Astronomy Solar/Galactic (#2001350)

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Course Number: 2001350

Course Path: Section: Grades PreK to 12 Education Courses > **Grade Group:** Grades 9 to 12 and Adult Education Courses > **Subject:** Science > **SubSubject:** Earth/Space Sciences > **Abbreviated Title:** ASTRONOMY S/G

Number of Credits: One (1) credit

Course Length: Year (Y)

Course Type: Elective Course

Course Level: 2

Course Status: Course Approved

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC *Framework for K-12 Science Education, 2010*)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Course Standards

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.

- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Name	Description
SC.912.E.5.6:	Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other. **Remarks/Examples:** Explain that Kepler's laws determine the orbits of objects in the solar system and recognize that Kepler's laws are a direct consequence of Newton's Law of Universal Gravitation and Laws of Motion.
SC.912.E.5.7:	Relate the history of and explain the justification for future space exploration and continuing technology development. **Remarks/Examples:** Identify examples of historical space exploration (e.g. telescopes, high altitude balloons, lunar landers, deep-space probes, space station) that had significant impact on current space exploration and recognize the importance of continued exploration in space.
SC.912.E.5.8:	Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. **Remarks/Examples:** Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources.
SC.912.E.5.9:	Analyze the broad effects of space exploration on the economy and culture of Florida. **Remarks/Examples:** Recognize the economic, technical and social benefits of spinoff technology developed through the space program.
SC.912.E.5.11:	Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations. **Remarks/Examples:** Determine which units of measurement are appropriate to describe distance (e.g. astronomical units, parallax, and light years). Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and MAFS.K12.MP.6: Attend to precision.
SC.912.E.6.2:	Connect surface features to surface processes that are responsible for their formation. **Remarks/Examples:** Identify various landforms (e.g. dunes, lakes, sinkholes, aquifers) and describe how they form (erosion, physical/chemical weathering, and deposition). Explain how sea level changes over time have exposed and inundated continental shelves, created and destroyed inland seas, and shaped the surface of the Earth.
SC.912.E.7.7:	Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change. **Remarks/Examples:** Explain the possible natural (e.g. increased global temperature, wildfires, volcanic dust) and anthropogenic mechanisms (e.g. air pollution, acid rain, greenhouse gases, burning of fossil fuels) and the effects of these mechanisms on global climate change.
SC.912.N.1.1:	Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. **Examine books and other sources of information to see what is already known,** 4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. **Plan investigations,** (Design and evaluate a scientific investigation). 6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. **Pose answers, explanations, or descriptions of events,** 8. **Generate explanations that explicate or describe natural phenomena (inferences),** 9. **Use appropriate evidence and reasoning to justify these explanations to others,** 10. **Communicate results of scientific investigations, and** 11. **Evaluate the merits of the explanations produced by others.** **Remarks/Examples:** Florida Standards Connections for 6-12 Literacy in Science For Students in Grades 9-10 LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.3 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. LAFS.910.RST.3.7 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. LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research. For Students in Grades 11-12

	LAFS.1112.RST.1.1 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. LAFS.1112.RST.1.3 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. LAFS.1112.RST.3.7 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. LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research. Florida Standards Connections for Mathematical Practices MAFS.K12.MP.1: Make sense of problems and persevere in solving them. MAFS.K12.MP.2: Reason abstractly and quantitatively. MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.] MAFS.K12.MP.4: Model with mathematics. MAFS.K12.MP.5: Use appropriate tools strategically. MAFS.K12.MP.6: Attend to precision. MAFS.K12.MP.7: Look for and make use of structure. MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.
SC.912.N.1.2:	Describe and explain what characterizes science and its methods. **Remarks/Examples:** Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs. Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.
SC.912.N.1.3:	Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. **Remarks/Examples:** Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions. Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others
SC.912.N.1.4:	Identify sources of information and assess their reliability according to the strict standards of scientific investigation. **Remarks/Examples:** Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled variables, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification. Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.
SC.912.N.1.5:	Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. **Remarks/Examples:** Recognize that contributions to science can be made and have been made by people from all over the world.
SC.912.N.1.6:	Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. **Remarks/Examples:** Collect data/evidence and use tables/graphs to draw conclusions and make inferences based on patterns or trends in the data. Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
SC.912.N.1.7:	Recognize the role of creativity in constructing scientific questions, methods and explanations. **Remarks/Examples:** Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving). Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.
SC.912.N.2.1:	Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). **Remarks/Examples:** Science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)
SC.912.N.2.2:	Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion. **Remarks/Examples:** Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled variables, sample size, replicability, empirical and measurable evidence, and the concept of falsification). Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.
	Identify examples of pseudoscience (such as astrology, phrenology) in society.

