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4/9/2015 4:54:19 PM

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FORM 5 -- NOTICE OF AGENCY ADOPTION OF A PROCEDURAL OR INTERPRETIVE RULE OR A LEGISLATIVE RULE EXEMPT FROM LEGISLATIVE REVIEW

AGENCY **Education**

RULE TYPE **Legislative Exempt** AMENDMENT TO EXISTING RULE **No** TITLE-SERIES **126-044CC**

RULE NAME **Next Generation Content Standards and Objectives for Science in West Virginia Schools (2520.3C)**

CITE AUTHORITY **W. Va. Code §§29A-3B-1, et seq.: W. Va. Board of Education v. Hechler, 180 W. Va. 451; 376 S.E.2d 839 (1988)**

RULE IS LEGISLATIVE EXEMPT

Yes

CITE STATUTE(S) GRANTING EXEMPTION FROM LEGISLATIVE REVIEW

W. Va. Code §§29A-3B-1, et seq.; W. Va. Board of Education v. Hechler, 180 W. Va. 451; 376 S.E.2d 839 (1988)

THE ABOVE RULE IS HEREBY ADOPTED AND FILED WITH THE SECRETARY OF STATE, THE EFFECTIVE DATE OF THIS RULE IS

Friday, July 01, 2016

BY CHOOSING 'YES', I ATTEST THAT THE PREVIOUS STATEMENTS ARE TRUE AND CORRECT.

Yes

Charles K Heinlein -- By my signature, I certify that I am the person authorized to file legislative rules, in accordance with West Virginia Code §29A-3-11 and §39A-3-2.

Title-Series: 126-044CC

Rule Id: 9701

Document: 26574

TITLE 126
LEGISLATIVE RULE
BOARD OF EDUCATION

SERIES 44CC
NEXT GENERATION CONTENT STANDARDS AND OBJECTIVES FOR SCIENCE IN WEST VIRGINIA SCHOOLS (2520.3C)

§126-44CC-1. General.

1.1. Scope. – West Virginia Board of Education (hereinafter WVBE) Policy 2510 provides a definition of a delivery system for, and an assessment and accountability system for, a thorough and efficient education for West Virginia public school students. Policy 2520.3C defines the content standards and objectives for science as required by W. Va. 126CSR42 (Policy 2510).

1.2. Authority. – W. Va. Constitution, Article XII, §2, W. Va. Code §18-2-5 and §18-9A-22.

1.3. Filing Date. – April 9, 2015.

1.4. Effective Date. – July 1, 2016.

1.5. Repeal of former rule. -- This legislative rule repeals and replaces W. Va. 126CSR44R WVBE Policy 2520.35 "21st Century Science 9-12 Content Standards and Objectives for West Virginia Schools (2520.35)" filed July 10, 2013 and effective September 11, 2013 and W. Va. 126CSR44C Policy 2520.3 "21st Century Science K-8 Content Standards and Objectives for West Virginia Schools (2520.3)" filed August 14, 2009 and effective September 14, 2009.

§126-44CC-2. Purpose.

2.1. This policy defines the content standards and objectives for the program of study required by Policy 2510 in science. The period of time between the adoption date and the effective date of the policy will allow time for the adoption of instructional materials and the administration of professional development and support to educators.

§126-44CC-3. Incorporation by Reference.

3.1. A copy of the Next Generation Standards and Objectives for Science in West Virginia Schools is attached and incorporated by reference into this policy. Copies may be obtained in the Office of the Secretary of State and in the West Virginia Department of Education (hereinafter WVDE), Office of Secondary Learning.

§126-44CC-4. Summary of the Content Standards and Objectives.

4.1. The WVBE has the responsibility of establishing high quality standards pertaining to all educational standards (W. Va. Code §18-9A-22). The content standards and objectives provide focus for teachers to teach and students to learn the skills and competencies essential for future success in the workplace and further education. The document includes content standards for science, an explanation of terms, and objectives that reflect a rigorous and challenging curriculum.

§126-44CC-5. Severability.

5.1 If any provisions of this rule or the application thereof to any person or circumstances are held invalid, such invalidity shall not affect other provisions or applications of this rule.

Introduction

The WVBE and the WVDE are pleased to present Policy 2520.3C, The Next Generation Content Standards and Objectives for Science in West Virginia Schools. West Virginia educators, including regular classroom teachers, special education teachers, teachers representing higher education institutions, and informal science educators convened to revise the content standards and objectives; they played a key role in shaping the content standards to align with national standards and rigorous national assessments. The committees considered major advances in science, research from the American Association for Advancement in Science and the National Research Council, and their understanding of how students learn science as decisions were made regarding science content, science and engineering practices, cross-cutting concepts, the nature of science, science literacy and the sequencing of standards. The contribution of these professionals was critical in creating a policy that is meaningful to classroom teachers and appears in a format that can easily be understood and used.

Policy 2520.3C is organized around the two major components of a standards-based curriculum: learning standards and instructional objectives. The learning standards are the *broad descriptions* of what *all* students must know and be able to do at the conclusion of the instructional sequence. Science learning standards address science content, engineering design, and literacy. The accompanying grade-level objectives are specific descriptors of knowledge, skills, practices and attitudes that, when mastered, will enable students to attain each standard. The instructional objectives guide instructional *planning* and provide a basis for determining appropriate *instructional strategies, resources and assessments.*

There is a deliberate sequencing of objectives (based on programmatic level) to ensure students will develop skills to acknowledge and distinguish claim(s) from alternate or opposing claims, support arguments either claims or counterclaims with evidence, and communicate about science related topics/issues in a knowledgeable, clear and objective manner. In combination, the use of learning standards and instructional objectives become a comprehensive guide for delivering a rigorous and relevant science curriculum to all West Virginia students. These elements, when used to guide the instructional process and delivered with the creativity and instructional expertise of West Virginia teachers, will become a powerful resource for preparing students to be scientifically literate and meet the challenges of the 21st century.

Explanation of Terms

Content Standards are broad descriptions of what students should know and be able to do in a content area. Content standards describe what students' knowledge and skills should be at the end of a K-12 sequence of study.

There are two types of elementary science standards- Content and Engineering, Technology, and the Application of Science. There are three types of standards in each course in middle and high school: Content, Engineering, Technology, and the Application of Science, and Science Literacy.

Objectives are incremental steps toward accomplishment of content standards. Objectives are listed by course title and are organized around the content standards. Where appropriate, objectives are arranged by topics. Objectives followed by an asterisk (*) denote the integration of traditional science content with an engineering practice.

Numbering of Standards and Objectives
The number for each standard and objective is composed of four parts, each part separated by a period:

- the content area code is S for Science,
- the grade level or programmatic level,
- a capital letter or letters indicating the standard,
- the objective number.

Examples:

S.K-2.ETS.3 refers to science objective # 3 in the Engineering, Technology, and the Application of Science Standard for kindergarten through second grade.
S.8.PS.1 refers to science objective #1 in the Physical Science Content Standard (PS) for eighth grade.
S.9-10.L.7 refers to science objective #7 in the Literacy Standard (L) for ninth and tenth grades.

Unique Electronic Numbers (UENs)
Unique Electronic Numbers (or UENs) are numbers that electronically identify, categorize and link specific bits of information. Once Policy 2520.3C is available on the Internet, each standard and objective will have a Unique Electronic Number (UEN) that will always remain the same.

The codes printed in Policy 2520.3C form the basis of the UENs. The only additional set of numbers that will be added to each code to formulate its UEN will be a prefix that indicates the year and month that a particular version of Policy 2520.3 is approved by the WVBE.
The prefix for the UENs for each content area in Policy 2520.3C is noted at the top of each page containing standards, objectives and performance descriptors. As sections of 2520.3C are revised, UENs will be changed to reflect the new approval date.

UENs (Unique Electronic Numbers) are unique numbers that facilitate implementation of West Virginia Next Generation Science Standards and Objectives into Electronic formats such as Databases and XML Files. The WVDE encourages everyone who is going to use the West Virginia Next

Generation Science Standards and Objectives in any kind of electronic distribution, alignment, or software development to use the UENs so that all efforts can be cross-referenced and there is consistency across initiatives.

