

VGLA COE Organizer

Grade 8 Science (2003)

Place evidence that has been collected for submission behind the VGLA COE Organizer. Cardstock or colored paper may be used to assist in the organization of the COE.

6.1 The student will plan and conduct investigations in which	
a)	observations are made involving fine discrimination between similar
	objects and
	organisms;
b)	a classification system is developed based on multiple attributes;
c)	precise and approximate measurements are recorded;
d)	scale models are used to estimate
	distance,
	volume, and quantity;
e)	hypotheses are stated in ways that identify the
	independent (manipulated) and
	dependent (responding) variables;
f)	a method is devised to test the validity of
	predictions and
	inferences;
g)	one variable is manipulated over time with many repeated trials;
h)	data are
	collected using appropriate metric measurement,
	recorded using appropriate metric measurement,
	analyzed using appropriate metric measurement, and reported using appropriate metric measurement;
i)	data are
	organized through graphical representation (graphs, charts, and diagrams)
	communicated through graphical representation (graphs, charts, and diagrams);
j)	models are designed to explain a sequence; and
k)	an understanding of the nature of science is
	developed and
	reinforced.

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LS.1 The student will plan and conduct investigations in which		
a)		data are organized into tables showing
		repeated trials and
		means;
b)		variables are defined;
c)		metric units (SI-International System of Units) are used;
d)		models are constructed to
		illustrate phenomena and
		explain phenomena;
e)		sources of experimental error are identified;
f)		dependent variables are identified,
		independent variables are identified, and
		constants are identified;
g)		variables are controlled to test hypotheses and
		trials are repeated;
h)		continuous line graphs are
		constructed,
		interpreted, and
		used to make predictions;
i)		interpretations from a set of data are
		evaluated and
		defended.
j)		an understanding of the nature of science is
		developed and
		reinforced.

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PS.1 The student will plan and conduct investigations in which	
a)	chemicals are used safely and equipment is used safely;
b)	the following is accurately <u>measured</u> and <u>reported</u> using metric units (SI-International System of Units); length mass, volume, density, temperature, weight, and force;
c)	conversions are made among metric units, applying appropriate prefixes;
d)	the following are used to gather data: triple beam and electronic balances, thermometers, metric rulers, graduated cylinders, and spring scales;
e)	numbers are expressed in scientific notation where appropriate;
f)	research skills are utilized using a variety of resources;
g)	The following are identified independent variables dependent variables, constants, controls, and repeated trials;
h)	data tables showing the following are <u>constructed</u> and <u>interpreted</u> independent variables, dependent variables, derived quantities, and the number of trials;
i)	data tables for the following are <u>constructed</u> and <u>interpreted</u> descriptive statistics showing specific measures of central tendency, the range of the data set, and the number of repeated trials;
j)	the following are <u>constructed</u> and <u>interpreted</u> frequency distributions, scattergrams, line plots, and histograms;
k)	valid conclusions are made after analyzing data;
l)	research methods are used to investigate practical problems and questions; and
m)	experimental results are presented in appropriate written form; and
n)	an understanding of the nature of science is developed and reinforced.

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6.2 The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include	
a)	potential energy and kinetic energy; and
e)	energy transformations (heat/light to mechanical, chemical, and electrical energy)

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6.4 The student will investigate and understand that all matter is made up of atoms. Key concepts include	
a)	atoms are made up of
	electrons,
	protons, and
	neutrons;
b)	atoms of any element are alike but are different from atoms of other elements;
c)	elements may be represented by chemical symbols;
d)	two or more atoms may be chemically combined;
e)	compounds may be represented by chemical formulas;
f)	chemical equations can be used to model chemical changes; and
g)	a limited number of elements comprise the largest portion of the
	solid Earth,
	living matter,
	the oceans, and
	the atmosphere.

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6.5 The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include		
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a)		Water as the universal solvent;
b)		the properties of water in all three states;

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6.6 The student will investigate and understand the properties of air and the structure and dynamics of the Earth's atmosphere. Key concepts to include	
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a)	air as a mixture of gaseous elements and compounds;
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PS.2 The student will investigate and understand the basic nature of matter. Key concepts include	
a)	the particle theory of matter;
b)	elements,
	compounds,
	mixtures,
	acids,
	bases, and
	salts;
c)	solids,
	liquids, and
	gases;
d)	characteristics of types of matter based on
	physical properties,
	chemical properties;
e)	physical properties (shape, density, solubility, odor, melting point, boiling point, color); and
f)	chemical properties (acidity, basicity, combustibility, reactivity).

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PS.3 The student will investigate and understand the modern and historical models of atomic structure. Key Concepts include	
a)	the contributions of the following people in understanding the atom
	Dalton,
	Thomson,
	Rutherford, and
b)	Bohr; and
	the modern model of atomic structure.