SC.912.N.2.3:	**Remarks/Examples:** Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.
SC.912.N.2.4:	Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. **Remarks/Examples:** Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence. Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.
SC.912.N.2.5:	Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. **Remarks/Examples:** Recognize that scientific questions, observations, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data analysis.
SC.912.N.3.1:	Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. **Remarks/Examples:** Explain that a scientific theory is a well-tested hypothesis supported by a preponderance of empirical evidence. Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.
SC.912.N.3.2:	Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. **Remarks/Examples:** Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events. Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.
SC.912.N.3.3:	Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships. **Remarks/Examples:** Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific law describes how something behaves.
SC.912.N.3.4:	Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions. **Remarks/Examples:** Recognize that theories do not become laws, theories explain laws. Recognize that not all scientific laws have accompanying explanatory theories.
SC.912.N.3.5:	Describe the function of models in science, and identify the wide range of models used in science. **Remarks/Examples:** Describe how models are used by scientists to explain observations of nature. Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.
SC.912.N.4.1:	Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. **Remarks/Examples:** Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach. MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.
SC.912.P.8.1:	Differentiate among the four states of matter. **Remarks/Examples:** Differentiate among the four states of matter (solid, liquid, gas and plasma) in terms of energy, particle motion, and phase transitions. (Note: Currently five states of matter have been identified.)
SC.912.P.8.4:	Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom. **Remarks/Examples:** Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses. Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.
SC.912.P.10.4:	Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. **Remarks/Examples:** Explain the mechanisms (convection, conduction and radiation) of heat transfer. Explain how heat is transferred (energy in motion) from a region of higher temperature to a region of lower temperature until equilibrium is established. Solve problems involving heat flow and temperature changes by using known values of specific heat and/or phase change constants (latent heat). Explain the phase transitions and temperature

	changes demonstrated by a heating or cooling curve.
SC.912.P.10.9:	Describe the quantization of energy at the atomic level. **Remarks/Examples:** Explain that when electrons transition to higher energy levels they absorb energy, and when they transition to lower energy levels they emit energy. Recognize that spectral lines are the result of transitions of electrons between energy levels that correspond to photons of light with an energy and frequency related to the energy spacing between levels (Planck's relationship E = hv).
SC.912.P.10.11:	Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues. **Remarks/Examples:** Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power). Explain the concept of half-life for an isotope (e.g. C-14 is used to determine the age of objects) and calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. Recognize that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions due to the large amount of energy related to small amounts of mass by equation E=mc^2.
SC.912.P.10.18:	Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications. **Remarks/Examples:** Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.
SC.912.P.10.19:	Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not. **Remarks/Examples:** Recognize the Planck function allows examination of the radiation emitted by an object as a function only of its temperature.
SC.912.P.10.20:	Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another. **Remarks/Examples:** Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) and explain the relationships among them. Recognize that the source of all waves is a vibration and waves carry energy from one place to another. Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves). Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.
SC.912.P.10.21:	Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver. **Remarks/Examples:** Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).
SC.912.P.10.22:	Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors. **Remarks/Examples:** Use examples such as converging/diverging lenses and convex/concave mirrors. Use a ray diagram to determine the approximate location and size of the image, and the mirror equation to obtain numerical information about image distance and image size.
SC.912.P.12.2:	Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time. **Remarks/Examples:** Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant. Florida Standards Connections: MAFS.912.N-VM.1.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.
SC.912.P.12.4:	Describe how the gravitational force between two objects depends on their masses and the distance between them. **Remarks/Examples:** Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them.
SC.912.P.12.6:	Qualitatively apply the concept of angular momentum. **Remarks/Examples:** Explain that angular momentum is rotational analogy to linear momentum (e.g. Because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]).
SC.912.P.12.7:	Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving. **Remarks/Examples:** Recognize that regardless of the speed of an observer or source, *in a vacuum* the speed of light is always *c*.
LAFS.910.RST.1.1:	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
LAFS.910.RST.1.2:	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.
LAFS.910.RST.1.3:	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.
LAFS.910.RST.2.4:	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.

LAFS.910.RST.2.5:	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LAFS.910.RST.2.6:	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.
LAFS.910.RST.3.7:	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.
LAFS.910.RST.3.8:	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.
LAFS.910.RST.3.9:	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.
LAFS.910.RST.4.10:	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
LAFS.910.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
LAFS.910.SL.1.2:	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LAFS.910.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
LAFS.910.SL.2.4:	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
LAFS.910.SL.2.5:	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
LAFS.910.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. 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. b. 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. c. 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. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LAFS.910.WHST.1.2:	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. 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. b. 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. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. 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. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. 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).
LAFS.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.910.WHST.2.5:	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.
LAFS.910.WHST.2.6:	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.
LAFS.910.WHST.3.7:	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.
LAFS.910.WHST.3.8:	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; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
LAFS.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.910.WHST.4.10:	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.
MAFS.912.F-IF.3.7:	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

	e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.
MAFS.912.N-Q.1.1:	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★
MAFS.912.N-Q.1.3:	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★
ELD.K12.ELL.SC.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
ELD.K12.ELL.SI.1:	English language learners communicate for social and instructional purposes within the school setting.

Related Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
Earth/Space Science (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)

There are more than 968 related instructional/educational resources available for this on CPALMS. Click on the following link to access them: http://www.cpalms.org/Public/PreviewCourse/Preview/13081