Abbreviations

Content Area

S	Science

Programmatic Levels

K-2	Kindergarten through Second Grades
3-5	Third through Fifth Grades
6-8	Sixth through Eighth Grades
9-10	Ninth and Tenth Grades
11-12	Eleventh and Twelfth Grades
HS	High School

Standards

GS	General Science Content
ESS	Earth and Space Science Content
LS	Life Science Content
PS	Physical Science Content
C	Chemistry Content
P	Physics Content
ENV	Environmental Content
FS	Forensics Science Content
HAP	Human Anatomy and Physiology Content
ETS	Engineering, Technology, and Applications of Science
L	Literacy

SCIENCE – Policy 2520.3C

Science is the study of the structures and processes of the physical and natural world through observations and experiments. By its very nature, science embodies the ***doing*** of science and engineering practices which builds and organizes knowledge in the form of testable explanations, predictions about the universe, and technological applications. The science policy describes students engaging in those practices as they acquire science knowledge and skills necessary for the furtherance of their education, careers, and general welfare.

The overarching goal of Policy 2520.3C, as referenced by A Framework for K-12 Science Education, is to ensure that "by the end of 12th grade, all students have some appreciation of the beauty and wonder of science; possess sufficient knowledge of science and engineering to engage in public discussions on related issues; are careful consumers of scientific and technological information related to their everyday lives; are able to continue to learn about science outside school; and have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology. For those reasons, the policy addresses what all students should know in preparation for their individual lives and for their roles as citizens in this technology-rich and scientifically complex world, and it provides the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future." [Source: Committee on Conceptual Framework for the New K-12 Science Education Standards, Board on Science Education, Division of Behavioral and Social Sciences and Education, and National Research Council. (2012). A framework for K-12 science education: Practices, crosscutting concepts, and core ideas. H. Quinn, and T. Keller (Eds.). Washington, D.C.: The National Academies Press.]

Numerous sources were referenced and used to identify and describe the major ideas for K-12 science education. These include Science for All Americans and Benchmarks for Science Literacy (1993), developed by the American Association for the Advancement of Science (AAAS); the National Science Education Standards (1996), developed by the NRC; and A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) by the Committee on Conceptual Framework for the New K-12 Science Education Standards. The policy is also informed by recent works of the American Association for the Advancement of Science (in Project 2061 especially) and the National Science Teachers Association (particularly the 2009 Anchors project), Common Core Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects, in addition to the guidelines of National Assessment of Education Progress (NAEP), American College Testing (ACT), Standardized Aptitude Test (SAT) and various accredited assessment consultants. The foundation of West Virginia's Next Generation Science Content Standards and Objectives is to identify what students should know and to guide them in the development of their skills, practices and dispositions. With this philosophy as a guide, members of West Virginia's Next Generation of Science Standards Lead State Team, The Next Generation of Science Standards Steering Committee and West Virginia's Next Generation of Science Middle School and High School Subcommittees support the vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.

The Common Core State Standards for Literacy in History/Social Studies, Science and Technical Subjects were adopted by the WVBE in May 2010. West Virginia educators found the standards to be research-and evidenced-based, aligned with college and work expectations, rigorous and internationally benchmarked. The Literacy Standards and Objectives for Science, and Technical Subjects are required and crucial for the delivery of

science instruction. Achievement in reading, writing and reasoning in science will accelerate students' progress in all subjects. The Literacy Standards are meant to complement the specific content demands of science, not replace them.

West Virginia's vision for education includes the integration of technology and critical thinking skills throughout the curriculum so that all West Virginia students have the opportunity to develop skills that support achievement. Successful learning environments provide opportunities for students to use educational technology with curricular content in relevant context. West Virginia teachers are responsible for integrating Policy 2520.14, 21st Century Learning Skills and Technology Tools, into the content standards and objectives.

Science Standards K-12

General Science Content
The General Science Standard is a content standard that provides an integrated approach to science instruction that is arranged in a coherent manner, follows the logic of learning progressions and spans kindergarten through middle school. The three disciplines of science--Physical Science, Life Science, and Earth and Space Science--are limited to the major topics in the core ideas from each discipline. From the Life Science discipline the core ideas are the following: From Molecules to Organisms: Structures and Processes; Ecosystems: Interactions, Energy, and Dynamics; Heredity: Inheritance and Variation of Traits Across Generations; and Biological Evolution: Unity and Diversity. From the Physical Science discipline, the topics are the following: Matter and Its Interactions; Motion and Stability, Forces and Interactions; Energy; and Waves and Their Applications in Technologies for Information Transfer. Earth's Place in the Universe; Earth's Systems; and Earth and Human Activity are the topics from the Earth and Space Science discipline. Limiting instruction to the main topics of core ideas allows opportunities for deep exploration of important concepts and provides time for students to develop meaningful understandings, engage in science and engineering practices, and reflect on crosscutting concepts and the nature of science. The foundation not only provides an organizational structure for the acquisition of new knowledge, it prepares students to engage in deeper levels of scientific and engineering practices as they continue to high school, college, and beyond.

Earth and Space Science Content
The Earth and Space Standard is a content standard which spans kindergarten through high school and provides opportunities for students to investigate processes that operate on Earth and also address its place in the solar system and the galaxy. The standard encompasses three core ideas: Earth's Place in the Universe; Earth's Systems; and Earth and Human Activity. Beginning in kindergarten, students make observations, ask questions, and make predictions as they describe patterns in their local Weather and Climate. In later grades, the content progresses to include these topics: Space Systems: Patterns and Functions; Earth Systems: Processes that Shape the Earth; Earth's Systems: Space Systems: Stars and the Solar System; History of Earth; and Human Impacts. Elementary students observe and investigate matter and processes in their own yards and neighborhoods with their own eyes; the content continues in the grades that follow to include investigations of invisibly small phenomena to the unimaginably large and distant. As students investigate the atmosphere, hydrosphere, geosphere, and biosphere, they gain understanding of the differing sources of energy, matter cycles, multiple systems' interconnections, and feedbacks which cause Earth to change over time.

Life Science Content
The Life Science Standard is a content standard which spans kindergarten through high school and focuses on patterns, processes, and relationships of living organisms. The standard includes four core ideas: From Molecules to Organisms: Structures and Processes; Ecosystems: Interactions, Energy, and Dynamics; Heredity: Inheritance and Variation of Traits across Generations; and Biological Evolution: Unity and Diversity. These four core ideas, which represent basic life science fields of investigation—structures and processes in organisms, ecology, heredity, and evolution—have a long history and solid foundation based on the research evidence established by many scientists working across multiple fields. Beginning in kindergarten, curious learners explore Animals, Plants, and Their Environment as they learn of the Interdependent Relationships in Ecosystems. In the grades which follow, the inquiry continues as the standards encompass these topics: Structure, Function, and Information Processing; Inheritance and Variation of Traits: Life Cycles and Traits; Matter and Energy in Organisms and Ecosystems; and Growth, Development, and Reproduction of Organisms. Investigations include single molecules, organisms, ecosystems, and the entire biosphere that is all life on Earth. Students examine

processes that occur on time scales from the blink of an eye to those that happen over billions of years. As they make observations, construct hypotheses, perform experiments, evaluate evidence, build models, and use technology to explore how life works, they prepare to answer questions about themselves and the world around them.

Physical Science Content
The Physical Science Standard is a content standard which spans kindergarten through high school as two subjects, physics and chemistry, are presented in a coherent approach which addresses four core ideas: Matter and Its Interactions; Motion and Stability, Forces and Interactions; Energy; and Waves and Their Applications in Technologies for Information Transfer. Beginning in kindergarten, students explore pushes and pulls as an introduction to the Forces and Interactions Topic. The inquiry continues through each programmatic level and includes the following topics: Light and Sound, Structure and Properties of Matter, Forces and Interactions, Energy, Waves and Information, Matter and Energy in Organisms and Ecosystems, Waves and Electromagnetic Radiation, and Chemical Reactions. An understanding of these topics allows students to answer two fundamental questions- "What is everything made of?' and "Why do things happen?" Students apply these core ideas to explain and predict a wide variety of phenomena, such as the evaporation of water, the transmission of sound, the digital storage and transmission of information, the tarnishing of metals, and photosynthesis, to name just a few. Because such explanations and predictions rely on a basic understanding of matter and energy, students' abilities to conceive the interactions of matter and energy are central to their science education.

Chemistry Content
The Chemistry Standard is a content standard which focuses on the core concepts: Structure and Properties of Matter and Chemical Reactions. Opportunities are provided for studying in-depth phenomena central not only to the physical sciences, but to life science and earth and space science, as well. The standard includes the chemistry concepts found in the Physical Science Standard, but *not* those emphasizing Forces and Interactions, Energy, and Waves and Electromagnetic Radiation. Instead the standard goes into greater depth in the study of matter, its composition, and its changes by including concepts such as the periodic table and modern theories of bonding, the effects of temperature, concentration, and vapor pressure on solubility, types of chemical reactions, stoichiometry, molarity, and gas laws. The standard blends the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. There is an emphasis on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking and constructing explanations.