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PS.4 The student will investigate and understand the organization and use of the periodic table of elements to obtain information. Key concepts include	
a)	symbols,
	atomic number,
	atomic mass,
	chemical families (groups), and
	periods,
b)	classification of elements as
	metals,
	metalloids, and
	nonmetals; and
c)	simple compounds (formulas and the nature of bonding).

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PS.5 The student will investigate and understand changes in matter and the relationship of these changes to the Law of Conservation of Matter and Energy. Key concepts include	
a)	physical changes
b)	nuclear reactions (products of fusion and fission and the effects of these products on human and the environment); and
c)	chemical changes (types of reactions, reactants and products, and balanced equations).

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PS.6 The student will investigate and understand states and forms of energy and how energy is transferred and transformed. Key concepts include	
a)	potential energy,
	kinetic energy;
b)	mechanical energy,
	chemical energy,
	electrical energy;
c)	heat,
	light,
	sound.

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PS.7 The student will investigate and understand temperature scales, heat, and heat transfer. Key concepts include	
a)	Celsius temperature scales,
	Kelvin temperature scales, and
	absolute zero;
b)	phase change,
	freezing point,
	melting point,
	boiling point,
	vaporization, and
condensation	
c)	conduction,
	convection,
	radiation; and
d)	applications of heat transfer
	heat engines,
	thermostats,
	refrigeration, and
	heat pumps

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PS.8 The student will investigate and understand characteristics of sound and technological applications of sound waves. Key concepts include	
a)	wavelength,
	frequency,
	speed, and
	amplitude;
b)	resonance;
c)	the nature of mechanical waves; and
d)	technological applications of sound.

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PS.9 The student will investigate and understand the nature and technological applications of light. Key concepts include	
a)	the wave behavior of light
	reflection,
	refraction,
	diffraction, and interference;
b)	images formed by
	lenses and
	mirrors; and
c)	the electromagnetic spectrum.

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PS.10 The student will investigate and understand scientific principles and technological applications of work, force, and motion. Key concepts include	
a)	speed,
	velocity, and
	acceleration;
b)	Newton's laws of motion;
c)	work,
	force,
	mechanical advantage,
	efficiency, and
d)	power; and
	applications
	simple machines,
	compound machines,
	powered vehicles,
rockets,	
restraining devices	

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PS.11 The student will investigate and understand basic principles of electricity and magnetism. Key concepts include	
a)	static electricity,
	current electricity, and
	circuits;
b)	magnetic fields and
	electromagnets; and
c)	motors and
	generators.

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LS.2 The student will investigate and understand that all living things are composed of cells. Key concepts include		
a)		cell structure and organelles (cell membrane, cell wall, cytoplasm, vacuole, mitochondrion, endoplasmic reticulum, nucleus, and chloroplast);
b)		similarities and differences between plant and animal cells;
c)		development of cell theory; and
d)		cell division
		mitosis and
		meiosis.

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LS.3 The student will investigate and understand that living things show patterns of cellular organization. Key concepts include	
a)	cells,
	tissues,
	organs, and
	systems; and
b)	life functions and processes of cells, tissues, organs, and systems
	respiration,
	removal of wastes,
	growth,
	reproduction,
	digestion, and
cellular transport	

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LS.4 The student will investigate and understand that the basic needs of organisms must be met in order to carry out life processes. Key concepts include		
a)		plant needs (light, water, gases, nutrients);
b)		animal needs (food, water, gases, shelter, space); and
c)		factors that influence life processes.

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LS.5 The student will investigate and understand how organisms can be classified. Key concepts include		
a)		the distinguishing characteristics of kingdoms of organisms;
b)		the distinguishing characteristics of major
		animal phyla, and
		plant phyla; and
c)		the characteristics of the species.

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LS.6 The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include		
a)		energy transfer between sunlight and chlorophyll;
b)		transformation of water and carbon dioxide into sugar and oxygen; and
c)		photosynthesis as the foundation of virtually all food webs.

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LS.13 The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include	
a)	the role of DNA;
b)	the functions of genes and chromosomes;
c)	genotypes and phenotypes;
d)	factors affecting the expression of traits;
e)	characteristics that can and cannot be inherited;
f)	genetic engineering and its applications; and
g)	historical contributions and significance of discoveries related to genetics.

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LS.14 The student will investigate and understand that organisms change over time. Key concepts include	
a)	the relationships of
	mutation,
	adaptation,
	natural selection, and
	extinction.

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6.7 The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include	
a)	the health of ecosystems and the abiotic factors of a watershed;
b)	the location and structure of Virginia's regional watershed systems;
c)	divides, tributaries, river systems, and river and stream processes;
d)	wetlands;
e)	estuaries;
f)	major conservation issues associated with watersheds, health issues associated with watersheds, safety issues associated with watersheds; and
g)	water monitoring and analysis using field equipment including hand-held technology.

