

2010 Arizona ELA Standards (Common Core State Standards plus Arizona additions)

Grades 9-10 Science and Technical Subjects

Reading Standards for Literacy in Science and Technical Subjects

Reading is critical to building knowledge in history/social studies as well as in science and technical subjects. College and career ready reading in these fields requires an appreciation of the norms and conventions of each discipline, such as the kinds of evidence used in history and science; an understanding of domain-specific words and phrases; an attention to precise details; and the capacity to evaluate intricate arguments, synthesize complex information, and follow detailed descriptions of events and concepts. In history/social studies, for example, students need to be able to analyze, evaluate, and differentiate primary and secondary sources. When reading scientific and technical texts, students need to be able to gain knowledge from challenging texts that often make extensive use of elaborate diagrams and data to convey information and illustrate concepts. Students must be able to read complex informational texts in these fields with independence and confidence because the vast majority of reading in college and workforce training programs will be sophisticated nonfiction. It is important to note that these Reading standards are meant to complement the specific content demands of the disciplines, not replace them.

The explanations and examples are intended to be used as a guide to provide possible strategies for incorporating the reading and writing standards within a science classroom; they are not classroom requirements nor do they represent the only approaches to teaching these standards.

Reading Standards for Literacy in Science and Technical Subjects	
Key Ideas and Details	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.RST.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	<p>Students examine the details of scientific or technical text to support their analysis of the document. Supporting evidence may include citing evidence that supports the author’s claim or conclusion, purpose, or perspective; evidence that supports the credibility and validity of the text, including research design or sample size; date of publication; visual representations of data and findings; or if the supporting research has been peer reviewed.</p> <p>Common science texts could include magazine or newspaper articles, journal articles, science textbooks, online resources, and personal narratives.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read a news article about the extent of damage caused by an earthquake. Cite specific evidence in the article that supports the author’s claims of damage (cost of repairs, loss of life, habitat damage). SCHS-S3C1-02, SCHS-S6C2-05 • Read an article or website providing information about how the introduction of the imported red fire ant in the southeastern United States has impacted the invaded ecosystems. Cite specific evidence in the article that supports the author’s claims of damage (cost of control measures, loss of native diversity, habitat damage). SCHS-S4C3

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Reading Standards for Literacy in Science and Technical Subjects	
Key Ideas and Details	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.RST.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.	<p>Students identify the key ideas of their text and provide an accurate summary for an expository text or sequencing summary for a functional text. Students should be able to create a visual representation (timeline, model, flow chart) of a sequence or complex process (e.g., protein synthesis, chemical reactions, transfer of energy) from the text summary.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read a journal article on the role of the cell membrane in transport of macromolecules. Summarize the transport process using words, pictures, and/or diagrams. SCHS-S4C1-04 • Read a paper on water reclamation and conservation. Summarize the key methods for reclaiming and conserving water. Provide a diagram or flow chart as needed. SCHS-S6C1-06 • When reading safety considerations or procedures prior to a laboratory activity, identify key safety concerns and/or summarize necessary precautions, such as proper handling procedures for acids/bases (SCHS-S5C4-12), techniques for preparing and running gel electrophoresis (SCHS-S4C2-01), or analyzing calorimetric measurements (SCHS-S5C5-06).
9-10.RST.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.	<p>Students follow a written lab protocol or sequence of steps to accomplish an activity. Students should pay attention to accuracy and precision when taking measurements. Students should be aware of the special cases specific to that procedure.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Follow written procedures for preparing wet mount slides to view pond organisms under the microscope, paying attention to the type of preparation needed for a variety of different types of organisms. SCHS-S4C1-02 • Follow written procedures for determining the concentration of acids and bases, demonstrating proper techniques and safety precautions. SCHS-S5C4-12, SCHS-S1C2-01

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Reading Standards for Literacy in Science and Technical Subjects	
Craft and Structure	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
<p>9-10.RST.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 <i>grades 9–10 texts and topics</i>.</p>	<p>Students determine the meaning of words and phrases as they read science content, including text books, lab materials, and other print or electronic sources of information. They use a variety of strategies (context clues, linguistic roots and affixes, restatement, examples, contrast, glossary, etc.) to determine the meaning of words and phrases in the text. This standard specifically addresses domain-specific Tier Three words and interpreting symbols in equations or in diagrams and flow charts.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read about food chains and food webs, and then identify the linguistic roots and affixes to help clarify the meanings of terms related to trophic levels, such as carnivore, herbivore, omnivore, autotroph, and heterotrophy. SCHS-S4C3-01 • Determine the meaning of chemical equations containing chemical formulas, coefficients, and symbols that represent the states of the reactants and products. SCHS-S5C4-03 • Determine the meaning of variables in mathematical equations, such as $f=ma$ (SCHS-S5C2-04), $PV=nRT$ (SCHS-S5C5-05), or $V=IR$ (SCHS-S5C5-06).
<p>9-10.RST.5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., <i>force, friction, reaction force, energy</i>).</p>	<p>Students identify different structures within a text (headings, sub-headings, bold words, pictures, graphs, data tables, paragraphs) and explain how the visual structures support, reinforce, or provide additional information to the paragraph text. Students explain how specific key terms are related to each other or to the broader science concept and general science understanding.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read a section from a textbook and analyze how structures within the text (headers, bold words, embedded definitions, and graphics) help the reader understand the meaning of the text. • Read a research article or lab report and explain the purpose for each section (abstract, materials/methods, analysis, and conclusion) and why the information is organized in that format. • Read a section from a textbook or published article and analyze how key science or technical terms within the text are related to each other and the overall meaning of the text.