Physics Content
The Physics Standard is a content standard which focuses on the core concepts: Forces and Interactions, Energy, and Waves and Electromagnetic Radiation. Opportunities are provided for studying in-depth phenomena central not only to the physical sciences, but to life science and earth and space science, as well. The standard includes the physics concepts found in the Physical Science Standard, but *not* those emphasizing Structure and Properties of Matter and Chemical Reactions. Instead the standard goes into greater depth in the studies of elastic and inelastic collisions, buoyancy and fluid dynamics, projectile motion, vectors, circuits and currents, and optics. The standard blends the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. There is an emphasis on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking and constructing explanations.

Environmental Content
The Environmental Standard is a content standard which focuses on chemical, physical, biological, and geological processes and the interdependent relationships in the natural world. Concepts from the major science disciplines—Life Science, Physical Science, and Earth and Space Science—are integrated into six environmental topics which include: Biogeochemical cycles, Energy Conservation, Ecosystems, Oceans and Climate, Water Management, Land Use. There is an emphasis on several scientific practices that include developing and using models; planning and conducting investigations; analyzing and interpreting data; constructing explanations; engaging in arguments from evidence; obtaining, evaluating, and communicating information; and synthesizing concepts across various science disciplines. The standard provides opportunities for students to develop an understanding of systems of a complex world and the interdependence of organisms as well as an appreciation of the ecosystem in which they live. As students develop an awareness of the environment and its associated problems, they acquire knowledge and skills of how to work individually and collectively toward solutions of current problems and the prevention of new ones.

Forensic Science Content
The Forensic Science Standard is a content standard which applies the knowledge and technology of science to criminal and civil law. Concepts from the three major disciplines--Life Science, Physical Science, and Earth and Space Science--are reinforced and made relevant and pertinent to students as they acquire techniques and skills and learn the limitations of the modern crime laboratories. There is an emphasis on several scientific practices which include planning and carrying out investigations; analyzing and interpreting data; obtaining, evaluating and communicating information; and using mathematics and computations. Students must address the attention to detail and protocol that are necessary for providing impartial scientific evidence that may be used in courts of law to support the prosecution or defense in criminal and civil investigations. These skills and attitudes transfer readily to other areas of science.

Human Anatomy and Physiology Content
Human Anatomy and Physiology is a content standard which addresses the structures and functions of the human body. While concepts from the Life Science discipline are the major focus of study, concepts from the Physical Sciences are incorporated to explain processes and mechanisms of the human body. The interdisciplinary nature of the sciences is revealed through the interdependency of body systems. There is an emphasis on several scientific practices which include asking questions, developing and using models, constructing explanations, and obtaining and communicating information. Engineering Design Standards are integrated throughout instruction as students define problems and design solutions related to the course objectives. The standard encompasses gross and microscopic an atom, basic biochemistry and physiological concepts which are foundational to medical fields of study and useful as students make health related decisions.

Engineering, Technology, and Applications of Science
Engineering, Technology, and Applications of Science Standards (ETS) are included in science instruction, kindergarten through high school, and provide opportunities for students to utilize science and appreciate the distinctions and relationships between engineering, technology, and applications of science. The ETS are in programmatic levels- Kindergarten through Second Grade, Third through Fifth Grade, Middle School, and High School. As Engineering, Technology, and the Application of Science objectives are integrated with content from the three major strands of science- life science, physical science, and earth and space science- students develop understandings of how scientific knowledge is acquired,

scientific explanations are developed, and science is applied in the world around us. The interactive cycle of design offers potential in applying science knowledge and engaging in engineering practices. Students gain experiences and understandings about the following: 1.) using technology to modify the natural world to fulfill human needs or desires; 2.) using an engineering approach to design objects, use processes, or construct systems to meet human needs and wants; and 3.) applying scientific knowledge for a specific purpose, whether to do more science, design a product, process, or medical treatment, develop a new technology, or to predict the impacts of human actions.

Literacy

Literacy Standards span middle and high school and address skills which are critical to building knowledge in science. The standards work in tandem with the specific content standard demands outlined in the West Virginia Next Generation Science Standards and Objectives. Reading in science requires an appreciation of the norms and conventions of the sciences which includes a working knowledge of domain-specific words, phrases, and symbols; an understanding of the nature of evidence used to support claims; an attention to precision and detail; and the capacity to make and assess intricate arguments, synthesize complex information often presented qualitatively and quantitatively in tables and graphs, and follow detailed procedures and accounts of events and concepts. Students also need to be able to gain knowledge from elaborate diagrams and data that convey information and illustrate scientific concepts. Likewise, writing and presenting information orally are key means for students to assert and defend claims in science, demonstrate what they know about a concept, and convey what they have experienced, imagined, thought, and learned. The skills and understandings students are expected to demonstrate in both reading and writing have a wide applicability outside the classroom and workplace and serve students as they address public and private responsibilities and interests.

Science - Kindergarten

The Kindergarten Science objectives are designed to engage students in finding answers to questions related to their interests and the world around them. Kindergarten students engage in active inquiries, investigations and hands-on activities throughout the instructional day to develop conceptual understanding and research skills as described in the objectives. Students use safe and proper techniques for handling, manipulating, and caring for science materials and treating living organisms humanely. Kindergarten objectives include physical, life, earth and space sciences and engineering. In the kindergarten objectives, students are expected to demonstrate age-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students are expected to use these practices to demonstrate an understanding of the scientific world.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade K	**Science**
Standard	General Science Content
Topic	**Forces and Interactions: Pushes and Pulls**
Objectives	Students will
S.K.GS.1	plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
S.K.GS.2	analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*
Topic	**Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment**
Objectives	Students will
S.K.GS.3	use observations to describe patterns of what plants and animals (including humans) need to survive.
S.K.GS.4	construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
S.K.GS.5	use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
S.K.GS.6	communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*
Topic	**Weather and Climate**
Objectives	Students will
S.K.GS.7	use and share observations of local weather conditions to describe patterns over time.
S.K.GS.8	ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*

S.K.GS.9	make observations to determine the effect of sunlight on Earth's surface.
S.K.GS.10	use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*

Grade K-2	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.K-2.ETS.1	ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
S.K-2.ETS.2	develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
S.K-2.ETS.3	analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Science – Grade 1

First Grade Science objectives build on the process skills and add data gathering and reporting. Through a progressive rigorous, inquiry-based program of study, all students demonstrate scientific literacy and the use of 21st century skills in the fields of life science, physical science, and earth and space sciences. By engaging in active inquiries, investigations and hands-on activities throughout the instructional day, students focus on the major themes of science: systems, changes, and models in order to develop conceptual understanding and research skills as described in the objectives. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students use safe and proper techniques for handling, manipulating, caring for science materials, and treating living organisms humanely. The content develops early problem-solving skills through observing, experimenting and concluding. First Grade Science intentionally supports developmental and academic growth.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 1	**Science**
Standard	General Science Content
Topic	**Waves: Light and Sound**
Objectives	Students will
S.1.GS.1	plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
S.1.GS.2	make observations to construct an evidence-based account that objects can be seen only when illuminated.
S.1.GS.3	plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.
S.1.GS.4	use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*
Topic	**Structure, Function, and Information Processing**
Objectives	Students will
S.1.GS.5	use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*
S.1.GS.6	read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
S.1.GS.7	make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
Topic	**Space Systems: Patterns and Cycles**
Objectives	Students will
S.1.GS.8	use observations of the sun, moon, and stars to describe patterns that can be predicted.
S.1.GS.9	make observations at different times of year to relate the amount of daylight to the time of year.

Grade K-2	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.K-2.ETS.1	ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
S.K-2.ETS.2	develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
S.K-2.ETS.3	analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Science – Grade 2

Second Grade Science objectives build upon the early stages of experimentation and maintenance of natural curiosity. Through a progressive rigorous, integrated approach, the inquiry-based program of study blends science and 21st century skills and provides students opportunities to demonstrate scientific literacy in the fields of life science, physical science, and earth and space sciences. By engaging in active inquiries, investigations and hands-on activities throughout the instructional day, students focus on the major themes of science: systems, changes, and models in order to develop conceptual understanding and research skills as described in the objectives. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. The content focus develops early problem-solving skills through observing, experimenting and concluding. Students use safe and proper techniques for handling, manipulating, and caring for science materials and treating living organisms humanely. Second Grade Science intentionally supports developmental and academic growth.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 2	**Science**
Standard	General Science Content
Topic	**Structure and Properties of Matter**
Objectives	Students will
S.2.GS.1	plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
S.2.GS.2	analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.*
S.2.GS.3	make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
S.2.GS.4	construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
Topic	**Interdependent Relationships in Ecosystems**
Objectives	Students will
S.2.GS.5	plan and conduct an investigation to determine if plants need sunlight and water to grow.
S.2.GS.6	develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*
S.2.GS.7	make observations of plants and animals to compare the diversity of life in different habitats.
Topic	**Earth's Systems: Processes that Shape the Earth**
Objectives	Students will
S.2.GS.8	use information from several sources to provide evidence that Earth events can occur quickly or slowly.
S.2.GS.9	compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*
S.2.GS.10	develop a model to represent the shapes and kinds of land and bodies of water in an area.
S.2.GS.11	obtain information to identify where water is found on Earth and that it can be solid or liquid.