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LS.7 The student will investigate and understand that organisms within an ecosystem are dependent on one another and on nonliving components of the environment. Key concepts include	
a)	the following cycles
	carbon,
	water, and
	nitrogen;
b)	interactions resulting in a flow of energy and matter throughout the system;
c)	complex relationships within
	terrestrial ecosystems,
	freshwater ecosystems, and marine ecosystems; and
d)	energy flow in
	food webs and
	energy pyramids.

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LS.8 The student will investigate and understand that interactions exist among members of a population. Key concepts include	
a)	competition,
	cooperation,
	social hierarchy,
	territorial imperative; and
b)	influence of behavior on a population.

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LS.9 The student will investigate and understand interactions among populations in a biological community. Key concepts include		
a)		the relationship among producers, consumers, and decomposers in food webs;
b)		the relationship between predators and prey;
c)		competition and
		cooperation;
d)		symbiotic relationships and
e)		niches.

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LS.10 The student will investigate and understand how organisms adapt to biotic and abiotic factors in an ecosystem. Key concepts include		
a)		differences between ecosystems and biomes;
b)		characteristics of
		land ecosystems,
		marine ecosystems,
c)		freshwater ecosystems; and
		adaptations that enable organisms to survive within a specific ecosystem.

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LS.11 The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time (daily, seasonal, and long term). Key concepts include	
a)	phototropism,
	hibernation, and
	dormancy;
b)	factors that increase or decrease population size; and
c)	eutrophication,
	climate changes, and
	catastrophic disturbances.

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LS.12 The student will investigate and understand the relationships between ecosystem dynamics and human activity. Key concepts include		
a)		food production and harvest;
b)		change in habitat
		size,
		quality, and
		structure;
c)		change in species competition; and
d)		population disturbances and factors that
		threaten species survival
		enhance species survival.
e)		environmental issues
		water supply,
		air quality,
		energy production, and
		waste management

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6.2 The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include		
b)		the role of the sun in the formation of most energy sources on Earth;
c)		nonrenewable energy sources (fossil fuels) including
		petroleum,
		natural gas, and coal;
d)		renewable energy sources
		wood,
		wind,
		hydro,
		geothermal,
		tidal, and solar

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6.3 The student will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on the Earth's surface. Key concepts include		
a)		the Earth's energy budget;
b)		the role of
		radiation in the distribution of energy;
		convection in the distribution of energy;
c)		the motion of
		the atmosphere
		and the oceans;
d)		cloud formation; and
e)		the role of heat energy in weather-related phenomena including
		thunderstorms and
		hurricanes.

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6.5 The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include	
c)	the action of water in
	physical weathering and
	chemical weathering;
d)	the ability of large bodies of water to
	store heat and
	moderate climate;
e)	the origin of water on Earth;
	the occurrence of water on Earth;
f)	the importance of water for
	agriculture,
	power generation,
	and public health; and
g)	the importance of
	protecting water resources and
	maintaining water resources

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6.6 The student will investigate and understand the properties of air and the structure and dynamics of the Earth's atmosphere. Key concepts include	
b)	air pressure,
	temperature, and
	humidity;
c)	how the atmosphere changes with altitude;
d)	natural changes to the atmosphere and
	human-caused changes to the atmosphere;
e)	the relationship of atmospheric measures and weather conditions;
f)	basic information from weather maps including
	fronts,
	systems, and
	basic measurements.
g)	the importance of
	protecting and
	maintaining air quality.

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6.8 The student will investigate and understand the organization of the solar system and the relationships among the various bodies that comprise it. Key concepts include	
a)	the sun,
	moon,
	Earth,
	other planets and their
	moons,
	meteors,
	asteroids, and comets;
b)	relative size of planets and
	relative distance between planets;
c)	the role of gravity;
d)	revolution and
	rotation;
e)	the mechanics of day and night and
	the phases of the moon;
f)	the unique properties of Earth as a planet;
g)	the relationship of the Earth's tilt and the seasons;
h)	the cause of tides; and
i)	the history of space exploration and
	the technology of space exploration.

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6.9 The student will investigate and understand public policy decisions relating to the environment. Key concepts include	
a)	management of renewable resources
	water,
	air,
	soil,
	plant life, animal life;
b)	management of nonrenewable resources
	coal,
	oil,
	natural gas,
	nuclear power, mineral resources;
c)	the mitigation of land-use through preventive measures and the mitigation of environmental hazards through preventive measures; and
d)	cost/benefit tradeoffs in conservation policies.

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LS.14 The student will investigate and understand that organisms change over time. Key concepts include		
b)		evidence of evolution of different species in the fossil record; and
c)		how environmental influences can lead to diversity of organisms
		how genetic variation can lead to diversity of organisms