groups: those that produce seeds and those that produce spores. • Many seed-producing plants have roots, stems, leaves, and flowers. • Seeds vary considerably in size. Orchids, for example, produce seeds as small as dust particles. The coconut is one of the largest seeds in the	**In order to meet this standard, it is expected that students will** • analyze a common plant: identify the roots, stems, leaves, and flowers, and explain the function of each. • create a model/diagram illustrating the parts of a flower and its reproductive processes. Explain the model/diagram using the following terminology: pollination, stamen, stigma, pistil, sepal, embryo, spore, seed. • compare and contrast different ways plants are pollinated. • explain that ferns and mosses reproduce with spores rather than seeds.

plant kingdom. In many seeds, the protective outer seed coat is resistant to physical damage and may also contain waxes and oils that help prevent water loss. • The embryo within the seed begins as a single cell, the zygote. The basic organs of the plant body can be found in the embryo. In some seeds the embryonic leaves are quite large, filling most of the volume of the seed. The embryonic leaves are a major source of stored food for the embryo. Beans are an example of plants with large embryonic leaves. In many other plants the embryonic leaves are relatively small, and the embryo is nourished by a tissue called endosperm. • Pollination is part of the reproductive process of flowering plants. Pollination is the process by which pollen is transferred from the stamens to the stigma. • The stamen and pistil are reproductive parts of the flower. The sepals are the small leaves that form the housing of the developing flower. • Some plants reproduce with spores. These include ferns and mosses. • Green plants produce their own food through the process of photosynthesis. Green plants use chlorophyll to produce food (sugar), using carbon dioxide, water, enzymes and other chemicals, and sunlight. Leaves are the primary food-producing part of these plants. • Oxygen is released during photosynthesis. • Plants adapt to changes in their environment in order to survive. Dormancy is a plant adaptation. Dormancy is a period of suspended life processes brought on by changes in the environment.	• explain the process of photosynthesis, using the following terminology: sunlight, chlorophyll, water, carbon dioxide, oxygen, and sugar. • explain the role of adaptations of common plants to include dormancy, response to light, and response to moisture.

Vocabulary	Lessons and TEI Items	Trade Books
Leaves – the primary food-producing part of green plants (photosynthesis) **Stems** - provide support and allow movement of water and nutrients. **Roots** – anchor the plants and take water and nutrients from the soil. **Pollination** – the process by which pollen is transferred from the stamens to the stigma. **Reproduction- the making of an offspring** **Stamen** (filament, anther) – the male reproductive part of the flower. **Pistil** (style, ovary, stigma) – the female reproductive part of the flower. **Sepal** - the small leaves that form the housing of the developing flower. **Photosynthesis** – the process where green plants produce their own food. **Dormancy** – a period of suspended life processes brought on by changes in the environment.	Activities in Google Drive Flower Parts Photosynthesis Plant Adaptations Learning From Nature	*Plant Life Cycles* (by Anita Ganeri) *Photosynthesis: Changing Sunlight into Food* (by Bobbie Kalman) *Plant reproduction* (by Richard Spilsbury) *Virginia Plants and Animals* (by Karla Smith) *Flowering Plants* (by Francine Galko) *From Seed to Plant* (by Gail Gibbons) *How a Seed Grows* (by Helene Jordan) *Pick, Pull, Snap! Where Once a Flower Bloomed* (by Loia Shaeffer)

Embryo- a developing organism that results from fertilization. **Spore – the cells in a seedless plant that grows into new organisms.** **Seed –** an underdeveloped plant with stored food sealed in a protective covering. **Chlorophyll-** a green substance in plant cells that helps plants make food by trapping the Sun's energy. **Carbon dioxide** **Dormant** **Pollen** **Zygote** **Endosperm**		

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Dinwiddie County Public Schools Science Curriculum			
SOL 4.5 – 3rd / 4th Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand how plants and animals, including humans, in an ecosystem interact with one another and with the nonliving components in the ecosystem. Key concepts include a) plant and animal adaptations b) organization of populations, communities, and ecosystems and how they interrelate; c) flow of energy through food webs; d) habitats and niches; e) changes in organism's niche at various stages in its life cycle; f) influences of human activity on ecosystems	Living Processes and Living Systems	4.4a-d 4.5a-f 4.9b	10
	Prior Knowledge		
	3.6 - investigate and understand that ecosystems support a diversity of plants and animals that share limited resources a) aquatic ecosystems b) terrestrial ecosystems; c) populations and communities; d) the human role in conserving limited resources.		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• Organisms have structural adaptations or physical attributes that help them meet a life need. • Organisms also have behavioral adaptations, or certain types of activities they perform, which help them meet a life need. • All the organisms of the same species that live in the same place at the same time are a population. • Populations of species that live in the same place at the same time together make up a community. • The organization of communities is based on the utilization of the energy from the sun within a given ecosystem. The greatest amount of energy in a community is in the producers.	**In order to meet this standard, it is expected that students will** • distinguish between structural (physical) and behavioral adaptations. • investigate and infer the function of basic adaptations. • understand that adaptations allow an organism to succeed in a given environment. • explain how different organisms use their unique adaptations to meet their needs. • describe why certain communities exist in given habitats. • illustrate the food webs in a local area. • compare and contrast the niches of several different organisms within

• Within a community, organisms are dependent on the survival of other organisms. Energy is passed from one organism to another. • All the populations and the nonliving components in an environment that interact with each other form an ecosystem. • The sun's energy cycles through ecosystems from producers through consumers and back into the nutrient pool through decomposers. • A habitat is the place or kind of place in which an animal or plant naturally lives. An organism's habitat provides food, water, shelter, and space. The size of the habitat depends on the organism's needs. • A niche is the function that an organism performs in the food web of that community. A niche also includes everything else the organism does and needs in its environment. No two types of organisms occupy exactly the same niche in a community. • The organization of a community is defined by the interrelated niches within it. • During its life cycle, an organism's role in the community — its niche — may change. For example, what an animal eats, what eats it, and other relationships will change. Humans can have a major impact on ecosystems	the community. • compare and contrast the differing ways an organism interacts with its surroundings at various stages of its life cycle. Specific examples include a frog and a butterfly. • differentiate among positive and negative influences of human activity on ecosystems.