Grade K-2	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.K-2.ETS.1	ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
S.K-2.ETS.2	develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
S.K-2.ETS.3	analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Science – Grade 3

The Third Grade Science objectives build upon problem-solving and experimentation moving into a more in-depth study of science. Through a progressive rigorous, integrated approach, the inquiry-based program of study blends science and 21st century skills and provides students opportunities to demonstrate scientific literacy in the fields of life science, physical science, and earth and space sciences. By engaging in active inquiries, investigations and hands-on activities throughout the instructional day, students focus on the major themes of science: systems, changes, and models in order to develop conceptual understanding and research skills as described in the objectives. Third Grade Science highlights science-related careers. The study of geology and astronomy expands in Third Grade Science. Collecting and testing materials, recording data, and developing concepts relating to physics and chemistry expand the student's investigative abilities leading to logical conclusions. The content focus develops early problem-solving skills through observing, experimenting and concluding. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students use safe and proper techniques for handling, manipulating, and caring for science materials and treating living organisms humanely. Third Grade Science intentionally supports developmental and academic growth.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 3	**Science**
Standard	General Science Content
Topic	**Forces and Interactions**
Objectives	Students will
S.3.GS.1	plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
S.3.GS.2	make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
S.3.GS.3	ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
S.3.GS.4	define a simple design problem that can be solved by applying scientific ideas about magnets.*
Topic	**Interdependent Relationships in Ecosystems**
Objectives	Students will
S.3.GS.5	construct an argument that some animals form groups that help members survive.
S.3.GS.6	analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
S.3.GS.7	construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

S.3.GS.8	make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.*
Topic	**Inheritance and Variation of Traits: Life Cycles and Traits**
Objectives	Students will
S.3.GS.9	develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
S.3.GS.10	analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
S.3.GS.11	use evidence to support the explanation that traits can be influenced by the environment.
S.3.GS.12	use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
Topic	**Weather and Climate**
Objectives	Students will
S.3.GS.13	represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
S.3.GS.14	obtain and combine information to describe climates in different regions of the world.
S.3.GS.15	make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*

Grade 3-5	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.3-5.ETS.1	define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
S.3-5.ETS.2	generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
S.3-5.ETS.3	plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science – Grade 4

Fourth Grade Science objectives build on the study of geology, astronomy, chemistry and physics. Through a progressive rigorous, integrated approach, the inquiry-based program of study blends science and 21st century skills and provides students opportunities to demonstrate scientific literacy in the fields of life science, physical science, and earth and space sciences. By engaging in active inquiries, investigations and hands-on activities throughout the instructional day, students focus on the major themes of science: systems, changes, and models in order to develop conceptual understanding and research skills as described in the objectives. Fourth Grade Science promotes cooperative learning, group decisions, cultural diversity, and careers. The curricular focus develops basic problem-solving skills through observing, experimenting and concluding. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students use safe and proper techniques for handling, manipulating, and caring for science materials and treating living organisms humanely. Fourth Grade Science intentionally supports developmental and academic growth.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 4	**Science**
Standard	General Science Content
Topic	**Energy**
Objectives	Students will
S.4.GS.1	use evidence to construct an explanation relating the speed of an object to the energy of that object.
S.4.GS.2	make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
S.4.GS.3	ask questions and predict outcomes about the changes in energy that occur when objects collide.
S.4.GS.4	apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*
S.4.GS.5	obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
Topic	**Waves: Waves and Information**
Objectives	Students will
S.4.GS.6	develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
S.4.GS.7	generate and compare multiple solutions that use patterns to transfer information.*
Topic	**Structure, Function, and Information Processing**
Objectives	Students will
S.4.GS.8	develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
S.4.GS.9	construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

S.4.GS.10	use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
Topic	**Earth's Systems: Processes that Shape the Earth**
Objectives	Students will
S.4.GS.11	identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
S.4.GS.12	make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
S.4.GS.13	analyze and interpret data from maps to describe patterns of Earth's features.
S.4.GS.14	generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*

Grade 3-5	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.3-5.ETS.1	define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
S.3-5.ETS.2	generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
S.3-5.ETS.3	plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science – Grade 5

Fifth Grade Science objectives identify, compare, classify and explain our living and designed worlds. Through a progressive rigorous, integrated approach, the inquiry-based program of study blends science and 21st century skills and provides students opportunities to demonstrate scientific literacy in the fields of life science, physical science, and earth and space sciences. By engaging in active inquiries, investigations and hands-on activities throughout the instructional day, students focus on the major themes of science: systems, changes, and models in order to develop conceptual understanding and research skills as described in the objectives. Fifth Grade Science expands understanding of earth and sky, life cycles and habitats of organisms, properties, positions and motions of objects and energy. Major content concepts at the fifth grade level include changes in properties of matter, structures, functions and adaptations of organisms, and the structure of the earth's system. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students use safe and proper techniques for handling, manipulating, and caring for science materials and treating living organisms humanely. Fifth Grade Science intentionally supports developmental and academic growth.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 5	**Science**
Standard	General Science Content
Topic	**Structure and Properties of Matter**
Objectives	Students will
S.5.GS.1	develop a model to describe that matter is made of particles too small to be seen.
S.5.GS.2	measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
S.5.GS.3	make observations and measurements to identify materials based on their properties.
S.5.GS.4	conduct an investigation to determine whether the mixing of two or more substances results in new substances.
Topic	**Matter and Energy in Organisms and Ecosystems**
Objectives	Students will
S.5.GS.5	use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
S.5.GS.6	support an argument that plants get the materials they need for growth chiefly from air and water.
S.5.GS.7	develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Topic	**Earth's Systems**
Objectives	Students will
S.5.GS.8	develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
S.5.GS.9	describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

S.5.GS.10	obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
Topic	**Space Systems: Stars and the Solar System**
Objectives	Students will
S.5.GS.11	support an argument that the gravitational force exerted by Earth on objects is directed down.
S.5.GS.12	support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
S.5.GS.13	represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Grade 3-5	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.3-5.ETS.1	define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
S.3-5.ETS.2	generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
S.3-5.ETS.3	plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science – Grade 6

Sixth Grade Science objectives build upon students' science understanding from earlier grades and provide deeper understandings in six major content topics: Weather and Climate; Space Systems; Waves and Electromagnetic Radiation; Matter and Energy in Organisms and Ecosystems; Interdependent Relationships in Ecosystems; and Human Interactions. The objectives blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge across the science disciplines. There is a focus on several scientific practices which include developing and using models; analyzing and interpreting data; using mathematical and computational thinking; obtaining, evaluating, and communicating information; and engaging in argument from evidence. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

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Grade 6	**Science**
Standard	Life Sciences Content
Topic	**Interdependent Relationships in Ecosystems**
Objectives	Students will
S.6.LS.1	construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
S.6.LS.2	evaluate competing design solutions for maintaining biodiversity and ecosystem services.*
Topic	**Matter and Energy in Organisms and Ecosystems**
Objectives	Students will
S.6.LS.3	construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
S.6.LS.4	develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
S.6.LS.5	analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
S.6.LS.6	develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
S.6.LS.7	construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Grade 6	**Science**
Standard	Physical Sciences Content

Topic	**Waves and Electromagnetic Radiation**
Objectives	Students will
S.6.PS.1	use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
S.6.PS.2	develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
S.6.PS.3	integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

Grade 6	**Science**
Standard	Earth and Space Science Content
Topic	**Space Systems**
Objectives	Students will
S.6.ESS.1	develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
S.6.ESS.2	develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
S.6.ESS.3	analyze and interpret data to determine scale properties of objects in the solar system.
Topic	**Weather and Climate**
Objectives	Students will
S.6.ESS.4	collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
S.6.ESS.5	develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
S.6.ESS.6	ask questions to clarify evidence of the factors that have caused the change in global temperatures over the past century.
Topic	**Human Impacts**
Objectives	Students will
S.6.ESS.7	analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