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Reading Standards for Literacy in Science and Technical Subjects Craft and Structure	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.RST.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.	<p>Examples:</p> <ul style="list-style-type: none"> • Read a science article that describes the procedure for measuring seismic waves and then they analyze why the author included the procedure in the text and how that procedure would address the author’s research question. SCHS-S6C2-06 • Read a newspaper article that provides information about how DNA and cladograms show the degree of relatedness between species; the article contains an explanation on how to construct a cladogram. Explain why the author included information on how to construct a cladogram in the article and the question that cladogram information would help answer. SCHS-S4C4-06

Reading Standards for Literacy in Science and Technical Subjects Integration of Knowledge and Ideas	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.RST.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.	<p>Students will use words in a text and information expressed visually to obtain information about a given topic. Sources of text could include textbooks, magazine or newspaper articles, websites, or product information or safety sheets. Students should be able to develop a written or oral explanation of a visual representation (graph, chart, picture, etc.) that accurately represents the information presented; or vice versa.</p> <p>Examples:</p> <ul style="list-style-type: none"> • After reading a written description of a chemical reaction, write an equation that shows the reaction. Text provided: Solid sodium reacts with chlorine gas to produce solid sodium chloride. Student translated: $2\text{Na}(s) + \text{Cl}_2(g) \rightarrow 2\text{NaCl}(s)$. SCHS-S5C4-03 • Given a chemical equation, write a description of that equation. Text provided: $2\text{Na}(s) + \text{Cl}_2(g) \rightarrow 2\text{NaCl}(s)$ SCHS-S5C4-03 Student translated: Solid sodium reacts with chlorine gas to produce solid sodium chloride. SCHS-S5C4-03 • Read text describing the luminosity, color, and temperature of various stars and show the relative position of each star on a Hertzsprung-Russell diagram. SCHS-S6C4-03 • Using a diagram illustrating the Coriolis Effect on the movement of water and air, use appropriate science vocabulary (written or verbally) to describe the process with accuracy and enough detail that would allow another student to construct a similar diagram. SCHS-S6C2-10

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Reading Standards for Literacy in Science and Technical Subjects Integration of Knowledge and Ideas	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.RST.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.	<p>Students evaluate the degree to which an author's claim is supported by the evidence provided and whether that evidence is relevant to the reasoning of the claim or recommendation.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read an article that evaluates different methods of water reclamation and then recommends the best method for a city to implement. Analyze the relevance of the evidence provided and the reasoning the author used to support the recommendation. SCHS-S1C3-03 • Read a newspaper article or letter to the editor that proposes solutions to prevent forest fires during summer lightning storms. Analyze the text to identify which claims are supported by evidence and facts in the text and the degree to which the reasoning supports the proposed solution. SCHS-S3C1-02, ETHS-S3C2-03 • Read another student's laboratory report and analyze the text to identify which claims in the conclusion section are supported by evidence and facts and which claims are speculation, reasoned judgment, or unsupported by evidence. SCHS-S1C3-03, ETHS-S3C2-03
9-10.RST.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.	<p>Students compare and contrast the information gained (depth and scope of content, author's purpose, whether the source provides new information or summarizes known information, etc.) from experiments, simulations, video or multimedia sources with information gained from reading a text on the same topic. Students determine whether the information in the compared sources supports or contradicts each other.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Watch a video that shows weathering, sedimentation or orogenesis, then read text (textbook, trade book, educational website) that provides information about the same Earth processes. Compare and contrast the amount and type of information conveyed by each source and be able to explain how each helps to develop understanding of these Earth processes. Determine whether the information in the compared sources supports or contradicts each other. SCHS-S6C1-02 • Perform a series of experiments that show evidence of chemical reactions (precipitate, gas, color change, change in temperature). After collecting data, read text that describes different chemical reactions and the types of evidence of the reaction. Compare and contrast the amount and type of information conveyed by the experiment to that contained in the text and explain how each source of information helps to develop understanding of chemical reactions. Determine whether the information in the compared sources supports or contradicts each other. SCHS-S5C4-02

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Reading Standards for Literacy in Science and Technical Subjects	
Range of Reading and Level of Text Complexity	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.RST.10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently..	Students read and comprehend text in science and technical subjects at the appropriate grade level. See Appendix B of the Common Core State Standards for text examples and sample performance tasks that would be appropriate for the grades 9-10 complexity band.