Vocabulary	Lessons and TEI Items	Trade Books
Ecosystem- the living and nonliving things in an environment and all their interactions. **Organism –** a living thing that carries out five basic life functions on its own. **Community-** the living part of an ecosystem **Environment-** the things and conditions that are all	Activities in Google Drive The Best Beak for the Job Change is good Life in the web Hello from my habitat!	*Forests* (by Emily K. Green) *Temperate Forests* (by Greg Reid) *Temperate Forests* (by Sally Wilkins) *Virginia Plants and Animals* (by Karla Smith) *How do Animals Adapt*? (by Bobbie Kalman)

around **Niche-** the function that an organism performs in a food web of the community. **Carnivore –** A consumer that eats only animals. **Habitat-** the home of an organism **Consumer –** any organism that eats the food producers make or eat other consumers **Life cycle-** the stages of growth and change of an organism's life **Decomposer-** an organism that breaks down wastes and the remains of other organisms. **Food chain-** the set of steps in which organism get the food they need to survive. **Food web-** the pattern that shows how food chains are related. **Herbivore-** a consumer that eats only plants. **Omnivore-** a consumer that eats both plants and animals. **Predator-** an animal that hunts other animals for food. **Prey-** an animal being hunted, caught, and eaten by another animal **Hibernation**-to sleep through the winter in a den or burrow to save energy **Decay-** to rot	What can we do? Influences of Human Activity Did You Pollute the Water?	*Mouths and Teeth* (by Elizabeth Miles) *Pass the Energy, Please!* (by Barbra Shaw McKinney)

Ecology- the study of how living and nonliving things interact. **Behavioral adaptation-** things animals do in order to survive **Structural adaptation-** physical features of an animal that help them to survive		

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Dinwiddie County Public Schools Science Curriculum			
SOL 4.9 – 4th Nine Weeks	**Blueprint Categories**	**Grade 4 SOL**	**Number of Items**
The student will investigate and understand important Virginia natural resources. Key concepts include a) watersheds and water resources; b) animals and plants; c) minerals, rocks, ores, and energy sources; and d) forests, soil, and land.	Earth Space Systems and Cycles	4.6 a-c 4.7a-c 4.8 a-e 4.9 a, c-d	10
	Prior Knowledge		
	3.10 - investigate and understand that natural events and human influences can affect the survival of species the interdependency of plants and animals **3.11 -** investigate and understand different sources of energy		

Understanding the Standard	Essential Knowledge, Skills, and Procedures
• Virginia is rich in a wide variety of natural resources, including forests, arable (farmable) land, coal, sand and aggregates (rocks), wildlife and aquatic organisms, clean water and air, and beautiful scenery. • A watershed is an area over which surface water (and the materials it carries) flows to a single collection place. The Chesapeake Bay watershed covers approximately half of Virginia's land area. The other two major watershed systems are the Gulf of Mexico and the North Carolina Sounds. • Virginia's water resources include groundwater, lakes, reservoirs, rivers, bays, and the Atlantic Ocean.	**In order to meet this standard, it is expected that students will** • compare and contrast natural and human-made resources. • distinguish among rivers, lakes, and bays; describe characteristics of each; and name an example of each in Virginia. • create and interpret a model of a watershed. Evaluate the statement: "We all live downstream." • identify watershed addresses. • recognize the importance of Virginia's mineral resources, including coal, limestone, granite, and sand and gravel.

• Virginia has a great variety of plant and animal resources. • Natural and cultivated forests are a widespread resource in Virginia. • Virginia's soil and land support a great variety of life, provide space for many economic activities, and offer a variety of recreational opportunities.	• appraise the importance of natural and cultivated forests in Virginia. describe a variety of soil and land uses important in Virginia.

Vocabulary	Lessons and TEI Items	Trade Books
Watershed- an area over which surface water (and the materials it carries) flows to a single collection place **River-** a natural stream of water of fairly large size flowing in a definite course or channel or series of diverging and converging channels. **Lake-** a body of fresh or fresh and salt water of considerable size, surrounded by land. **Bay -** a body of water forming an indentation of the shoreline, larger than a cove but smaller than a gulf. **Arable(farmed) land-** land that can be used to grow crops **Groundwater-** precipitation that seeps into the ground and is stored in tiny holes or pores in soil and rocks. **Reservoirs-** a storage area for water supplies for a community	Activities in Google Drive Watershed Virginia's Rocks and Mineral Resources Virginia's forests	*All Around Virginia* (by Karla Smith) *Conservation and Natural Resources* (by Jackie Ball) *Natural and Man-Made: My World of Science* (by Angela Royston)

Natural resources- a land's forests, mineral, deposits, and water. **Peninsula-** an area of land with water on three sides. **Mineral-** a solid material of Earth's crust with a definite composition **Ores-**a mineral containing a a useful substance **Fossil fuels-** a fuel formed from the decay of ancient forms of life. **Wetland-** land that has a wet and spongy soil, as a marsh, swamp, or bog. **Estuary-** that part of the mouth or lower course of a river in which the river's current meets the sea's tide		

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