Grade 6-8	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.6-8.ETS.1	define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

S. 6-8.ETS.2	evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
S. 6-8.ETS.3	analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
S. 6-8.ETS.4	develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Grade 6-8	**Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.6-8.L.1	cite specific textual evidence to support analysis of science and technical texts.
S.6-8.L.2	determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
S.6-8.L.3	follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.6-8.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
S.6-8.L.5	analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
S.6-8.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.6-8.L.7	integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
S.6-8.L.8	distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
S.6-8.L.9	compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.6-8.L.10	by the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will

S.6-8.L.11	write arguments focused on discipline-specific content: • introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims and organize the reasons and evidence logically. • support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. • use words, phrases and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons and evidence. • establish and maintain a formal style. • provide a concluding statement or section that follows from and supports the argument presented.
S.6-8.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments or technical processes: • introduce a topic clearly, previewing what is to follow; organize ideas, concepts and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts and tables) and multimedia when useful to aiding comprehension. • develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. • use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. • use precise language and domain-specific vocabulary to inform about or explain the topic. • establish and maintain a formal style and objective tone. • provide a concluding statement or section that follows from and supports the information or explanation presented.
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.6-8.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.6-8.L.14	with some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on how well purpose and audience have been addressed.
S.6-8.L.15	use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.6-8.L.16	conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
S.6-8.L.17	gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
S.6-8.L.18	draw evidence from informational texts to support analysis, reflection and research.

Topic	**Writing- Range of Writing**
Objectives	Students will
S.6-8.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Science – Grade 7

Seventh Grade Science objectives build upon students' science understanding from earlier grades and provide deeper understandings in six major content topics: Systems; History of Earth; Energy; Forces and Interactions; Structure, Function, and Information Processing; and Human Interactions. The objectives blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge across the science disciplines. There is a focus on several scientific practices which include planning and carrying out investigations; developing and using models; analyzing and interpreting data; using mathematical and computational thinking; obtaining, evaluating, and communicating information; and engaging in argument from evidence. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 7	**Science**
Standard	Life Science Standard
Topic	**Structure, Function, and Information Processing**
Objectives	Students will
S.7.LS.1	conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells.
S.7.LS.2	develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
S.7.LS.3	use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
S.7.LS.4	gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Grade 7	**Science**
Standard	Physical Science Standard
Topic	**Energy**
Objectives	Students will
S.7.PS.1	construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
S.7.PS.2	develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
S.7.PS.3	apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*

S.7.PS.4	plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
S.7.PS.5	construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
Topic	**Forces and Interactions**
Objectives	Students will
S.7.PS.6	apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*
S.7.PS.7	plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
S.7.PS.8	ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
S.7.PS.9	construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
S.7.PS.10	conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Grade 7	**Science**
Standard	Earth and Space Sciences Content
Topic	**Earth's Systems**
Objectives	Students will
S.7.ESS.1	develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
S.7.ESS.2	develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
S.7.ESS.3	construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
Topic	**History of Earth**
Objectives	Students will
S.7.ESS.4	construct a scientific explanation based on evidence from rock strata for how the geologic timescale is used to organize Earth's 4.6-billion-year-old history.
S.7.ESS.5	construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
S.7.ESS.6	analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
Topic	**Human Impacts**
Objectives	Students will
S.7.ESS.7	apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

Grade 6-8	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.6-8.ETS.1	define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
S. 6-8.ETS.2	evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
S. 6-8.ETS.3	analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
S. 6-8.ETS.4	develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Grade 6-8	**Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.6-8.L.1	cite specific textual evidence to support analysis of science and technical texts.
S.6-8.L.2	determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
S.6-8.L.3	follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.6-8.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
S.6-8.L.5	analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
S.6-8.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.6-8.L.7	integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
S.6-8.L.8	distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

S.6-8.L.9	compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.6-8.L.10	by the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.6-8.L.11	write arguments focused on discipline-specific content: • introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims and organize the reasons and evidence logically. • support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. • use words, phrases and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons and evidence. • establish and maintain a formal style. • provide a concluding statement or section that follows from and supports the argument presented.
S.6-8.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments or technical processes: • introduce a topic clearly, previewing what is to follow; organize ideas, concepts and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts and tables) and multimedia when useful to aiding comprehension. • develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. • use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. • use precise language and domain-specific vocabulary to inform about or explain the topic. • establish and maintain a formal style and objective tone. • provide a concluding statement or section that follows from and supports the information or explanation presented.
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.6-8.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.6-8.L.14	with some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on how well purpose and audience have been addressed.
S.6-8.L.15	use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.6-8.L.16	conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
S.6-8.L.17	gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
S.6-8.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.6-8.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Science – Grade 8

Eighth Grade Science objectives build upon students' science understanding from earlier grades and provide deeper understandings in five major content topics: Structure and Properties of Matter; Chemical Reactions; Growth, Development, and Reproduction of Organisms; Natural Selection and Adaptations; and Human Interactions. The objectives blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge across the science disciplines. There is a focus on several scientific practices which include planning and carrying out investigations; developing and using models; analyzing and interpreting data; using mathematical and computational thinking; obtaining, evaluating, and communicating information; and engaging in argument from evidence. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 8	**Science**
Standard	Life Science Content
Topic	**Growth, Development, and Reproduction of Organisms**
Objectives	Students will
S.8.LS.1	use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
S.8.LS.2	construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
S.8.LS.3	develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of an organism.
S.8.LS.4	develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
S.8.LS.5	gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
Topic	**Natural Selection and Adaptations**
Objectives	Students will
S.8.LS.6	analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
S.8.LS.7	apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

S.8.LS.8	analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
S.8.LS.9	construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
S.8.LS.10	use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Grade 8	**Science**
Standard	Physical Science Content
Topic	**Structure and Properties of Matter**
Objectives	Students will
S.8.PS.1	develop models to describe the atomic composition of simple molecules and extended structures.
S.8.PS.2	gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
S.8.PS.3	develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
Topic	**Chemical Reactions**
Objectives	Students will
S.8.PS.4	analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
S.8.PS.5	develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
S.8.PS.6	undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

Grade 8	**Science**
Standard	Earth and Space Science Content
Topic	**Human Impacts**
Objectives	Students will
S.8.ESS.1	construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Grade 6-8	**Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will

S.6-8.ETS.1	define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
S. 6-8.ETS.2	evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
S. 6-8.ETS.3	analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
S. 6-8.ETS.4	develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Grade 6-8	**Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.6-8.L.1	cite specific textual evidence to support analysis of science and technical texts.
S.6-8.L.2	determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
S.6-8.L.3	follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.6-8.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
S.6-8.L.5	analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
S.6-8.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.6-8.L.7	integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
S.6-8.L.8	distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
S.6-8.L.9	compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.6-8.L.10	by the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and

	proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.6-8.L.11	write arguments focused on discipline-specific content: • introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims and organize the reasons and evidence logically. • support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. • use words, phrases and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons and evidence. • establish and maintain a formal style. • provide a concluding statement or section that follows from and supports the argument presented.
S.6-8.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments or technical processes: • introduce a topic clearly, previewing what is to follow; organize ideas, concepts and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts and tables) and multimedia when useful to aiding comprehension. • develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. • use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. • use precise language and domain-specific vocabulary to inform about or explain the topic. • establish and maintain a formal style and objective tone. • provide a concluding statement or section that follows from and supports the information or explanation presented.
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.6-8.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.6-8.L.14	with some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on how well purpose and audience have been addressed.
S.6-8.L.15	use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.6-8.L.16	conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
S.6-8.L.17	gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and

	accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
S.6-8.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.6-8.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Earth and Space Science - Grade 9