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Strand: Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects	
Text Types and Purposes	
<u>Standards</u>	<u>Explanations and Examples</u>
<p><i>Students are expected to:</i></p> <p>9-10.WHST.1 Write arguments focused on <i>discipline-specific content</i>.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>e. Provide a concluding statement or section that follows from or supports the argument presented.</p>	<p>Students write an argument or claim based on an issue or topic included in the grade level Science Standard. The argument is presented with logical reasoning, accurate science content, and relevant data to support the claim. The students’ argument may include scientifically accurate claims and counterclaims as well as supporting statements for each. Cohesion and clarification of claims are created with effective word choice, appropriate use of science vocabulary, and writing style. A sound conclusion supports the argument presented.</p> <p>The writers’ skill should be evidenced in: a clear and developed thesis statement, a logical organization, accurate use of academic vocabulary, and a detailed and supported argument with transitions and a concluding statement.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Write an essay or argument explaining whether viruses are considered living organisms, using scientific evidence to support the claim. SCHS-S4C4-06 • Write two persuasive essays: one making a claim that supports the development of National Parks in Central America as a method for preserving tropical biodiversity and one essay presenting the counterclaim that National Parks are not the most effective method for preserving tropical biodiversity in Central America. Use scientific research as the evidence base to support the claims made by each essay. SCHS-S3C1-05, SCHS-S4C3-01 • After completing an experiment that compared the motion of a steel ball on different surfaces, write a conclusion that supports or refutes the statement “Rough surfaces provide more friction than smooth surfaces” and provide evidence to support the claim with the experimentally collected data in addition to other existing research. SC08-S5C2-02

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Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

Text Types and Purposes

<u>Standards</u>	<u>Explanations and Examples</u>
<p><i>Students are expected to:</i></p> <p>9-10.WHST.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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).</p>	<p>Students select and develop an informational topic aligned to the Arizona High School Science Standard and their science course. The topic is well-developed using facts, details and examples. Various writing techniques and rich vocabulary are used to provide clarity and cohesion. A strong conclusion supports the information.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Write an informative essay about how a specific cultural or societal issue promotes or hinders scientific advancements: how attempts to reduce dependency on oil promote scientific or technological advancements in alternate or renewable energy sources or how societal values restrict stem cell research. SCHS-S3C2-04, SCHS-S4C5-05 • Write a research paper documenting the history of model of the atom (SCHS-S5C1-07) or other historical advancements in science, like the discovery of the structure of DNA (SCHS-S2C1-02). • Following a lab investigation that explores factors that affect energy transfer between two samples of water, write a description of procedures, observations, including any claims that can be made from those observations and evidence that supports the claim. SCHS-S5C3-02 • Write an informative essay that explains how radioactive decay maintains the Earth’s internal temperature. SCHS-S6C2-08

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Text Types and Purposes

<u>Standards</u>	<u>Explanations and Examples</u>
<p><i>Students are expected to:</i></p> <p>9-10.WHST.3. (See note; not applicable as a separate requirement)</p> <p>Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.</p>	<p>Students write step-by-step procedures for their experiments that are detailed enough that others would be able to replicate their experiments exactly and achieve the same results.</p> <p>Example:</p> <ul style="list-style-type: none"> • Write a step-by-step procedure showing safe and correct use of a microscope, Bunsen burner, or calorimeter as part of a lab report. SCHS-S1C2-01 • Design and test a mathematical or computer-based model showing the cause and/or effects of climate changes over long periods of time (SCHS-S6C2-16). Write a technical report that includes a description of the model design (assumptions, calculations, limitations), appropriate sources and displays of the test data, and explains how preliminary test data was used to refine the model.

