

EARTH AND SPACE SCIENCE NXG SCIENCE STANDARDS

GRADE 9

EARTH AND SPACE SCIENCE CONTENT

Topic	Space Systems				
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				
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				
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.				
Topic	Weather and Climate				
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				
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

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

Topic	Engineering Design				
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 SCIENCE LITERACY

Topic	Reading- Key Ideas and Details				
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				
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				
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				
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				
S.9-10.L.11	write arguments focused on <i>discipline-specific content</i> :				
	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				
	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.				

	<ul style="list-style-type: none"> 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. 				
	<ul style="list-style-type: none"> establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 				
	<ul style="list-style-type: none"> 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				
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				
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				
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.				