The ninth grade Earth and Space Science (ESS) course builds upon science concepts from middle school by revealing the complexity of Earth's interacting systems, evaluating and using current data to explain Earth's place in the universe and enabling students to relate Earth Science to many aspect of human society. Disciplinary core ideas, science and engineering practices, and crosscutting concepts are intertwined as students focus on five ESS content topics: Space Systems, History of Earth, Earth's Systems, Weather and Climate, and Human Sustainability. The objectives strongly reflect the many societally relevant aspects of ESS (resources, hazards, environmental impacts) with an emphasis on using engineering and technology concepts to design solutions to challenges facing human society. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. There is a focus on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, constructing explanations and designing solutions. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 9	**Earth and Space Science**
Standard	Earth and Space Science Content
Topic	**Space Systems**
Objectives	Students will
S.9.ESS.1	develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
S.9.ESS.2	construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
S.9.ESS.3	communicate scientific ideas about the way stars, over their life cycle, produce elements.
S.9.ESS.4	use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
Topic	**History of Earth**
Objectives	Students will
S.9.ESS.5	evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
S.9.ESS.6	apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
S.9.ESS.7	develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

Topic	**Earth's Systems**
Objectives	**Students will**
S.9.ESS.8	analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
S.9.ESS.9	develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
S.9.ESS.10	plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
S.9.ESS.11	develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
S.9.ESS.12	construct an argument based on evidence about the simultaneous coevolution of Earth systems and life on Earth.
Standard	**Weather and Climate**
Objectives	**Students will**
S.9.ESS.13	use a model to describe how variations in the flow of energy into and out of Earth systems result in changes in climate.
S.9.ESS.14	analyze geoscience data and the results from the global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
Topic	**Human Sustainability**
Objectives	**Students will**
S.9.ESS.15	construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
S.9.ESS.16	evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*
S.9.ESS.17	create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
S.9.ESS.18	evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
S.9.ESS.19	use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.*

High School	**Earth and Space Science**
Standard	Engineering Design
Objectives	**Students will**
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Grade 9-10	**Earth and Space Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.9-10.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
S.9-10.L.2	determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
S.9-10.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.9-10.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
S.9-10.L.5	analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
S.9-10.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.9-10.L.7	translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
S.9-10.L.8	assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
S.9-10.L.9	compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.9-10.L.10	by the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will

S.9-10.L.11	write arguments focused on *discipline-specific content*: • introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. • use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.9-10.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes: • introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g. figures, tables), and multimedia when useful to aiding comprehension. • develop the topic with well-chosen, relevant and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among ideas and concepts. • use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.9-10.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.9-10.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.9-10.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
Topic	**Writing- Research to Build and Present Knowledge**

Objectives	Students will
S.9-10.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem and narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.9-10.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question and integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
S.9-10.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.9-10.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Biology - Grade 10

The tenth grade Biology content provides more in-depth studies of the living world and enables students to make sense of emerging research findings and apply those understandings to solving problems. Disciplinary core ideas, science and engineering practices, and crosscutting concepts are intertwined as students focus on five life science topics: Structure and Function, Inheritance and Variation of Traits, Matter and Energy in Organisms and Ecosystems, Interdependent Relationships in Ecosystems, and Natural Selection and Evolution. Engineering, Technology, and the Application of Science objectives are integrated throughout instruction as students define problems and design solutions related to the course objectives. There is a focus on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, constructing explanations and designing solutions. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

Grade 10	**Biology**
Standard	Life Science
Topic	**Structure and Function**
Objectives	Students will
S.10.LS.1	construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
S.10.LS.2	develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
S.10.LS.3	plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
Topic	**Matter and Energy in Organisms and Ecosystems**
Objectives	Students will
S.10.LS.4	use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
S.10.LS.5	construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
S.10.LS.6	use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
S.10.LS.7	construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
S.10.LS.8	use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

S.10.LS.9	develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Topic	**Interdependent Relationships in Ecosystems**
Objectives	Students will
S.10.LS.10	use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
S.10.LS.11	use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
S.10.LS.12	evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
S.10.LS.13	design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*
S.10.LS.14	evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
S.10.LS.15	create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*
Topic	**Inheritance and Variation of Traits**
Objectives	Students will
S.10.LS.16	use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
S.10.LS.17	ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
S.10.LS.18	make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
S.10.LS.19	apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Topic	**Natural Selection and Evolution**
Objectives	Students will
S.10.LS.20	communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
S.10.LS.21	construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
S.10.LS.22	apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
S.10.LS.23	construct an explanation based on evidence for how natural selection leads to adaptation of populations.
S.10.LS.24	evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

High School	**Biology**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Grade 9-10	**Biology**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.9-10.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
S.9-10.L.2	determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
S.9-10.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.9-10.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
S.9-10.L.5	analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
S.9-10.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.9-10.L.7	translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

S.9-10.L.8	assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
S.9-10.L.9	compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.9-10.L.10	by the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.9-10.L.11	write arguments focused on *discipline-specific content*: • introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. • use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.9-10.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes: • introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g. figures, tables), and multimedia when useful to aiding comprehension. • develop the topic with well-chosen, relevant and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among ideas and concepts. • use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

	• provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.9-10.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.9-10.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.9-10.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.9-10.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem and narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.9-10.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question and integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
S.9-10.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.9-10.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Physical Science (recommended third course option)

The Physical Science course develops understandings of the core concepts from chemistry and physics: Structure and Properties of Matter; Chemical Reactions; Forces and Interactions; Energy; and Waves and Electromagnetic Radiation. The objectives in Physical Science allow high school students to explain more in-depth phenomena central not only to the physical sciences, but to life and earth and space sciences, as well. These objectives blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. There is a focus on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations. Students are expected to use these practices to demonstrate understanding of the core ideas as well as demonstrate understanding of several engineering practices, including design and evaluation. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

High School	**Physical Science**
Standard	Physical Science Content
Topic	**Structure and Properties of Matter**
Objectives	Students will
S.HS.PS.1	use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
S.HS.PS.2	plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
S.HS.PS.3	develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
S.HS.PS.4	communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. *
Topic	**Chemical Reactions**
Objectives	Students will
S.HS.PS.5	construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
S.HS.PS.6	develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

S.HS.PS.7	apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
S.HS.PS.8	refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*
S.HS.PS.9	use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
Topic	**Forces and Interactions**
Objectives	Students will
S.HS.PS.10	analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
S.HS.PS.11	use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
S.HS.PS.12	apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*
S.HS.PS.13	use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
S.HS.PS.14	plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
Topic	**Energy**
Objectives	Students will
S.HS.PS.15	create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
S.HS.PS.16	develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
S.HS.PS.17	design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*
S.HS.PS.18	plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
S.HS.PS.19	develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
Topic	**Waves and Electromagnetic Radiation**
Objectives	Students will
S.HS.PS.20	use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
S.HS.PS.21	evaluate questions about the advantages of using a digital transmission and storage of information

S.HS.PS.22	evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
S.HS.PS.23	evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
S.HS.PS.24	communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*

High School	**Physical Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

High School	**Physical Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.11-12.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.11-12.L.11	write arguments focused on *discipline-specific content*: • introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. • use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes:

	• introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension. • develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts. • use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. • provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.11-12.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.11-12.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

Chemistry (recommended third course STEM option)

Chemistry is an advanced elective course designed for students pursuing Science Technology Engineering Mathematics (STEM) education and careers. Students will develop a deeper understanding of the core concepts of: Structure and Properties of Matter and Chemical Reactions as they prepare for college chemistry requiring a strong mathematical foundation. The chemistry course prepares high school students to explain more in-depth phenomena central not only to the physical sciences, but to life and earth and space sciences as well. The chemistry objectives blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. There is a focus on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations. Students will use these practices to demonstrate understanding of the core ideas as well as demonstrate understanding of several engineering practices, including design and evaluation. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

High School	**Chemistry**
Standard	Chemistry Content
Topic	**Structure and Properties of Matter**
Objectives	Students will
S.HS.C.1	use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
S.HS.C.2	research and evaluate contributions to the evolution of the atomic theory.
S.HS.C.3	describe atoms using the Quantum Model.
S.HS.C.4	produce electron configurations and orbital diagrams for any element on the periodic table and predict the chemical properties of the element from the electron configuration.
S.HS.C.5	plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
S.HS.C.6	investigate the solubility of various materials in water and determine experimentally the effects of temperature, concentration and vapor pressure on solution properties.
S.HS.C.7	develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
S.HS.C.8	communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*
Topic	**Chemical Reactions**

Objectives	Students will
S.HS.C.9	construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
S.HS.C.10	predict the products, write and classify balanced chemical reactions including single replacement, double replacement, composition, decomposition, combustion and neutralization reactions.
S.HS.C.11	design a properly working electrolytic cell based on redox principles.
S.HS.C.12	compare and contrast the Arrhenius and Bronsted-Lowry definitions of acids and bases.
S.HS.C.13	compare methods of measuring pH: • indicators • indicator papers • pH meters.
S.HS.C.14	predict the product of an acid-base reaction.
S.HS.C.15	develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
S.HS.C.16	apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
S.HS.C.17	refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*
S.HS.C.18	use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
S.HS.C.19	generate mole conversions that demonstrate correct application of scientific notation and significant figures: • mass to number of particles • number of particles to volume • volume to mass.
S.HS.C.20	perform calculations using the combined gas laws.
S.HS.C.21	perform the following "mole" calculations showing answers rounded to the correct number of significant figures: • molarity • percentage composition • empirical formulas • molecular formulas • formulas of hydrates • mole-mole and mass-mass stoichiometry • determination of limiting reactant • theoretical yield.