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Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects	
Production and Distribution of Writing	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
<p>9-10.WHST.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>a. Produce clear and coherent functional writing (e.g., formal letters, envelopes, experiments, labels, timelines, graphs/tables, procedures, charts, maps, captions, diagrams, sidebar, flow charts) in which the development, organization and style are appropriate to task, purpose, and audience.</p>	<p>Examples:</p> <ul style="list-style-type: none"> • Write a report based on a laboratory experiment or activity aligned to the Arizona High School Science Standard and science course. In the report, include procedures, tables, graphs, charts, and/or diagrams that communicate the purpose, results, and conclusions of the research. SCHS-S1C4 • Write a report that includes timelines for historical developments in science, such as the discovery of the structure of DNA (SCHS-S2C1-02, SCHS-S4C2-01) or includes a decision flow chart for evaluating methods used to manage natural resources (SCHS-S3C2-05).
<p>9-10.WHST.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.</p>	<p>Students develop and strengthen their writing through the writing process with a focus on purpose and audience. Writing in science utilizes an academic voice and is mostly non-fiction and formal. At this level of the writing process students can use peers and adults to provide feedback on drafts of their writing.</p> <p>The writing process and peer/adult review of drafts can be used for any and all writing assignments within the science classroom.</p>
<p>9-10.WHST.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.</p>	<p>This standard requires the use of technology (Internet, keyboarding skills, formatting, storing) to create a published piece wherein information and ideas are connected and presented clearly and efficiently.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Use technology to create and publish any writing assignment aligned to the Arizona High School Science Standards for a specific high school course. The written product could be shared on a school or classroom website, blog, or discussion board. • Use technology, such as Google Docs, to collaborate on writing or to edit shared documents related to a classroom investigation or research assignment.

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Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects	
Research to Build and Present Knowledge	
<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
<p>9-10.WHST.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.</p>	<p>Students conduct research projects or experimental investigations of differing lengths meant to answer a question or solve a problem. Students answer questions - including those they create themselves - through research (online, library, laboratory investigations) to solve a problem. They use and combine information from multiple sources to construct their claims, evidence, and explanations.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Generate questions about the genetics of an organism (pea plants, fruit flies) and then test the question experimentally and/or by researching published data. Synthesize relevant information from multiple sources to construct claims, evidence, and explanations supporting the research or published information. SCHS-S4C2-03 • Conduct research on possible causes and/or effects of climate changes over long periods of time. Synthesize data from multiple sources on effects of glaciations, solar activity, greenhouse effect, etc to construct a claim and support that claim with evidence gathered during research. SCHS-S6C2-15
<p>9-10.WHST.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.</p>	<p>Students gather relevant information from a variety of credible print and digital sources (e.g., encyclopedias, Internet websites, experts, journal articles, magazine articles, textbooks) for focused research. Students will then use quotations correctly and/or paraphrase information to avoid plagiarism and integrate information in their writing in a consistent “voice”. Citations will be in a standard recognized format (e.g., MLA) in both the text and the bibliography. Using of a variety of reliable resources to support their original work is expected.</p> <p>Examples:</p> <ul style="list-style-type: none"> • As part of an investigation on the impact of abiotic and biotic factors on an ecosystem, gather relevant information on abiotic and biotic factors for that ecosystem and integrate relevant information and appropriate citations from those sources in the written introduction, background information, and/or analysis of the student-conducted research project. SCHS-S4C3-02 • As part of a research project on how weather is influenced by natural and artificial Earth features, gather relevant information on how different features impact weather in general and then apply that information to the weather in a specific area. Integrate relevant information and appropriate citations from those sources in the written introduction, background information, and/or analysis of the project. SCHS-S6C2-02

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Research to Build and Present Knowledge

<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.WHST.9. Draw evidence from informational texts to support analysis, reflection, and research.	<p>Students should be given multiple opportunities to use evidence from informational texts (e.g., research papers, credible web sites, journal articles, textbooks) to support their claims, analyses, reflections, and/or research.</p> <p>Example:</p> <ul style="list-style-type: none"> • Following a lab aligned to the grade level Science Standard, in write a research claim and then support it with evidence (from one or multiple sources) or scientific principles that support the claim. These additional sources can either be teacher provided or researched by the students. • After reading a science article aligned to the grade level Science Standard, write a claim to support student research, reflection, or analysis of scientific principles. The written claim should include evidence (from one or multiple sources) that supports the claim. These additional sources can either be teacher provided or researched by the students.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

Range of Writing

<u>Standards</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	
9-10.WHST.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.	<p>Students should be given multiple opportunities to write about a wide range of science topics aligned to their grade level Science Standard. Writing assignments should be of varying lengths (e.g., one paragraph responses, multiple paragraph essays, research projects).</p> <p>Examples:</p> <ul style="list-style-type: none"> • Write short explanations of tables or graphs to demonstrate understanding of the displayed data (population graphs, geological timelines, data tables, velocity-time graphs). • Write short explanations of diagrams or images to demonstrate understanding of the illustration (cell models, diagrams of animal digestive or circulatory systems, food webs, rock cycle, models of Earth's structures). • Use reflective journaling as a concluding activity on any topic in a science classroom. • Write a letter to the editor of a paper or magazine critiquing the accuracy, reliability, or validity of a published science article. • Write a research paper or laboratory report about a relevant topic over an extended time period.