High School	**Chemistry**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

High School	**Chemistry**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.11-12.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.11-12.L.11	write arguments focused on *discipline-specific content*: • introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. • use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes: • introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension. • develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts. • use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

	• provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.11-12.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.11-12.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

Physics (recommended fourth course STEM option)

Physics is an advanced elective course designed for students pursuing Science Technology Engineering Mathematics (STEM) education and careers. The course emphasizes a mathematical approach to the topics of Forces and Interactions; Energy, and Waves and Electromagnetic Radiation and prepares student for college physics. The physics course prepares high school students to explain more in-depth phenomena central not only to the physical sciences, but to life and earth and space sciences, as well. These objectives blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. There is a focus on several scientific practices which include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations. Students will use these practices to demonstrate understanding of the core ideas as well as demonstrate understanding of several engineering practices, including design and evaluation. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

High School	**Physics**
Standard	Physics Content
Topic	**Forces and Interactions**
Objectives	Students will
S.HS.P.1	analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
S.HS.P.2	use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
S.HS.P.3	evaluate the conservation of energy and momentum and deduce solutions for elastic and inelastic collisions.
S.HS.P.4	apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*
S.HS.P.5	use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
S.HS.P.6	plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
S.HS.P.7	assess the magnitude of buoyant force on submerged and floating objects.
S.HS.P.8	anticipate the effects of Bernoulli's principle on fluid motion.
S.HS.P.9	analyze the motion of a projectile; appraise data, either textbook generated or laboratory collected, for motion in one and/or two dimensions, then select the correct mathematical method for communicating the value of unknown variables.

S.HS.P.10	interpret graphical, algebraic and/or trigonometric solutions to prove the values for vector components and resultants.
Topic	**Energy**
Objectives	Students will
S.HS.P.11	create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
S.HS.P.12	evaluate the conservation of energy and momentum and deduce solutions for elastic and inelastic collisions.
S.HS.P.13	develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
S.HS.P.14	design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*
S.HS.P.15	plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
S.HS.P.16	develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
S.HS.P.17	construct and analyze electrical circuits and calculate Ohm's law problems for series and parallel circuits.
S.HS.P.18	distinguish between direct and alternating current and identify ways of generating each type.
Topic	**Waves and Electromagnetic Radiation**
Objectives	Students will
S.HS.P.19	use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
S.HS.P.20	evaluate questions about the advantages of using a digital transmission and storage of information.
S.HS.P.21	evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
S.HS.P.22	evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
S.HS.P.23	communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*
S.HS.P.24	apply ray optics diagrams to lenses and mirrors; use the lens/mirror equation and the magnification equation to solve optics problems; justify the image results obtained by diagramming the ray optics of lenses and mirrors and/or by deducing the image information from the lens/mirror equation.

High School	**Physics**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will

S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

High School	**Physics**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.11-12.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.11-12.L.11	write arguments focused on *discipline-specific content*: • introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. • use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes: • introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension. • develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts. • use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. • provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will

S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.11-12.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.11-12.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

Environmental Science (Elective)

Environmental Science is an advanced, high school elective course which builds on foundational knowledge of the chemical, physical, biological, geological processes and focuses on the natural world. Through an inquiry-based program of study, all students will demonstrate environmental literacy as they explore the economic, social, political, and ecological interdependence in urban and rural areas and on local and global scales. As students fuse experiences across disciplines, they will acquire knowledge, values, and skills needed to protect and improve the environment. There is a focus on several crosscutting concepts including the following: Cause and Effect, Systems and System Models, Energy and Matter, and Stability and Change. Science practices and Engineering, Technology, and the Application of Science objectives are integrated as students ask questions and define problems, develop and use models, plan and conduct investigations, analyze and interpret data, and construct explanations and design solutions. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

High School	**Environmental Science**
Standard	Environmental Science Content
Objectives	Students will
S.HS.ENV.1	compare and contrast the rate elements cycle through the ecosphere, describing natural and human influences on reaction rates: • carbon • nitrogen • phosphorus • oxygen • sulfur.
S.HS.ENV.2	explain how the chemical components of biological and physical processes fit in the overall process of biogeochemical cycling such as photosynthesis, respiration, nitrogen fixation, or decomposition.
S.HS.ENV.3	analyze and evaluate the use and availability of renewable and nonrenewable energy resources: • coal • solar • biomass • biofuels • hydropower • natural gas

	• wind • geothermal • nuclear.
S.HS.ENV.4	evaluate environmental and economic advantages and disadvantages of using nonrenewable and renewable energy.
S.HS.ENV.5	differentiate various means of generating electricity in terms of the transformation of energy among forms, the relationship of matter and energy, and efficiency/production of heat energy.
S.HS.ENV.6	explain how technology has influenced the sustainability of natural resources over time: • forestry practices • fossil fuels • farming.
S.HS.ENV.7	relate logistic, exponential, and irruptive population growth to population dynamics including: • natural selection • predator/prey relationships • reproductive strategies • carrying capacity • limiting factors.
S.HS.ENV.8	create food web diagrams to explain how adding and/or removing a species from an ecosystem may affect other organisms and the entire ecosystem.
S.HS.ENV.9	evaluate the leading causes of species decline and premature extinction: • habitat destruction and degradation • invasive species • pollution • human population growth • over exploitation.
S.HS.ENV.10	analyze biological diversity as it relates to the stability of an ecosystem.
S.HS.ENV.11	relate habitat changes to plant and animal populations and climate influences: • variations in habitat size • fragmentation • fluctuation in conditions of abiotic factors • albedo • surface temperature.
S.HS.ENV.12	compare and contrast legislation and international agreements associated with protecting habitats, ecosystems, and species: • Superfund • Surface Mining Control and Reclamation Act

	• Wilderness Act • Endangered Species Act • Marine Mammals Act.
S.HS.ENV.13	illustrate how changes in wind patterns or ocean temperatures can affect weather in different parts of the world: • El Nino • La Nina • Santa Ana winds.
S.HS.ENV.14	identify natural and anthropogenic sources of primary, secondary, and indoor air pollutants and the resulting environmental and health effects.
S.HS.ENV.15	explain the formation of acid rain and describe the resulting effect on soil, plants, water, statues, etc.
S.HS.ENV.16	identify causes for the thinning of the ozone layer and evaluate the effectiveness of the Montreal Protocol for reducing ozone depletion.
S.HS.ENV.17	debate climate change as it relates to natural forces, greenhouse gases, human changes in atmospheric concentrations of greenhouse gases, and relevant laws and treaties.
S.HS.ENV.18	identify sources, uses, quality, conservation, and global distribution of water.
S.HS.ENV.19	create models to show surface and groundwater flows in a local drainage and explain how surface and ground water are related.
S.HS.ENV.20	contrast point source and non-point source water pollutants.
S.HS.ENV.21	use GIS data to analyze the parameters of a watershed and interpret physical, chemical and biological data as a means of assessing environmental quality.
S.HS.ENV.22	examine legislation associated with the protection of water: • Clean Water Act • London Dumping Convention of 1972.
S.HS.ENV.23	describe the processes involved and compare different methods of wastewater treatment.
S.HS.ENV.24	classify and analyze characteristics of different soil types: • texture • pH • nitrogen • phosphorus • potassium.
S.HS.ENV.25	analyze best management practices of the agriculture business: • fertilizers • integrated pest management

	• associated water pollution • irrigation practices.
S.HS.ENV.26	research and describe how communities have restored or protected ecosystems: • remediation • mitigation • rehabilitation • reclamation • preservation.
S.HS.ENV.27	evaluate solid waste management practices: • recycling • incineration • sanitary landfills • hazardous waste disposal.

High School	**Environmental Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

High School	**Environmental Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.11-12.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.11-12.L.11	write arguments focused on *discipline-specific content*: • introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. • use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

	• establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes: • introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension. • develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts. • use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. • provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.11-12.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.11-12.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.

Topic	**Writing- Range of Writing**
Objectives	Students will
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

Forensic Science (Elective)

Forensic Science is an advanced, high school elective course designed to provide students with hands-on experiences in various aspects of a criminal investigation. Science content and Engineering, Technology, and the Application of Science objectives are integrated as students ask questions and define problems, develop and use models, plan and conduct investigations, analyze and interpret data, construct explanations and design solutions as they consider crime scenes, evidence, and protocol. As students demonstrate proficiency in evidence collection--maintenance of data integrity, formulation of a conclusion/summary, and succinct communication of findings--they prepare for forensic-related careers and other occupational opportunities in science, technology, engineering, and math. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

High School	**Forensic Science**
Standard	Forensic Science Content
Objectives	Students will
S.HS.FS.1	identify evidence which encompasses materials establishing a link between a crime and its victim or a crime and its perpetrator: • impressions (tire, tool, teeth, shoes) • prints (finger, lip, voice) • hair and fiber analysis • drugs and poisons • ballistics • soil and pollen • glass • serology • questioned documents.
S.HS.FS.2	distinguish between types of evidence: • testimonial • physical: individual and class • quantitative • qualitative.
S.HS.FS.3	analyze modes of transfer and the factors affecting persistence of evidence (Locard's Exchange Principle): • indirect • direct

S.HS.FS.4	demonstrate steps of crime scene processing: • Note-taking • Photography • Sketching to scale • Evidence collection • chain of custody.
S.HS.FS.5	validate, classify, and analyze fingerprints as individual evidence: • type • pattern • minutiae.
S.HS.FS.6	model techniques of collecting and developing prints on various objects and textures: • physical (dusting powders) • chemical (ninhydrin, iodine, cyanoacrylate).
S.HS.FS.7	examine the absorption and effects of toxins in the human body: • alcohol • drugs • poisons.
S.HS.FS.8	identify known and unknown substances utilizing the techniques of forensic toxicology: • white powders • blood alcohol • over the counter/illicit drugs • gas chromatography charts.
S.HS.FS.9	discuss and cite evidence of biological and chemical hazards and their impact on society and the environment: • arson • bombs • bioterrorism • environmental terrorism.
S.HS.FS.10	apply forensic entomology to assess a crime scene: • Berlese funnel • life cycles.
S.HS.FS.11	analyze bones and teeth as forensic evidence: • type • articulation • origin

	• sex • age • race • stature • disease/injury.
S.HS.FS.12	analyze the composition of blood as evidence: • ABO system • Rh factor • DNA fingerprinting.
S.HS.FS.13	investigate forensic applications of chromatography: • inks and dyes • cosmetics • calculation of *Rf* values.
S.HS.FS.14	explore earth science concepts as they relate to forensic science: • rock and mineral identification • classify soils' common constituents in relation to crime scene location.
S.HS.FS.15	identify and describe agents and processes of degradation of evidence: • weathering • scavengers.
S.HS.FS.16	solve multi-step problems involving velocity, acceleration, net force, and projectile motion during analysis of crime scene: • ballistics • vehicular collisions • blood spatter.
S.HS.FS.17	investigate and analyze forensic evidence utilizing optical and acoustical applications
S.HS.FS.18	utilize biometric techniques for forensic science investigations: • prints • recognition scans • anthropometry.
S.HS.FS.19	research and evaluate technological advances and careers related to the field of forensics.

High School	**Forensic Science**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will

S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

High School	**Forensic Science**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.11-12.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.11-12.L.11	write arguments focused on *discipline-specific content.* • introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. • use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension. • develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. • use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts. • use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. • provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will

S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.11-12.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.11-12.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

Human Anatomy and Physiology (Elective)

Human Anatomy and Physiology is an advanced, high school elective course designed for those students wanting a deeper understanding of the structures and functions of the human body. The body will be viewed as a whole using anatomical terminology necessary to describe location. Instruction will be at both micro and macro levels reviewing cellular functions, biochemical processes, tissue interactions, organ systems and the interaction of those systems as it relates to the human organism. Systems covered include integumentary, skeletal, muscular, respiratory, circulatory, digestive, excretory, reproductive immunological, nervous and endocrine. Content standards are integrated with Engineering, Technology, and the Application of Science objectives as students develop conceptual understandings and research and laboratory skills, evaluate the academic requirements, and prepare for occupational opportunities in health and medical fields. Students will engage in active inquiries, investigations, and hands-on activities as they develop and demonstrate conceptual understandings and research and laboratory skills described in the objectives. Safety instruction is integrated in all activities, and students will implement safe procedures and practices when manipulating equipment, materials, organisms, and models.

All West Virginia teachers are responsible for classroom instruction that integrates content literacy and *21st Century Learning Skills and Technology Tools*.

High School	**Human Anatomy and Physiology**
Standard	Human Anatomy and Physiology Content
Objectives	Students will
S.HS.HAP.1	apply directional terminology to locate human body structures: • proximal • dorsal • medial • visceral • superficial • deep.
S.HS.HAP.2	describe the organizational levels, interdependency and the interaction of: • cells • tissues • organs • organ systems.
S.HS.HAP.3	categorize, by structure and function, the various types of human tissue: • muscle • epithelial • connective

	• nervous.
S.HS.HAP.4	relate the structure of the integumentary system to its function as a/an: • sensory organ • environmental barrier • temperature regulator.
S.HS.HAP.5	relate how bone tissue is important to the development of the human skeleton.
S.HS.HAP.6	correlate the structure and function of the elements of the skeletal system: • bone • articulations • insertions.
S.HS.HAP.7	model the mechanisms of muscular contraction on the cellular and molecular levels.
S.HS.HAP.8	integrate the skeletal, muscular and nervous systems to the functioning of the organism.
S.HS.HAP.9	model the muscular system including: • locations • origins • insertions • muscle groups • types of muscles.
S.HS.HAP.10	classify the various types of neurons emphasizing the relationship of structure and function.
S.HS.HAP.11	model the mechanism of a nerve impulse at the cellular and molecular levels.
S.HS.HAP.12	compare and contrast the parts and functions of the central and peripheral nervous system including the autonomic portions.
S.HS.HAP.13	apply the structure of the ear and eye to their function/dysfunction in relation to environmental perception.
S.HS.HAP.14	apply the action of specific enzymes to their roles in bodily functions.
S.HS.HAP.15	incorporate the role of endocrine glands and their hormones into the overall functions and dysfunctions of the body.
S.HS.HAP.16	analyze the role of components and processes of the digestive system in supplying essential nutrients.
S.HS.HAP.17	explain how structures of the respiratory system are essential to cellular respiration, gas exchange and communication.
S.HS.HAP.18	illustrate the structures of the circulatory and lymphatic systems and the function of blood to the role of: • transportation • cellular support • defense.
S.HS.HAP.19	compare the compatibility of blood types and assess the molecular basis for blood functions.
S.HS.HAP.20	integrate the functions of the excretory system to the maintenance of the other body systems.
S.HS.HAP.21	compare and contrast the structure and function of male and female reproductive systems.

S.HS.HAP.22	outline the events of reproduction for the formation of gametes through fertilizations and embryological development.
S.HS.HAP.23	assess the role of components of the immune system in defending the body.
S.HS.HAP.24	research disease causative factors, symptoms, prevention and treatment.

High School	**Human Anatomy and Physiology**
Standard	Engineering, Technology, and Applications of Science
Topic	**Engineering Design**
Objectives	Students will
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

High School	**Human Anatomy and Physiology**
Standard	Science Literacy
Topic	**Reading- Key Ideas and Details**
Objectives	Students will
S.11-12.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Topic	**Reading- Craft and Structure**
Objectives	Students will
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Topic	**Reading- Integration of Knowledge and Ideas**
Objectives	Students will
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Topic	**Reading- Range of Reading and Level of Text Complexity**
Objectives	Students will
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Topic	**Writing- Text Types and Purposes**
Objectives	Students will
S.11-12.L.11	write arguments focused on *discipline-specific content.* • introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. • develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. • use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • provide a concluding statement or section that follows from or supports the argument presented.
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension. • develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

	• use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts. • use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. • provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Topic	**Writing- Production and Distribution of Writing**
Objectives	Students will
S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
S.11-12.L.14	develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Topic	**Writing- Research to Build and Present Knowledge**
Objectives	Students will
S.11-12.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.
Topic	**Writing- Range of Writing**
Objectives	Students will
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.